SVERIGES RIKSBANK

The Riksbank's inquiry into the risks in the Swedish housing market

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COVER: The curve relates real property price index for permanent single family dwellings, Sweden, 1980:1-2010:4. Index 1980=100. The real series is the nominal series deflated by the CPI.

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Preface

On 4 February 2010 the Executive Board of the Riksbank decided to give the Head of the Monetary Policy Department, Per Jansson, and the Head of the Financial Stability Department, Mattias Persson, the task of carrying out a commission of inquiry into the Swedish housing market in accordance with the commission's terms of reference.

The purpose of the inquiry was to throw light on the relationship between the housing market and the Riksbank's tasks and objectives. The commission's task involved, on the basis of the current regulatory framework, examining risks in the Swedish housing market. It also included throwing light on which tools the authorities should have at their disposal to prevent risks from building up. The commission would also address developments in the commercial property market. When relevant, international comparisons were to be made.

The commission of inquiry consists of a total of 12 background reports written by economists/researchers at the Riksbank and economists/researchers outside of the Bank. The summary has been written by Per Jansson and Mattias Persson and does not constitute an official stance by the Riksbank on these issues.

■ The task

The Commission's terms of reference

BACKGROUND

From both an historical and an international perspective, large falls in property prices have played a prominent role in economic crises. A common feature of these crises has in most cases been that they have been preceded by a strong expansion in credit and an increase in indebtedness.

In some cases, such as during the Swedish banking crisis of the 1990s, this has primarily concerned commercial property. In other cases, such as the most recent international financial crisis, the focus has rather been on residential property.

Various international analysts have expressed concern over developments in the housing market over a long period of time, as house prices and household indebtedness in many countries have risen rapidly. The risk is that such price increases will be exaggerated. In the wake of the most recent financial crisis, house prices have fallen in many countries.

In Sweden, too, house prices have risen sharply over several years. However, the financial crisis has not led to any major fall in house prices in Sweden. Banks and other lenders have made very small loan losses on mortgages to households.

A distinguishing feature of the Swedish housing market in recent years has been that the loan-to-value ratio – that is, the size of the loan in relation to the value of the property – has been relatively high for new borrowers, that the fixed rate terms of the loans have been short and that amortisation payments have been small.

The commercial property market has recently been characterised by price falls and by an increase in property companies' leverage ratios. The Swedish property companies are dependent on loans to be able to fund their activities. Moreover, the banks' lending to the property companies comprises a not insignificant share of their total lending. The commercial property market is therefore highly important to financial stability.

The Riksbank has responsibility for monetary policy. The objective of monetary policy is to maintain price stability. This has been interpreted as a low and stable inflation rate. However, the Riksbank also has the task of promoting a safe and efficient payment system.

The most recent financial crisis has given new life to the debate on whether a central bank should try to counteract rising asset prices to prevent bubbles from building up. If a house price bubble bursts, house prices fall substantially. It is possible that this could have repercussions on the financial system and the payment

system, particularly if the increase in house prices has gone hand in hand with high indebtedness. Moreover, large fluctuations in house prices can affect the economy as a whole and thus monetary policy. At the same time, however, monetary policy affects house prices. In addition, a high loan-to-value ratio and a variable mortgage rate can make individual households sensitive to changes in interest rates. All in all, this means that house prices interact in a complicated manner with the Riksbank›s tasks and objective.

THE TASK

The Riksbank, other public authorities and individual academics have, in various contexts, analysed the function of the housing market in Sweden. The results of these discussions have not been clear-cut. Moreover, they have usually been based on individual issues, such as whether a housing bubble has arisen, or how robust the system is to isolated events, such as an interest rate increase. The Riksbank therefore considers that a more cohesive analysis of the Swedish housing market is necessary. The inquiry should examine the relationship between the housing market and the Riksbank's tasks and objective. The commission should examine, on the basis of the current regulatory framework, what risks exist in the Swedish housing market and what tools the authorities have at their disposal for dealing with them. The task includes making international comparisons where this is relevant.

The market for commercial properties, in a number of respects, has been better analysed than the housing market. However, considering our experiences of earlier crises, the development of this market should also be analysed under the framework of the inquiry.

The commission of inquiry should be given the task of

- Analysing what factors lie behind Swedish housing prices having risen for a long time and why the loan-to-value ratios have increased. The inquiry should in this connection analyse whether there are any differences between metropolitan areas and other parts of the country.
- Discussing the role played by monetary policy in developments in the Swedish housing market and how central banks should take developments in asset prices into account.
- Discussing what role institutional factors such as the tax system, the financial regulatory framework and the forms for housing finance have played in the development of the Swedish housing market.
- Analysing what risks there are with a high loan-to-value ratio and with little or no amortisation.
- Examining what risks arise when the percentage of households with loans at a variable interest rate increases.

- Examining what events might trigger a fall in house prices and what consequences this could have for the economy as a whole, for monetary policy, for the financial markets and for financial stability.
- Examining developments in the commercial property market and discussing price developments in this market and the property companies' leverage ratios.
- Analysing the role that monetary policy can and should play in affecting the unfavourable development of credit stocks and property prices.
- Discussing which alternative tools could be implemented to affect such unfavourable development, and under which circumstances such tools should be implemented.
- Discussing how responsibility for the implementation of such alternative tools can be allocated among various authorities.

CONSULTATION AND REPORTING THE TASK

The commission of inquiry shall be carried out within the Riksbank. The Riksbank will where necessary make use of the assistance of external experts. The work should be reported with appropriate regularity to the Executive Board of the Riksbank. The commission of inquiry will consult with Finansinspektionen (the Swedish financial supervisory authority) and with other authorities concerned. In autumn 2010, the commission of inquiry will organise a conference on the housing market with the participation of experts from Sweden and abroad. The commission of inquiry will present its final report no later than 31 January 2011.

The Commission's organisation and implementation

The Riksbank's commission of inquiry into risks in the housing market has been produced by a working group composed of employees from the Monetary Policy Department (APP) and the Financial Stability Department (AFS) under the leadership of Mattias Persson (Head of the Financial Stability Department) and Per Jansson (Head of the Monetary Policy Department). Ylva Hedén Westerdahl (head of division, APP) and Albina Soultanaeva (senior economist, AFS) have led the practical work of the group and managed the contacts with external experts. A steering group has been linked to the working group and this consisted of Mattias Persson (AFS), Per Jansson (APP), Claes Bergh (adviser to the Executive Board), Staffan Viotti (adviser to the Executive Board), and others.

The inquiry has involved around 10 minuted meetings held between the steering group and the leaders of the working group. The working group has presented its reports to the steering group and received feedback on its work on four occasions.

The Executive Board has been kept up-to-date on the inquiry and its work. A number of external economists/researchers have been asked to write reports for the inquiry.

- Professor Peter Englund has written about Swedish housing prices and put them in an international perspective, see chapter I.1.
- Professors Franklin Allen and Kenneth Rogoff (economic advisers to the Riksbank) have written about asset prices, financial stability and monetary policy, see chapter III.1
- Professor Philip Davis, Tatiana Fic and Dilruba Karim have written about the dynamics in the housing market and macroprudential tools, see chapter III.2.
- Professor Stellan Lundström and Bo Holmlund, PhD, have written about commercial property and financial stability, see chapter V.1.
- Professor Howell Jackson was to write a report on alternative tools and an international comparison of the allocation of mandates among public authorities. Unfortunately this issue has remained unaddressed, as the Riksbank was informed at a very late state that Professor Jackson was unable to deliver his report.

The Riksbank has also examined, under the umbrella of this inquiry, the opportunity to produce more statistics and better indicators of the situation in the housing market in Sweden. The new statistics include an indicator of stocks of unsold housing, information on how long housing has been for sale and the ratio between the price advertised and the final price, see chapter IV.1. Sometimes the Riksbank wishes to be able to shed light on certain issues that cannot be addressed with existing statistics. As of autumn 2010 the Riksbank is cooperating with the Association of Swedish Real Estate Agents. The Association sends out a questionnaire to its member companies four times a year and the Riksbank has been given the opportunity to word a couple of specific questions in the survey.

On 1 October 2010 the inquiry invited other authorities and private agents concerned[1] to a round table discussion of the risks in the Swedish housing market. The participants were invited to discuss the situation in the housing market, that is, whether or not they considered housing prices to be overvalued, and whether or not they considered households' debts to be too high. They were also invited to describe

1 Those who were invited to the meeting were: Finansinspektionen (the Swedish Financial Supervisory Authority, the Swedish National Debt Office, the Ministry of Finance, the National Institute of Economic Research, the National Housing Credit Guarantee Board, the Swedish Financial Markets Committee, the Swedish Tax Agency, the National Board of Housing, Building and Planning, the Swedish Homeowners Association, the Swedish Property Federation, the Association of Swedish Real Estate Agents, the Swedish Bankers' Association, SE Banken Nordea, Royal Bank of Scotland (RBS), SBAB, Statshypotek, Svenska Handelsbanken, Swedbank, Valuegard, Bostadrättsorganisationen SBC (tenant-owner organisation).

their views on future developments, the effects of new regulations, taxes and rising mortgages. Bengt Hansson from the National Housing Credit Guarantee Board, Tomas Pousette from SBAB and Filip Andersson from RBS began the discussion on the situation in the housing market. Lars Frisell, Finansinspektionen and Kerstin af Jochnick, Swedish Bankers' Association, introduced the discussion on the effects of the new regulations.

On 12 November 2010 the Riksbank organised a workshop on the subject of "Housing markets, financial stability and monetary policy". The first session dealt with the property market and financial stability. The speakers were Philip Davis, Brunel University, and Nancy Wallace, Berkley University. The second session dealt with asset prices, financial stability and monetary policy. The speakers were Kenneth Rogoff, Harvard University, and Claudio Borio, Bank for International Settlements (BIS). The third session dealt with the housing market and alternative tools. The speakers were Franklin Allen, Wharton University, Cho-hoi Hui, Hong Kong Monetary Authority, and Howell Jackson, Harvard University. The seminar concluded with a panel discussion on how to avoid property prices causing future financial crises. Claudio Borio, BIS, Luci Ellis, Reserve Bank of Australia, Stefan Gerlach, Goethe Universität, and Nancy Wallace took part in the panel discussion. See chapter VI.1 for a summary of the workshop.

A draft report was presented by the commission at the Executive Board meeting on 31 January 2011. After this the various reports were translated into Swedish and English. The reports were then given the same graphic layout. The entire results were published on 5 April 2011 as a PDF on the Riksbank's website, www.riksbank.se, and in book form.

The Riksbank's inquiry into the risks in the Swedish housing market – summary

Per Jansson and Mattias Persson*

Throughout history, the development of the property market has played a prominent role in economic crises. The Swedish crisis of the 1990s and the most recent global crisis are only two examples of how falls in property prices have caused major disruptions to both the financial sector and the economy as a whole. One common feature for property-related crises is that they are, in principle, always preceded by longer periods of rising house prices and increasing household indebtedness.

Looking more closely at individual countries during the current crisis, we can identify a connection between the development of housing prices and indebtedness on one side and the depth of the crisis on the other. The countries affected most severely were those experiencing the steepest fall in prices. Frequently, these were also the same countries that had experienced the highest levels of household indebtedness and the strongest growth in housing prices before the crisis.[1]

House prices and lending to households also increased strongly in Sweden for a number of years prior to the financial crisis. However, unlike in many other countries, Swedish house prices hardly fell at all during the crisis and continued to rise thereafter. That house prices did not fall was undoubtedly one of the reasons that the effects of the crisis were milder in Sweden, as this contributed to maintaining demand in the economy. But, at the same time, the combination of continued rising house prices and the fact that, for a long time, household borrowing had been increasing faster than household incomes was cause for concern.

Considering this development, in February 2010, the Riksbank's Executive Board decided to hold an inquiry into the risks in the Swedish housing market. This inquiry has now been concluded and its results are presented in this volume. The inquiry consists of a total of 12 reports written both by economists/researchers at the Riksbank and Swedish and foreign economists/researchers outside of the Bank. As

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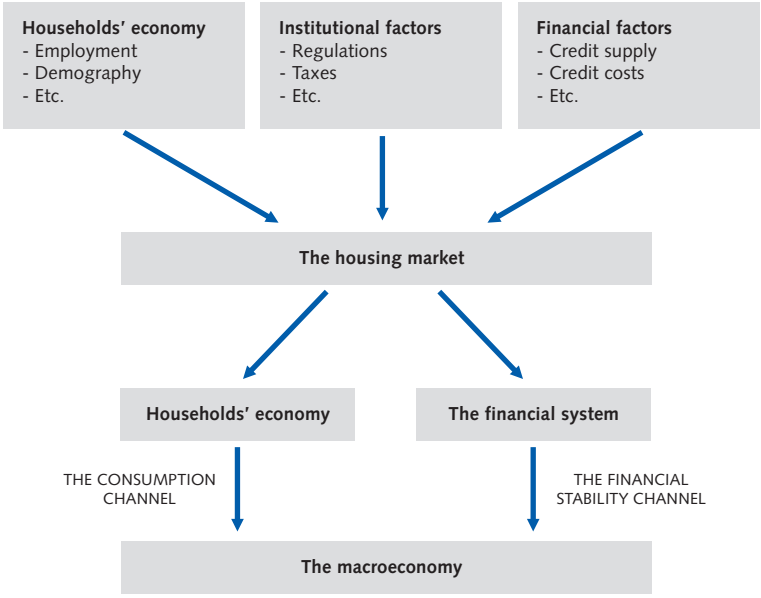
1 See Glick R. and Lansing K. J. (2010), "Global Household Leverage, House Prices and Consumption", *FRBSF Economic Letters*, 2010-01.

those responsible for this work, we will here try to summarise the most important results, in our view, of the inquiry.

How does the housing market affect the macroeconomy?

As a starting point for our discussion, it may be helpful to present a schematic description of how different factors may affect the housing market and how the housing market may affect the rest of the economy. This is illustrated by the following figure.

Figure 1. The housing market and the macroeconomy



The housing market is affected by real, institutional and financial factors, such as demographic developments, taxes and credit supply. Monetary policy primarily influences the housing market through its effects on household mortgage expenditure. Events on the housing market, in turn, affect the macroeconomy, for example employment, GDP growth and inflation, through two channels that can be designated the *consumption channel* and the *financial stability channel*.

THE CONSUMPTION CHANNEL

Changes in housing prices affect household consumption in different ways. When housing prices rise, household wealth increases. When households become richer

in this way, they may increase their consumption.[2] Houses can also be used as collateral for loans and if the value of homes increases, it can become easier for households to borrow and they can borrow on better terms. If housing prices fall, the mechanisms are, of course, the opposite – household wealth decreases, households find it harder to borrow, and the terms become less favourable.

Furthermore, if the upturn phase of housing prices is characterised by an excessively optimistic view of future developments, a situation may develop in which a steep fall in housing prices leads households to adjust downwards the debt level with which they feel comfortable in the long run. Consumption thus decreases, not only because homes are decreasing in value and households are finding it harder to borrow, but also because households are prioritising the repayment of their debts.

THE FINANCIAL STABILITY CHANNEL

A fall in housing prices can lead to greater problems for the macroeconomy than just a drop in consumption. In the event of a fall in prices on the housing market, a situation may arise in which households' mortgages exceed the value of their homes. If this takes place at the same time as a deterioration in households' ability to repay their loans, for example due to increased unemployment, losses will arise in the credit institutions in the same manner as happened in many countries during the last financial crisis. If the losses are comprehensive enough to cause solvency problems among institutions, there exists a risk that the stability of the financial system will come under threat.

However, the situation need not deteriorate to the extent that credit institutions encounter actual solvency problems for stability problems to arise. All that may be needed is a situation in which the development of the housing market makes the institutions' creditors see a significant degree of uncertainty regarding their investments. This may, in turn, cause them to withdraw their funding. If this happens, the result may be a constrained liquidity situation throughout the entire financial system. This is also something that happened in some countries during the last financial crisis.

Regardless of how stability problems may be manifested, there is a risk that this will lead to the credit allocation in the economy being impacted by supply and price shocks or in the functioning of the financial system coming under threat. Thus, in

2 Theoretically, it is not obvious that changes in housing prices will affect consumption in the economy as a whole (see, for example Buiter W.H. (2008) "Housing Wealth Isn't Wealth", NBER Working paper No. 14204). At the same time as some households benefit from higher housing prices, others are disadvantaged, for example young households that are not as well established on the housing market. Empirically, however, there seems to be a connection between changes in housing prices and consumption (see, for example, Davis, E.P. (2010), "New International Evidence on Asset-Price Effects on Investments, and a Survey for Consumption", OECD Economic Studies vol. 2010).

this channel, the macroeconomic disruptions do not take the form of a demand shock, but rather that of frictions in the supply of financial services.

Some key issues in the inquiry

Let us now summarise what we consider to be the most important results of the inquiry. We will do this by examining a number of central issues and briefly presenting our interpretation of the inquiry's conclusions. In certain cases, this will involve considering the results of several reports.

WHAT ROLE CAN MONETARY POLICY PLAY TO PREVENT RISKS ON THE HOUSING MARKET?

Considering the problems a fall in housing prices may cause, we would obviously like to avoid the build-up of imbalances that sooner or later would risk leading to large decreases in price. The issue of what role monetary policy can play in the prevention of such imbalances in the housing market has long been debated in international research and is also addressed here in several reports (Allen and Rogoff, chapter III.1, Claussen, Jonsson and Lagerwall, chapter II.1, and Davis, Fic and Karim, chapter III.2). This is an issue in which, so far, there are no definite answers, and in which more research is needed. However, our interpretation is that we are, at least, starting to approach a consensus that can be described in the following manner.

Even if the policy rate has a part to play in the development of the housing and mortgage market, monetary policy may need to be complemented with other measures. The policy rate has an 'across-the-board' effect and cannot be used to dampen a specific part of the credit market. Model simulations of the Swedish economy by Claussen, Jonsson and Lagerwall indicate that it would have been difficult to dampen the rise of housing prices through monetary policy without this also having significant negative repercussions on the rest of the economy. Simulations by Davis, Fic and Karim indicate that specific measures to prevent systemic risks (macroprudential policies) are more effective than monetary policy when it comes to affecting housing prices and indebtedness.

The question of how monetary policy and a macroprudential policy should best be coordinated still remains to be answered in many ways. Research in this area is still in its infancy. This also applies to the matter of the degree to which monetary policy affects risk-taking among economic agents, for example whether risk-taking tends to increase after a longer period of low interest rates. If monetary policy has such a "side effect", the central banks may need to take this into consideration. Research is also underway within this area, and it will be interesting to follow its results.

When it comes to finding a suitable combination of measures, it is obviously important that, in every situation, an attempt is made to identify the driving forces behind the development and the most prominent risk factors, as far as this is possible. An alarmingly rapid increase in house prices and credit growth is often a symptom of underlying problems, such as shortcomings in credit assessments or a generally overheated economy. Both driving forces and risk factors can vary, not only over time but also between countries. Of course, the more successfully a diagnosis is made, the more favourable the conditions will also be for the timely implementation of a successful treatment. However, experiences from the last crisis have shown that it is not always so easy either to identify the underlying problems or to adopt measures to correct them in time.

IS THE SWEDISH HOUSING MARKET OVERVALUED?

In retrospective, recent events in many countries may be described as a build-up of credit and house price bubbles, which then burst with major negative consequences for the economy. One important question from a Swedish point of view is thus whether the Swedish housing market at present is overvalued. This issue is addressed in the reports by Englund (chapter I.1) and by Claussen, Jonsson and Lagerwall.

Both of these reports find that the high Swedish housing prices can largely be explained by what are usually called fundamental factors – that is to say that there are natural economic explanations for the price increases that have taken place. For example, the development of household incomes has been strong, real interest rates have decreased and the supply of housing has increased only modestly. In many countries, the rate of housing construction also increased strongly in the years before the crisis, which exacerbated the problems when the crisis arrived.

The conclusion that developments in Sweden largely have natural explanations seems reasonable, even if – as the report by Finocchiaro, Nilsson, Nyberg and Soultanaeva, chapter II.3, observes – we should be careful not to attach too much significance to assessments of this kind. It should, for example, be borne in mind that opinions were divided on whether the US housing market was overvalued more or less right up until prices started to fall.

At the same time, the report by Englund points to an important circumstance: there may be reason to ask whether the fundamental factors explaining the development of the housing market *themselves* are on reasonable levels. In particular, Englund highlights the low rate of housing construction over the last 15-year period and the unusually low real interest rate. A partly-related observation in the report by Claussen, Jonsson and Lagerwall is that housing prices, even if they can largely be explained by fundamental factors, are above the long-term trend. So the existence of natural explanations for the high Swedish housing prices

does not necessarily mean that these will develop smoothly in the period ahead. One conclusion of this is that the term "bubble" is ambiguous and we should perhaps be cautious about using it at all, particularly for non-financial assets. One reflection that can also be made is that if any fundamental factor should change relatively rapidly, the effects of this on the economy could very well be dependent on the level of household indebtedness. Consequently, the risks could be greater if households have a high level of indebtedness, regardless of whether housing prices are fundamentally justifiable.

WOULD FINANCIAL STABILITY BE THREATENED BY A FALL IN HOUSING PRICES?

If there should be a larger fall in prices on the housing market in the period ahead, one central issue will concern the extent towards which this would form a threat to financial stability. In terms of Figure 1, the question could be expressed as: will a fall in housing prices only affect the macroeconomy via the consumer channel or can we expect effects via the stability channel too?

The risk that households will encounter problems leading to loan losses is, of course, related to the extent of their debts. It may also be related to how sensitive households are to interest rate changes. As is noted in the report by Johansson, Lagerwall and Lundvall, chapter II.2, the percentage of housing loans at variable interest rates has increased relatively strongly in recent years, which has also made households more interest-rate sensitive. At the same time, this has increased the possibilities for monetary policy to influence the national economy.

Jönsson, Nordberg and Wallin Fredholm, chapter II.4, investigate how debt-servicing ability among households with new mortgages may be affected by unfavourable economic scenarios. Their main conclusion is that it does not seem as though the loan losses that the Swedish banks may incur on household mortgages will form any direct threat to financial stability. As noted, for example, by the report by Lundström and Nordlund, chapter V.1, the problems arising during the Swedish crisis of the 1990s were caused by loan losses on commercial properties (that is, not normal homes).

In a review of international research, Davis, Fic and Karim observe that even if the development of housing prices seems to be an *indicator* of banking crises, it is primarily in the United States that falls in prices on the housing market have historically tended to lead to bank failures. Above all, this is probably due to the greater possibilities US borrowers have when it comes to discharging themselves from their obligation to repay their debts, as Andersson and Lindh, chapter II.6, describe in their report on differences between the US and Swedish regulations for insolvent mortgage holders.

In their report, Janzén, Jönsson and Nordberg, chapter II.5, analyse, among other things, how the banks' funding may be affected by a fall in housing prices. One

conclusion they reach is that the credit quality of the instruments largely used by the banks to borrow capital on the financial markets – covered bonds – should not be threatened. Despite this, a significant refinancing risk linked to these bonds may exist for the banks. A large part of these securities are currently owned by foreign investors and, in times of unrest on the financial markets, foreign investors have often turned out to be particularly "fickle". The rapid increase of loan volumes through the entire financial crisis and the continued rise of housing prices may lead investors to start to question how the liquidity and price of these bonds may come to be impacted by any future unease on the housing market. The banks are running a refinancing risk which, as the financial crisis of 2008 demonstrated, may become problematic. The banks thus have reason to contribute towards decreasing the risk of serious imbalances on the housing market.

In terms of Figure 1, it can thus be said that, in the event of a fall in housing prices, the Swedish macroeconomy would primarily be affected through the consumption channel, and probably also partly through the financial stability channel – in which this second effect should primarily be a matter of increased problems in the banks' funding of Swedish mortgages.

WHAT SHOULD BE DONE?

The inquiry points out a few areas where, from a Swedish point of view, it is important to devote resources so that progress can be made fairly quickly. This involves determining which tools would be suitable for the prevention of systemic risks, as well as the closely-related issue of deciding on the division of responsibility in the use of these tools. Ultimately, responsibility for ensuring that all of these pieces are put into place lies with the government and the Riksdag. One important link here is the financial crisis commission[3] recently appointed by the government. It also involves determining which further data would need to be provided to form a good basis for the decision.

Alternative tools

As we have just observed, it is likely that macroprudential policies are often better suited than policy-rate increases to the prevention of imbalances on the housing market. For the sake of simplicity, let us call these measures "alternative tools", as they can be seen as an alternative to raising the policy rate. The report by Davis, Fic and Kim, chapter III.2, includes an outline of international experiences of alternative tools, while the report by Andersson, Claussen, Lagerwall and Torstensson, chapter III.3, focuses on conditions in Sweden. Both reports provide valuable reviews of the alternatives on offer. The second of these reports also reaches some tentative

3 See the government press release of 3 February 2011, www.sweden.gov.se/sb/d/14393/a/160326.

conclusions concerning the efficiency and suitability of various tools, but it is clear that more work will be needed before a more definitive ranking can be made.

Considering that the housing market has developed differently in Sweden as compared with many other countries, this is an urgent task. For example, should housing prices and the build-up of debts among households continue to increase, the Riksbank and other authorities must be ready to act. Consequently, we need to continue to prepare measures that can be implemented in a rapid and coordinated manner, should this be necessary.

The division of responsibility

The issue of which alternative tools may be suitable cannot be analysed separately from the issue of who should bear responsibility for these tools. This issue is also discussed in the report by Andersson, Claussen, Lagerwall and Torstensson. The issue of responsibility is complicated by the facts that the housing market can affect the macroeconomy via two channels and that several authorities are active within policy areas in which these channels are significant. Given the existing institutional framework, Finansinspektionen (the Swedish Financial Supervisory Authority) and the Riksbank appear to be the most appropriate candidates, although other arrangements are also conceivable. Here, too, it seems clear that further studies will be needed. Ultimately, of course, this is an issue that must be determined on a political level.

In our opinion, the most central issue is not which authority is chosen, but that responsibility is made clear. An arrangement based on divided responsibility and coordination between authorities will risk leading to passiveness and measures not being adopted when the need arises. This is also a lesson that has been taken to heart in many countries following the crisis.

The government commission into the financial crisis has been assigned to examine this more closely, among other tasks. The faster we can find a satisfactory solution for how responsibility, authority and tools should best be allocated between different authorities, the better.

Data requirements

One precondition for conducting a thorough and systematic analysis of the housing market and obtaining early indications of the build-up of risks is, of course, that there is access to relevant and reliable statistics. Soultanaeva and Nordberg, chapter IV.1, describe how, over the last year, the Riksbank has increased its efforts to collect data for its analysis of the housing market in Sweden. However, a number of areas remain in which statistics need to be developed.

- Microdata on household mortgages, with the same level of detail as Finansinspektionen's mortgage survey[4]. One alternative would be to carry out a similar mortgage survey, but including more detailed statistics on households' financial positions and taking place more frequently. Another, more ambitious proposal would be to create a central credit and loan register for mortgages and other debts, based on reporting on the individual level from banks and other monetary financial institutions. A credit and loan register should make it possible to answer those questions regarding which the responsible authorities currently have incomplete information, such as the size of amortisations, remaining fixed-interest periods, assigned loans and so on.
- Microdata on households' financial assets. The discontinuation of the compilation of wealth statistics led to a deterioration of the possibilities for making stability assessments on the basis of the household sector's economic conditions. The development of a new register-based wealth statistic to replace the discontinued statistic is desired.
- Micro and macrodata concerning households' real assets. At present, the analysis is based on rateable values. A debate on the property tax is currently underway, and could lead to the abolition of rateable values. Should this happen, the analysis of households would suffer. If rateable values are abolished, a register-based statistic showing property values should be developed.
- A better price index for housing. At present, Statistics Sweden publishes a quarterly real estate price index for one- and two-dwelling buildings for permanent living, buildings for seasonal and secondary use, and agricultural real estate. In the metropolitan areas, owner-occupied apartments are an important type of housing. A price index for owner-occupied apartments that includes information from the apartment register would facilitate this analysis.
- Bidding statistics. Numbers of bids and bidders signal changes in demand for housing.

One possibility would be to take a consolidated approach and appoint a commission of inquiry into how the official statistics, including microdata, could be improved to increase the possibilities for maintaining financial stability and preventing financial crises. It would also be desirable for all relevant data to be gathered in one location, preferably Statistics Sweden.

4 "The Swedish Mortgage Market and Bank Lending", Finansinspektionen, February 2010.

Some concluding thoughts

As this summary makes clear, the inquiry has not answered all questions. On the other hand, this may not be particularly surprising. These questions are often complex, and many of the areas addressed are presently the focus of intense international research.

We should also be aware that certain questions will probably never receive a definite answer. It can certainly be observed that the risks on the housing market are not constant, but vary over time depending on the development of various underlying explanatory factors. However, it will never be possible to determine, with certainty, the right time to adopt measures to dampen a troubling development on the housing market. It is not possible to "calculate" with certainty the exact level of household debt or of housing prices that would indicate the most appropriate time to act.

This uncertainty is something we will have to live with. The responsible authorities must make the best assessment they can and, on the basis of this and the risk aversion they have, take a decision. However, we consider that the financial crisis has made abundantly clear that measures are needed to counteract the risky development of the housing market. It is not enough to have a strategy based on taking care of the problems once they have materialised, for example with the assistance of monetary policy measures.

However, even though a number of questions have thus been left unanswered, the inquiry has deepened our understanding of many areas and provides a valuable summary of the state of our knowledge, such as it is today. It also indicates areas in which it is essential that we attempt to advance the boundaries of our knowledge. From a Swedish point of view, the immediate future will, above all, involve specifying the appropriate tools for the prevention of systemic risks, investigating and specifying how the allocation of responsibilities should look as regards using these tools, and producing more and better data as a basis for decisions. In our opinion, the inquiry has provided a strong and stable basis for continued work.

Swedish house prices in an international perspective

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The paper aims to assess which factors can explain the development of house prices. Can prices be explained by fundamental factors of demand and supply and, if so, which are the most important fundamentals? Or, do house and apartment prices tend to deviate from fundamentals due to irrational expectations or other factors? What is the importance of institutional factors like taxes and credit market conditions? The focus is on understanding the rapid increase of Swedish house prices in recent years. We show that much of the price increase can be explained by the decrease of after-tax capital costs due to falling real interest rates and a reduction of the Swedish taxation of the returns to owner-occupied housing. Further, the value of owner-occupied housing services has increased beyond the increase in rental apartment rents as a result of a lack of new construction. Understanding why housing supply has been so little affected by the increase in house prices remains a challenge for future studies.

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The house price boom that started in the mid 1990s is unprecedented in recent history, both in length and magnitude. Figure 1 illustrates the price development for a selection of countries. In all cases, prices more than doubled between 1995 and the peak in 2007-08. In Great Britain house prices increased more than four-fold and in Spain and Norway more than three-fold. After 2008, prices have come down in some countries but continued to increase in others, including Sweden. This report aims to assess which factors can explain the development of house prices. Can prices be explained by fundamental factors of demand and supply and, if so, which are the most important fundamentals? Or, do house and apartment prices tend to deviate from fundamentals due to irrational expectations or other factors? What is the importance of institutional factors like taxes and credit market conditions? The focus is on understanding the development of Swedish house prices, particularly in recent years, but we will draw on lessons from international research and make comparisons with the development in other countries.

As a background, the first section discusses briefly a number of stylized facts about house prices: (i) house prices tend to increase in real terms over the long run, (ii) house price changes are cyclical and positively correlated with the general business cycle, (iii) house price changes are predictable; price increases above trend tend to be followed by further price increases in the short run but over the longer term house prices tend to revert towards the trend, (iv) house price changes are generally positively correlated across countries, (v) house price changes are positively correlated across different types of dwellings and across regions within a country, (vi) house price changes are positively correlated with market liquidity (the number of sales).

Houses have the double characteristic of being both durable consumption goods and assets. It is crucial to distinguish between the price of the housing services – corresponding to the rent that a renter would pay to his landlord – and the price of the house itself. There are hence two questions to answer. First, what determines the value of housing services? Second, what determines the price of the asset that gives the owner the right to these services, today and in the future? The answer to the latter question depends on the rate of return that the typical home buyer requires on her investment, or expressed differently the costs of funding for a typical home investment. This question will be discussed in Section 2. In section 3, the perspective switches to the fundamental determinants of the price of housing services, that is the factors that affect the supply and demand of housing services.

The market's willingness to pay for a house depends on the capital costs of holding the house and the costs of operating and maintaining the house in order to "produce" housing services. The sum of these costs defines the user cost of housing. Capital costs depend on mortgage interest rates, borrowing opportunities, capital gains expectations and taxes. These costs have fallen dramatically over

the last couple of decades as a result of lower interest rates and easier access to borrowing. In Sweden, reduced housing taxation has further contributed to reducing the user cost of housing. With reduced user costs homebuyers can afford paying higher house prices. The question is how much higher. To provide a benchmark, we measure the value of housing services by apartment rents. We may then compare the ratio of rent to price with the development of user cost. As it turns out the user cost and the rent-to-price ratio in Sweden track each other quite closely from the mid 1980s until today. This suggests that, taking rents as given, the gradual reduction of user cost can explain almost all of the price increase from the trough of the house price cycle in the mid 1990s until today. This conclusion comes with some caveats relating to capital costs, expectations and borrowing constraints. Discussing these factors separately, we still conclude in Section 2 that the development of user cost – essentially the sharp reduction of the real interest rate – can fully explain the sharp increase in the ratio of house prices to rents. This is mainly discussed in the Swedish context, but the decrease of real interest rates has been a world-wide phenomenon.

We next ask, in section 3, what determines the cost of housing services and look at the determinants of demand and supply. The discussion combines a selective survey of the international research literature with a more specific discussion of Swedish developments. On the demand side, the evidence from numerous empirical studies indicates that the demand for housing services increases roughly in proportion to income, i.e. the income elasticity of demand is around unity. In contrast, demand appears to be quite insensitive to variations in rent; the price elasticity seems to be below unity. This means that if supply does not keep track with demand increases due to income and other fundamentals, the price change needed to maintain balance between demand and supply may be substantial. In other words, the price sensitivity of housing supply is a crucial factor that determines the link between fundamentals and housing prices. It is generally agreed that supply, in particular in the short run, is quite inelastic with regard to house prices. Looking at Swedish data, the response of construction to the sharp increase in house prices in recent years has been very modest. Supply has not increased enough to keep pace with demand and this can explain an increase in the shadow rent of owner-occupied housing beyond the modest increase in rental apartment rents. Understanding why there is so little supply response even to quite dramatic price changes is a key issue for a better understanding of housing markets, in Sweden and other countries.

1. Stylized facts about house prices

In this introductory section, we will briefly state and discuss some general features of house prices that are common to most housing markets, across different countries as well as over different time periods. In order to do this, it is necessary to take a longer time perspective. Figures 2a and 2b depict the development of inflation-adjusted prices of owner-occupied homes since the 1970s and 1980s for a number of these countries, and Figure 3 shows the corresponding development across different regions in Sweden. A number of features of house prices are apparent.[1]

Real house prices have been increasing trend-wise over the last 40 years

All countries record an increase in the house price index between the starting and end point of the data series. To take a few examples based on Figure 2, the average rate of yearly price increase over the 30-year period 1978-2008 was 4.1 percent in Great Britain, 3.6 percent in Spain, 3.1 percent in the Netherlands, 2.5 percent in Norway, 2.1 percent in Finland, 1.7 percent in Denmark, 1.2 percent in Sweden and 1.1 percent in the United States. The main underlying reason for this increase is in all likelihood related to urbanization and the growth of population and income levels. With a large and increasing number of ever richer households living in cities, an increased demand for housing will increase the pressure on centrally located land. For the United States, the share of land in the price of the average home increased from 32 percent in 1984 to 50 percent in 2004 (Davis and Palumbo, 2008). Looking across countries, house prices in densely populated countries, where the land component is more important, have generally risen faster than prices in more sparsely populated countries. But that tendency is not without exceptions, with high rates of increase in relatively sparsely populated countries like Spain and Ireland.

The role of land prices is even more apparent when comparing different regions in a single country. Figure 3 shows the development of real house prices across the main Swedish regions. In the major metropolitan areas of Stockholm, Göteborg and Malmö, the 2010 price level is around two and a half time as high as in the early 1980s, whereas prices have hardly increased at all in the sparsely populated parts of the country where population is declining and the cost of land is a negligible part of house prices. Note that Malmö, which is getting more and more integrated with Copenhagen, has had the highest price growth of all regions.

The recent 40 years are special in some respects. In particular, the deregulation of credit markets in most countries have made owner-occupied housing more

1 The price indexes underlying Figures 1 and 2 have been compiled by BIS. The indexes generally refer to owner-occupied one-family houses. The discussion in the paper is perfectly general, however, and applies in principle to all kinds of owner-occupied housing including apartments. In the text, I will use the term houses throughout.

broadly attractive and may have lead to an increase in the price level more as a result of a transition between two regimes than as an expression of a long-run trend. For this reason, a longer time perspective on house prices is warranted. Such data are only available from a few countries: Eichholtz for Amsterdam houses starting in the 17th century, Eitrheim and Erlandsen for Norway starting in the 19th century, Stapledon (2010) for Australia starting in 1880, and Shiller (2005) for US prices from around 1900. Broadly speaking, these studies indicate that real house prices have been close to constant over long periods. It is, for example, striking that U.S. house prices fell by a third during the inter-war period.[2] The problems of constructing a price index, controlling for quality, is particularly serious over the long term (see the appendix for a brief overview of techniques for constructing house price indexes). Hence, these long-term trends need to be taken with a grain of salt.

House prices move in long cycles

For most countries there are well-identified turning points of the house price cycle – for Sweden peaks in 1979 and 1989-91 and troughs in 1985-86 and 1993-96. In a recent study Agnello and Schuknecht (2009) identify such turning points for 18 developed countries covering the period 1970-2007. Peaks and troughs are identified by a sign change in the first difference of data that are filtered in order to remove the trend. Interestingly, the current Swedish boom starting in 1997 stands out as the longest (11 years) of all booms that the authors identify. They also find it to be the severest, with a cumulative price increase of 67 percent above trend counted from start to peak. Whereas the particular definition of severity used by the authors may be discussed, this highlights an important lesson. Due to the strong cyclicality of house prices, the time period considered in any international comparison has a decisive impact on the results. Most comparisons look over a shorter horizon than the three decades covered in Figure 2 and end up with very different rankings. As an example, looking at the period 1995-2008 would yield a yearly rate of real price increase in Sweden of 6.6 percent, second only to Ireland with 7.8 percent per year.

House prices are predictable

The observed cyclicality indicates that house prices are predictable in the short and medium run. Several studies have established a strong autocorrelation in the rate of house price change. The first-order autoregressive coefficient in yearly data may be on the order of 0.4 (see e.g. Englund and Ioannides, 1997), quite high relative to typical financial assets. It is, hence, rational to extrapolate recent price changes

2 Shiller (2007) has taken the long-run constancy of U.S. house prices as an indicator that the post-2000 development – leading to an all-time-high ratio of house prices to income – represents a "bubble".

into the (near) future. On the other hand, there is also a tendency for house prices to revert towards their trendwise development in the longer run. This has been confirmed in numerous studies that will be briefly discussed in section 3.5 below. Hence, while increasing house prices can be expected to continue to increase for a while, the house price level will tend to revert towards trend eventually.

The strong predictability of house price changes may suggest that the housing market is not informationally efficient. It appears that one could make money by buying when prices are rising and when prices are low relative to the long-run trend and selling when prices are falling and when they are high relative to trend. This conclusion does not follow immediately, however. First, the capital gain is only part of the return to housing. The other part is the value of the housing services generated by the dwelling, the rent that the homeowner as a consumer of housing services "pays" to himself in his capacity of the owner of the house. Unfortunately, this implicit rent is hard to measure with any accuracy, in particular in a country like Sweden where access to the rental market is rationed for most households. Second, the potential gains are limited by the absence of a well-developed buy-to-let market in many countries including Sweden. Third, there are large transaction costs associated with exit and entry in the housing market. The most thorough study trying to measure the full return is by Meese and Wallace (1997). Based on observations of rents in the second hand market in San Francisco, they conclude that housing returns are indeed predictable, but that the potential gains from arbitrage transactions are within the bound set by transaction costs.

House prices are correlated across countries

Figures 2 give a clear picture of joint dynamics across countries, in particular after 1995. This may both reflect the influence from common global business cycle components and more direct effects across housing markets. The latter would come from mobility between markets that would tend to equalize house price movements. A recent study by Vansteenkiste and Hiebert (2009) tries to disentangle these two effects. The authors analyze quarterly data from ten euro area countries over the period 1989-2007. They estimate a global vector-autoregression model including three variables: real house prices, real disposable income and real interest rates. They conclude that direct spillover effects from house price shocks in one country to house prices in other countries are small. The correlation of house prices across countries is likely to reflect that macro variables are correlated.

The correlation between house prices and the business cycle may have different causes. On the one hand, causation runs from macroeconomic variables to house prices. Income and unemployment have a direct influence on the demand for housing services and, hence, on house prices. Likewise, supply factors like building

costs and new construction exert an impact on house prices. On the other hand, causation runs back from house prices onto the components of macroeconomic demand. Most obviously, high house prices stimulate new construction. There also appears to be a link between house prices and consumption. Indeed, several econometric studies (e.g. Case et al., 2005, for the U.S., Slacalek, 2009, for a panel of European countries and Berg and Bergström, 1995, for Sweden) have estimated that the marginal propensity to consume out of housing wealth is about as large as the propensity to consume out of financial wealth. This may seem surprising since a higher house price level also means a higher cost of housing services (i.e, in an aggregate sense housing wealth is not net wealth; Buiter 2008). Hence, in a standard life cycle model an increase in housing wealth should have little or no impact on consumption for the average household. The most likely reason why there nevertheless is an empirical relation between housing wealth and consumption is that a fraction of home owners are credit constrained. Higher house prices will release these constraints and allow the households to take out an extra mortgage, which can be partly used for consumption. Lower house prices on the other hand will further constrain consumption opportunities.

House prices are positively correlated across regions within countries

This correlation is evident in the Swedish data depicted in Figure 3. A basic reason for this pattern is that differences in costs of living (including housing) give incentives for migration. In a world of mobility across regions, differences in housing costs would tend to offset differences in income opportunities so as to equalize real income across regions. If income opportunities are driven by national shocks that affect housing demand more or less simultaneously across the country, we would expect to see positive correlations in house prices across regions. However, as the U.S. experience before 2000 tells us, house price correlations may be low if income shocks are local and there are strong regional business cycles. More recently, of course, all major U.S. regions experienced a coordinated boom as well as a common downturn, although with large differences in magnitude.

In general, the amplitude of the house price cycle tends to be higher in expanding regions where the price level is high. Compare, e.g, the volatility in many high-price coastal areas in the U.S. with the relative stability in low-price Midwest cities. For Sweden, Figure 4 depicts relative price indexes in different regions (expressed as a ratio of the national price index). We see that the relative indexes diverged in the boom of the late 1980s, but had converged almost all the way back to the 1985 situation at the bottom of the cycle in 1995. One explanation is the new construction that occurred in the regions where prices had increased the most. After 1995, dispersion has increased continuously during the boom but with some tendency towards compression as prices started to fall in 2008-2009.

Prices of different types of dwellings move together

Swedish households have access to two types of owner-occupied housing: one-family houses and apartments owned via shares in cooperative housing associations (coops for short). Unfortunately, statistical analysis has to be restricted to one-family homes, since indexes for coop prices are only computed since 2005. Figure 5 compares the coop indexes (3-month averages of the HOX Valueguard monthly indexes) and the indexes for one-family houses for Stockholm. It is hard to draw strong conclusions from a five-year period, but the graph indicates that the two markets are closely related and that coop prices are somewhat more volatile than house prices.

There is a positive correlation between the rate of price change and the number of transactions

When housing markets move from boom to bust, this is usually accompanied by a decreasing market activity. When the market turns downwards, not only do prices stagnate but fewer houses are offered for sale and it takes longer time before transactions are completed. The housing market moves from hot to cold. Hort (2000) has estimated a model on data for Swedish regions and shown that transaction responds before price to shocks to economic fundamentals (interest rates). Figure 6 illustrates the development of price and transaction volume in Sweden. The correlation is particularly strong around the crisis in the early 1990s, where price decreases of more than 10 percent per year were accompanied by sales volumes almost half the normal level. A similar pattern was also apparent in 2008-09 with stagnating prices and sharply reduced volume. At least three different mechanisms have been suggested to account for this pattern. A behavioral story says that sellers are unwilling to reduce their asking prices below their original purchase price. This pattern has been confirmed by Genesove and Mayer (2001) for New York condominiums, but is only relevant in times of falling prices. Another explanation (Stein, 1995, Ortalo-Magné and Rady, 2006) relates to the lock-in effects of borrowing constraints. With increasing prices, those constraints will be released and young households (typically more likely to be credit constrained than older ones) will be able to trade up the housing ladder. A third explanation (Berkovec and Goodman, 1996, Genesove and Han, 2010) emphasizes informational asymmetries. This view builds on the fact that the average buyer inspects many different houses and, hence, may have a better overview of the market than the average seller. For this reason sellers should be quicker to adjust their reservation prices as market conditions change. If demand is generally increasing, then there should be good deals available and sales will go up before buyers have adjusted their asking prices. Conversely, a negative demand shock

should result in fewer transactions during a transition period until sellers have learned about the new market situation. On such a housing market the number of transactions will be a leading indicator of future price changes. Research on Dutch data (de Wit et al., 2010) is consistent with this third explanation of the price-volume correlation.

2. The valuation of housing assets

Basically, houses are like any other asset. They generate income today and in the future, and their value depends on the rate at which this income stream is valued (the discount factor). For rental housing the income and the asset price – the rent and the price of rental apartment buildings – are set in separate markets and observed separately. For owner-occupied homes, the asset market and the market for housing services are integrated and there is only one price set in the market: the asset price. It is nevertheless fruitful to separate the two markets conceptually. This highlights that house prices may change for either of two reasons: due to shocks that affect the balance between the demand and supply for housing services and due to shocks to the rate at which the values of those services are discounted.

2.1 THE RENT-PRICE RATIO AND THE USER COST

A natural benchmark for the price of owner-occupied houses is the cost of rental housing. If there existed a well functioning rental market that offered housing services that were good substitutes for owner-occupied housing, then the cost of housing consumption for the two modes of tenure would have to follow each other closely. For a renter the cost of housing services is simply the rent she is paying to the landlord. For an owner occupant the corresponding cost (the *user cost*) consists of capital costs minus expected value changes plus operation and maintenance costs.

The key component of user cost is the real after-tax interest rate. Its development in Sweden over the last 30 years is depicted in Figure 7 based on the five-year mortgage rate with inflation expectations measured from household surveys. Essentially there are four rather distinct sub-periods with the interest moving from sharply negative (around -5 percent) in the early 1980s to around zero in the latter half of the 1980s to distinctly positive (around 4 percent) during the financial crisis of the early 1990s followed by a gradual descent towards zero until today. Figure 8 decomposes this development into three parts: the nominal interest rate, inflationary expectations and the tax effect (the nominal interest rate times the marginal tax rate). The tax effect was extremely important during the 1980s when it transformed a pre-tax real rate of around 3 percent into a negative after-tax rate of minus 5 percent. After the 1991 reform, which limited the tax rate to 30 percent,

the effect is quite small, however. From the mid 1990s, inflationary expectations have been anchored around the 2-percent target and the gradual reduction of the real rate is almost entirely due to the decrease in nominal interest rates.

The real interest rate graphed in the figures is calculated by deducting the expected inflation of consumer prices in general. What matters for the cost of housing, however, is the house-price inflation. This could deviate from the general inflation expectations both over time and across regions. If, e.g., house prices are thought to reflect a temporary supply shortage, then house prices should be expected to fall in the future. And if growth rates of population and income differ across cities, then house prices in fast growing cities should be expected to increase relative to prices in contracting cities. The role of expectations for user costs, and hence for house price levels, will be discussed more closely in section 3.2.

If rental apartment rents were good measures of the value of owner-occupied housing services and if owner-occupied houses were rationally priced, the costs of housing consumption should be the same in both modes of tenure. Then the ratio of apartment rents to house prices (the yield on a housing investment) should be closely tracked by user cost. User cost would represent the rate at which current rents were capitalized. Hence, taking the rent level as given, this approach would allow one to analyze how the market price level is affected by changes in the cost of capital and the various tax parameters that affect user cost. In the United States, there is a reasonably well functioning rental market that serves as a close substitute for owner-occupied dwellings.[3] Himmelberg et al. (2005) have studied the relation between rents, house prices and user cost across the major metropolitan areas in the United States. They conclude that the boom in U.S. house prices and the consequent decrease of the rent-to-price ratio, at least until 2005, is consistent with the decrease in user cost during the same period. They also find that fast growing cities in general have a lower rent-to-price ratio than stagnating cities, consistent with the differences in user cost.

Decreasing user cost has been a worldwide phenomenon since the mid 1990s. In a study of 17 European economies, Hilbers et al. (2008) estimate that user cost decreased by 3.3 percentage points on average between 1995 and 2000 and by a further 2.6 percentage points between 2000 and 2005. In a panel regression, they find that user cost has a significant negative impact on the price-to-rent ratio.

In looking at the rent-to-price ratio in the Swedish context, one faces the problem that rents are not determined in unregulated markets but set in negotiations where central organizations representing landlords and tenants agree on "fair rents" (*bruksvärde*). In central locations of the major metropolitan regions, rents set in this

3 As Meen (2002) has noted, US studies tend to focus on the rent-to-price ratio, whereas studies of European housing prices directly focus on equilibrium in the market for owner-occupied housing services.

way are significantly lower than market rents. In other parts of the country, rents based on *bruksvärde* may be reasonable approximations of market rents. Ideally, we would like to measure shadow rents that account for queuing time, limited freedom of choice and other frictions that cut a wedge between actual rents and the real value of owner-occupied housing services. Absent such observations, let us make the bold assumption that the wedge between observed rents and shadow rents has remained constant over time. In such case using the available rent index will only result in a measure of the rent-to-price ratio that differs from the "true" measure by a constant.[4]

The development of user cost along with the rent-to-price ratio is depicted in Figure 9. The series are normalized in such a way that they intersect, i.e. one may talk about periods of "over pricing" – when user cost is above rent-to-price – and "under pricing".[5] The reason for using quotation marks should be obvious as there is no way of calibrating rent-to-price for a base year short of having detailed information about the state of the rental market. Still the time variation of the two series gives useful information. In fact, their broad time series patterns are quite similar: an increase from very low starting levels around 1980, stagnation in the latter part of the 1980s, a sharp increase in the first half of the 1990s and a gradual fall thereafter. There are some interesting differences, however. During the first half of the 1980s, the user cost is much lower than the yield. This may reflect borrowing constraints. During this period credit markets were regulated and poorly developed, and many households had limited access to borrowed capital. Measuring the cost of capital by a mortgage interest rate may be more of an under-estimate during this period than later, and the representative cost of capital may have been higher than our measure assumes (see further discussion in Section 2.3 below). A second deviation occurs during the banking crisis in 1992, when user cost temporarily peaks more dramatically than the rent-to-price ratio. With steeply falling prices after 1992, over-pricing is quickly turned into under-pricing. From the mid 1990s there is a trendwise fall in the rent-to-price ratio relative to user cost. After around 2005 the yield is approximately one percentage point below user cost, i.e. the same amount of "over-pricing" as before the banking crisis in 1990-91.

From this simple exercise, we can conclude that if houses were correctly priced relative to regulated rents in the mid or late 1990s as well as in the late 1980s, then they are somewhat over-priced today. An alternative interpretation is that the gap between regulated rents and market rents has increased in recent years.

4 The number of vacant rental apartments gives one indication of the development of regulated rents relative to shadow market rents. Vacancies have decreased gradually since the mid 1990s. This suggests that the gap between the unobserved market rent and the measured rent index has increased over time.

5 We measure user cost by adding 7 percent to the real interest rate as calculated in Figure 7 and set the rent-to-price ratio to 5 percent in 1980. The 7 percent added to the real interest rate represent maintenance and operation costs and depreciation as well as a risk premium.

This interpretation is consistent with casual observations on the state of the rental market in the major Swedish cities, with an increasing housing shortage. During this period the number of vacant apartments has been continuously falling, from around 60,000 in the mid 1990s to around 20,000 today. Based on this, we can tentatively conclude that the development of user cost (in practice real after-tax interest rates) seems quite sufficient to explain the development of house prices taking the value of housing services as given. Before we draw any firmer conclusions we should look more closely into the components that determine user cost.

2.2 THE ROLE OF EXPECTATIONS

It is often claimed that the recent house price boom represents a "bubble" in the sense that it is at least partly explained by (overly) optimistic expectations among home buyers. Case and Shiller (2003) report survey evidence indicating that homebuyers tend to extrapolate past price increases during booms, thereby contributing to further price increases. In 2003, when U.S. house prices had already increased by 40 percent in real terms over the past five years, 83 to 95 percent of all home purchasers in the Case-Shiller survey believed that prices would continue to rise by an average of around 9 percent per year over the next decade. Taken literally such expectations would imply a negative user cost, i.e. that housing consumption is for free and that the owner could expect a capital gain on top. Even taken less literally, it is clear that extrapolative expectations have a tendency to be self-fulfilling and can potentially explain prolonged deviations of house prices from fundamentals. User cost is in fact extremely sensitive to expected capital gains. As an example, recall that the average real rate of house-price increase in Sweden during the period 1995-2009 was 6.6 percent, which can be compared with a negative price development during the previous 15 years. If such a difference is fed into price expectations, it could clearly justify almost any amount of price increase. The bottom line of the calculations presented in the previous section, however, is that there is no need to resort to special assumptions about expectations in order to explain the observed price development in Sweden.

Assuming that home buyers expect house prices to rise at the same rate as consumer prices in general may appear to provide a natural benchmark, but it is not consistent with a rational view on the housing market. Rational expectations should incorporate the basic time series pattern of house prices discussed in section 1: short-horizon positive autocorrelation and long-run trend reversion. Since the typical horizon of a housing investment is several years, the trend reversion effect should dominate. This empirical pattern is also backed up by the insight of Poterba (1984) and others that house prices in the long-run are anchored by production costs. Hence, house prices should rationally be expected to go down after a

prolonged period of price increase. Applying this reasoning to today's situation in Sweden would imply a higher value of user cost than assumed above and suggest that houses are after all over-valued relative to rents. Empirically, it may be a moot question whether house prices are overvalued provided that expectations are rational, or if they are correctly valued given that expectations follow consumer prices in general. In any case, survey data on expectations are too scarce to resolve this issue.

2.3 CAPITAL MARKET DEVELOPMENTS

Capital markets have undergone dramatic changes in recent decades and it is widely believed that these developments have had an impact on housing demand and house prices. In Sweden and many other countries, lending ceilings on banks and other credit institutions were removed in the 1980s and more recently various innovations in the mortgage market have improved the borrowing opportunities for many households. The range of mortgage products has been widened including interest-only loans and allowing households to choose between contracts with fixed and flexible rates. In Sweden, the United Kingdom and other countries flexible-rate loans have come to dominate and home-owners have taken advantage of the upward slope of the yield curve during recent years. Intensified competition has narrowed the margin between the lenders' funding costs and mortgage rates. Further, restrictions in terms of minimum downpayment amounts have been relaxed, whether as a result of more risk taking and laxer credit standards among banks or due to improved techniques of credit screening and new methods of bank funding. For all these reasons, calculating user cost based on a single mortgage interest rate may not capture the relevant cost of capital.

As a result of these developments household indebtedness has increased in most countries. A study from ECB (2009) has attempted to measure the amount of loans taken for house purchases in the Euro area, and reports that such loans have increased from 27 percent of GDP in 1999 to 42 percent in 2007. This aggregate number conceals large differences with the Netherlands as high as 90 percent in 2007. In Sweden total household debt as a fraction of disposable income has increased from around 100 percent in the late 1990s to 167 percent by the end of 2009, considerably higher than the previous peak in 1990; see Figure 10. The increase in indebtedness has been accompanied by an increase in household wealth, largely due to rising house prices. As a result, the development of household leverage is less dramatic. Even though, as shown in Figure 11, the ratio of debt to total assets (financial and real) also has increased in recent years, from around 1/4 in the late 1990s to 1/3 today, leverage is still lower today than in the years after the credit market deregulation in the late 1980s.

Aggregate credit volumes may reflect the demand for loans rather than supply restrictions and other institutional factors. A somewhat more direct indicator of supply is the average LTV ratio among first-time home buyers, many of whom would have little equity. According to a survey of US home buyers reported by Duca et al. (2010), this ratio increased from around 85 percent in the early 1990s to 93 percent in 2008. For Sweden, a recent household survey, Finansinspektionen (2010), looks at the average LTV ratio across all new loans to one-family houses (coop shares), including both first-time and repeat-buyers. This average increased from 62 (68) percent in 2005 to 69 (75) percent in 2009. Unfortunately, it is not easy to disentangle demand and supply factors, since the increase coincides with increasing house prices.[6]

Basing user cost on the mortgage interest rate – as in the previous section – would be appropriate if the capital market was "perfect" in the sense that all participants could borrow freely at the same interest rate. This is clearly a strong simplification which makes it impossible to discuss the impact of institutional changes in credit markets. The cost of capital should instead be understood as a weighted average across different sources of funding – the combination of various types of loan and equity with varying opportunity cost. Box 1 provides a derivation of user cost if a fraction of the value of a house has to be financed by equity. Essentially the capital cost is a weighted average of the opportunity cost of equity and the borrowing rate, and the impact of changes in the downpayment requirement depends critically on the cost of equity. If this is not too different from the borrowing cost, then effects are obviously modest, but if the cost of equity is much higher the impact can be substantial. Recently, the Swedish Financial Supervisory Authority mandated a LTV cap on mortgages of 85 percent.[7] If we, as an example, interpret this as changing the downpayment requirement from 5 to 15 percent and assume the cost of equity to be 20 percent, we see from the table in the box that this would lead to a 14 percent price decrease. In practice, the impact is likely to be smaller since the LTV cap only applies to mortgages and the cost of equity should be interpreted as the average across all market participants.

6 Between 2005 and 2009, house prices increased by 26 percent. If household equity (= ability to make a downpayment) was constant in real terms, then a LTV of 70 percent in 2009 would be needed to buy a house that could be bought with 62 percent LTV in 2005.

7 The cap on LTV applies only to mortgages and not to unsecured loans.

Box 1. User cost if a fraction of the value of a house is financed by equity

The value of a house, like that of any other asset, can be seen as the discounted value of the services derived from the house. Assume that a fraction θ of the purchase price of a house has to be financed by equity and that a fraction (1 - θ) is financed by borrowing at the rate r. Interest payments are tax deductible at the rate t. We also allow for property and wealth taxes levied as a fraction Ω of the market value of the house P. House prices are assumed to be growing at the constant rate g over the infinite future. To consume housing services the household has to pay operation and maintenance costs of m percent of market value. Discounting future cash flows at the rate ρ, the discounted cash flow associated with owning a house with a current market value of P_t is given by

$$\theta P_t + \sum_{j=1}^{\infty} \left(\frac{1}{1+\rho}\right)^j \left[r(1-t)(1-\theta)P_t + (m+\Omega)(1+g)^{j-1}P_t\right]. \quad (1)$$

The first term is the down-payment and the second is the discounted value of the sum of interest payments (assuming a non-amortizing loan) and maintenance and property tax expenditures. Evaluating the sum, this simplifies to

$$P_t\left[\theta + \frac{r(1-t)(1-\theta)}{\rho} + \frac{m+\Omega}{\rho-g}\right]. \quad (2)$$

Let us now compare this with the value of rental housing services. Assuming that the value of housing services (R) is growing at the same constant rate g, then the present value of these rents discounted at the same discount rate ρ over an infinite future is given by the familiar Gordon valuation formula:

$$\sum_{j=1}^{\infty} \left(\frac{1}{1+\rho}\right)^j R_{t+j-1} = \frac{R_t}{\rho - g}. \quad (3)$$

Equating the cost of owing a house in (2) with the value of housing services in (3) yields[1]

$$\frac{R_t}{P_t} = \theta\rho + (1-\theta)(1-t)r - g + m + \Omega + g\frac{(1-\theta)(\rho-(1-t)r)}{\rho}. \quad (4)$$

1 In a world of uncertainty, variations in R/P would reflect varying expectations about future interest rates and rent growth rates as well as risk premia that would affect discount rates. See Campbell et al. (2009) for a decomposition of R/P variance along these lines.

If the discount rate were equal to the after-tax borrowing rate, i.e. $\rho = (1\text{-}t)r$, this expression would simplify to the familiar formula $R/P = (1\text{-}t)r - g + m + \Omega$. This corresponds to the standard user cost expression noting that in steady-state house prices, rents and maintenance expenditures will all grow at the same rate, and hence that the exogenous growth rate g equals the rate of house price change. Table 1 illustrates the sensitivity of the rent-to-price ratio to variations in the downpayment requirement and the cost of equity capital.

Table 1. R/P for varying cost of equity (ρ) and degree of downpayment (Θ)

		Θ		
ρ	*0.05*	*0.10*	*0.15*	*0.20*
2.1	7.1	7.1	7.1	7.1
3	7.72	7.73	7.75	7.76
5	8.35	8.43	8.52	8.61
10	9.00	9.31	9.63	9.94
20	9.70	10.50	11.31	12.11

Note. The table is based on (4) assuming the following parameter values $r = 3$, $g = 2$, $m+\Omega = 7$, and $t = 0.30$.

The various institutional changes in recent years have provided homeowners throughout the world with a wider menu of loan contracts today than, say, 20 years ago. The ability to tailor funding to the particular needs of the individual borrower should in principle translate into lower borrowing costs and higher house prices, although the magnitude may be difficult to estimate. From a Swedish perspective, the most important dimension may be the choice of maturity of the mortgage loan. Traditionally, the great majority of Swedish mortgages had the interest reset every five years at the prevailing rate, unilaterally determined by the lender. Starting in the 1990s, borrowers have been offered a wider menu of choices and there has been a gradual switch towards shorter maturities. From around 1999 around half of all borrowers have chosen mortgages with the interest rate reset every three months; see Figure 12. To illustrate the impact of this flexibility, Figure 13 calculates the real-interest rate based on both the 3-month and the 5-year mortgage rate. Differences are rather small before the banking crisis in 1992, when the 3-month rate was temporarily 3 percentage points higher than the 5-year rate. From 1995 on, the yield curve has been almost constantly upward sloping and households choosing a flexible rate have faced lower borrowing costs. It follows that if user cost was calculated based on the actual mix of maturities, it would show a larger decline during the post-1995 period than according to either of the interest series. It may be argued, however, that the relevant investment horizon of the typical homeowner is at least 5 years[8] and that the relevant interest rate is the expected rate over this horizon, which may be better captured by a long interest rate. Be that as it may, allowing for flexibility in the choice of loan maturity has only a modest impact on user cost.

There are only a few empirical studies that explicitly account for the impact of changes in the availability of borrowing on user cost and housing demand in an econometric house price model. The closest example is Duca et al. (2010), where a measure of average LTV for first-time buyers is added as a separate variable in the house price regression. The long run elasticity of house price with respect to LTV is estimated to be between 0.8 and 1.1; i.e. a 10 per cent change in LTV leads to a price increase of 8-11 percent, depending on the exact specification of the model. Taking those results at face value and making the (somewhat heroic) assumption that the simple valuation model in Box 1 is a good description of reality, we may infer the market discount rate. The data of Duca et al. span LTV values ranging from 0.85-0.93. Over that range, an elasticity of around one corresponds to a cost of equity between 15 and 20 percent.

8 Despite this, few homeowners have mortgages with interest fixed for more than five years. Basing the user cost on a ten-year interest rate would make little difference to the time profile of user cost, since the difference between five- and ten-year interest rates has been relatively constant over time.

A more common way of accounting for credit market conditions is to simply include the stock of mortgage debt as a determinant of house prices. One example is a cross-national study by Ganoulis and Giuliodori (2010) based on data covering the period 1970-2004 for 12 European countries. They estimate a panel error-correction model with mortgage debt (normalized by GDP) added to the standard explanatory variables. The long-run elasticity of house price with respect to the debt-to-GDP ratio is found to be on the order of 0.2-0.3. Applied to the increase in debt-to-disposable income that we have seen recently – say 30 percent from the previous peak in 1990 – this would explain a price increase of 6-9 percent.

The comparison between user cost based on the 5-year mortgage rate and the rent-to-price ratio in Figure 9 indicates that houses are somewhat over-valued today relative to 1995. Accounting for the increased variety of mortgage contracts available and the easier access to borrowing during this period suggests that Figure 9 understates the actual fall in user cost. Taking this into account, we may tentatively conclude that the decrease in the rent-to-price ratio could be fully accounted for by a corresponding decrease in user cost.

2.4 USER COST AND TAXES

Housing is affected by a number of taxes, which all have an impact on user cost and on the valuation of housing assets. Tax effects on user cost reflect a lack of symmetry in the tax system: the property owner is allowed to deduct interest expenses but the income received in the form of housing services is taxed very lightly if at all. With high tax rates the effect of this asymmetry can be substantial as illustrated by the Swedish tax system. Before 1985, nominal interest payments were deductible against income at tax rates above 50 percent, while the imputed income was taxed at a low real interest rate. Combined with two-digit interest rates this translates into a negative impact on user cost on the order of 5-10 percent as seen from Figure 8. Following two tax reforms in 1982-1985 and 1991 and the change of monetary regime in the early 1990s, the Swedish tax system has turned more neutral with a dramatic reduction of the tax effect on user cost. Recent changes, however, have made the tax system somewhat less neutral again. In this section we will take a more detailed look at the various components of the tax code.

Ever since the 1950s the Swedish tax system has contained one or several taxes levied in *proportion to market value* as assessed by the tax authority. Prior to 1991 an imputed income calculated as a percentage of the assessed value (3 percent for most houses) was added to taxable income. Assessed values were on average 75 percent of market value at the time of assessment. With infrequent reassessments and rapid house price inflation, the imputed income corresponded to an average of 1-1.5 percent of market value. In 1991-1993, this tax was transformed into a property tax of 1.5 percent of assessed value. Subsequently the property tax

has been relabeled as a property fee (*fastighetsavgift*), currently 0.75 percent of assessed value (roughly 0.5 percent of market value) up to a maximum amount. The cap is set so low that the fee is independent of the market value for the majority of houses. It corresponds to 0.48 percent of the assessed value for the average house in the country and to 0.24 percent for the average house in the county of Stockholm. On top of the property tax, a wealth tax of 1.5-3 percent was previously levied in proportion to net wealth for individuals with wealth above a certain limit. With real estate valued by the assessed value, the wealth tax was 0.75-1.5 percent of market value for those few households with taxable wealth above the limit. The wealth tax was abolished in 2007. The combined impact of the reform of the property tax and the abolishment of the wealth tax has been a reduction from 1-2.25 of market value before 1991 to at most 0.5 per cent of market value today.

Capital gains are taxed at realization. Before 1991 a measure of capital gains was added to taxable income and taxed at 50 percent or more. Today the tax rate on capital gains is a flat 22 percent. Since the tax is only paid at realization, it translates into a lower effective tax rate on the current price appreciation. Agell and Södersten (1982) show that the difference may be sizeable for holding periods of a decade or more, depending on the discount rate. Furthermore, the tax can be rolled forward if the income from selling is reinvested in a more expensive dwelling. In such case, an interest charge is added to the tax credit. In practice, the capital-gains tax matters primarily for households with short holding periods. The impact on house prices in general is likely to be minor, however.

Sweden had an *inheritance tax* until 2004. From the viewpoint of user cost, the inheritance tax worked much like the capital-gains tax, i.e. it was levied in proportion to a market price in the far future. Translated into yearly user cost, it had a minor impact. Further, there is a stamp duty levied when a new title is registered. This is currently 1.5 percent of the sales price, again only with marginal impact on user cost for average holding periods.

The tax reform of 1991 brought housing taxation closer to neutrality, in particular at low rates of inflation and interest rates. Since 1991, the property tax has been cut in more than half and is now effectively zero at the margin for most households. Further, the wealth and inheritance taxes have been abolished. The combined effect of these changes has been to decrease user cost by something like one percentage unit since the mid 1990s, which may translate into a 10 percent increase of house prices, holding the value of housing services fixed. These tax changes were ignored in the user cost calculations presented in Figure 9.

3. Fundamental determinants of the price of housing services

In the previous section, we discussed the asset valuation of houses taking the value of the housing services that come with ownership as given. Let us now switch perspective and ask how the price of owner-occupied housing services (the implicit rent) is determined as a result of the balance between demand and supply. Viewing housing services as any other consumer good, demand should depend on the unit price and on other factors like income and demographics. The price per unit of housing services is simply the user cost as discussed in the previous section, or more precisely the user cost per krona house value multiplied by the price level of houses. It directly follows that changes to a component of the per krona user cost (e.g. a tax rate) should leave the cost of housing services unaffected and hence be offset by a proportionate change in the level of house prices. Expressed differently, the elasticity of house price with respect to per unit user cost should be equal to one; a one percent increase in per unit user cost must be met by a one percent reduction in the house price level.[9]

Taking the demand-supply perspective suggests that estimating a regression equation with the index of house prices as the dependent variable and supply, user cost, and other demand determinants as independent variables would yield estimates of the price and income sensitivity of housing demand.[10] In many cases supply may be difficult to measure. For this reason, some studies do not include a direct measure of supply but instead a variable that affects supply such as construction costs.[11]

A large number of studies have estimated the relation between house prices and fundamentals of demand and supply. Girouard et al. (2006) gives a survey of this literature. Recently a few studies have been based on panels of house prices covering several countries: Hilbers et al. (2008) for a yearly panel of 16 European countries 1985-2006, Ganoulis and Giuliodori (2010) for a yearly panel of 12 European countries 1970-2004, and Adams and Füss (2010) for a quarterly panel of 15 OECD countries (including Australia, Canada and USA) for the period 1975:1-

9 This has to be interpreted with some care, since a change in, e.g., a tax rate could also affect the expectation of future house price changes, which is another component of user cost.

10 A log-linear version of the equilibrium condition may be written $logS = -\beta_1(loguc + logP) + \beta_2 logX$, where S denotes supply, uc user cost, P the house price level, and X is a demand determinant, e.g. income. Inverting yields $logP = \frac{\beta_2}{\beta_1} logX - loguc - \frac{1}{\beta_1} logS$. Hence, the coefficient on supply in this regression equation is the inverse of the price elasticity of demand and the coefficient on income is the ratio of the income and price elasticities.

11 Assume a log-linear supply function, $logS = \gamma_1 \log P + \gamma_1 \log Z$, where Z could be construction costs. Solving for $\log P$ in the condition for market equilibrium gives $logP = -\frac{\beta_1}{\beta_1 + \gamma_1} loguc + \frac{\beta_2}{\beta_1 + \gamma_1} logX - \frac{\gamma_2}{\beta_1 + \gamma_1} logZ$. In this reduced-form model it is not possible to identify the structural coefficients of demand and supply, only their relation to each other.

2007:2. Below we will review some of these studies to see what they tell about the determinants of house prices.

3.1 THE PRICE ELASTICITY OF DEMAND

Estimated price equations usually include a measure related to user cost. In theory, the cost of housing services should not be affected by changes to user cost per krona house value, i.e. the percentage change in user cost should be equal to minus the percentage change in house prices (the elasticity should be minus one). In most studies, however, user cost is simply represented by the real interest rate, where costs of operation are ignored. Almost all studies report significantly negative effects. Among the international panel studies, only Hilbers et al. (2008) pay special attention to the details of user cost and account for separate tax rates on interest deductions and capital gains as well as property taxes. Capital gains are measured by the actual rate of change of the house price index. This measure of user cost comes out insignificant in the regressions, however. In contrast, a simplified version based on the real interest rate (long or short) yields significantly negative coefficients.

The price sensitivity of housing demand can be inferred from studies that include supply among the explanatory variables. According to most of the studies (nine out of eleven) in this category covered by Girouard et al. (2006) price reacts more than proportionately to changes in supply (i.e. the elasticity is larger than one). This implies that housing demand is price inelastic, a one percentage price increase reduces demand by less than one percent. This is in line with recent studies by Meen (2008) for the United Kingdom and by Wilhelmsson (2008) on Swedish data for a panel of local housing markets. The consistent findings that price is sensitive to supply indicate that supply conditions are highly relevant for explaining house prices. We will return to the determinants of supply in Section 3.3 below.

3.2 INCOME

Popular discussions of the housing market often take the price-to-income ratio as an indicator of affordability as well as to gauge whether houses are "correctly" priced. Figure 14 depicts the development of disposable income along with house prices for Sweden. Over the long term, income has increased faster than house prices. The real income in terms of house prices is 30 percent higher today than it was in 1970. Comparing across the recent peaks of the house price cycle, however, the ratio of price to income has returned to approximately the same level today as in 1990.

Since income is a major determinant of housing consumption and supply is constrained by the scarcity of land, one would expect to see a close relation between household disposable income and house prices. Judging from the figure,

however, income and price do not follow each other very closely. A likely partial reason is that consumption in general depends on permanent rather than current income. Since housing choices are more permanent than other consumption choices, this argument applies with particular force to housing. For this reason one should not be surprised that the dynamics of price and current income do not track each other very closely. As an example, the boom in the late 1980s, coincided with modest increases in current disposable income, whereas income growth was relatively strong throughout the crisis until the beginning of 1993, at a point when house prices had already fallen by 25 percent from the peak in 1990.

Nevertheless, most international house price studies find a statistically significant positive relation between house prices and current disposable income or GDP. Among the studies surveyed by Girouard et al. (2006), the implied income elasticities are centered around unity, meaning that a one percent income increase would cause house prices to increase by one percent holding supply fixed. Ganoulis and Giuliodori (2010) estimate a panel error-correction model conditioning on supply and find a long-run elasticity ranging from 0.7 to 1.5 depending on model specification.

Two other international panel studies both estimate a long-run relation not conditioning on supply. Hilbers et al. (2008) find an elasticity of house prices with respect to GDP of 1.75. They split the data based on the rate of house price growth during this period. This puts Spain on top followed by Ireland with Sweden ranked as number seven. Running separate models for three groups ranked according to the growth of house prices (with Sweden in the middle group) they find that the top group has a higher elasticity of price with respect to income (2.4) than the middle group (1.7) and bottom group (0.7). This pattern indicates that the higher rate of price growth in some countries can be explained by a greater sensitivity to income growth. Adams and Füss (2010) construct an "income" measure intended to capture economic activity in a wider sense by taking the first principal component based on five variables: money supply, consumption, industrial production, GDP, and employment. They estimate a panel error-correction model that identifies separate coefficients for each nation. The elasticities of house price with regard to economic activity are in general positive with an average value of 0.34. The coefficient for Sweden is 0.99. Swedish house prices appear to be more sensitive to macroeconomic activity than house prices in most other countries.

For Sweden, Hort (1998) has analyzed a panel of 20 local housing markets during the period 1967-1994. Based on a panel error-correction model not conditioning on supply, she finds an elasticity of house prices with respect to income in the range 0.4-1.0 depending on the specification of the model. More recently, Wilhelmsson (2008) has also looked at local housing markets, now covering a much larger number of markets (281) but over a shorter time period (1991-2006). Conditioning

on supply (measured by the number of housing units), he specifies a model with the ratio of price to income as the dependent variable and including income among the explanatory variables. The estimated income coefficient is negative indicating that the elasticity of house price with respect to income is less than one. Hence, both these studies on Swedish data indicate that house prices increase less than proportionately with income.

Overall, there is strong evidence that house prices are increasing functions of income. The average elasticity across a large number of studies appears to be close to one (in studies that condition on supply). This indicates that the elasticity of housing demand with respect to income is around one.[12] This conclusion is also consistent with micro evidence from demand studies based on household data that generally find income elasticities not too far from one.[13] This means that the in order to meet the increase in demand, the housing stock would have to grow by the same rate as income is growing in society. If not, house prices will have to rise in order to ensure balance between demand and supply.

3.3 DEMOGRAPHICS

The stock of housing has two main dimensions: the number of dwellings and the quality and size ("quantity of housing services") of the average dwelling. An increase in income per capita would primarily increase demand for quality and size, whereas a growing population would demand more units. For this reason, the size and composition of the population should have a separate influence on price beyond that of aggregate income. After all, a main balancing factor is between the number of dwellings and the number of households in different age groups. Differences in population and employment opportunities across regions exert a major influence on local house prices. Referring back to Figure 3 we see very clearly that the rate of price increase has been highest in the three rapidly growing metropolitan areas followed by other parts of southern Sweden where the population has been stable. The northern regions, on the other hand, have been characterized by emigration and stagnating house prices.

Housing demand varies by age. Households typically follow a housing career moving from smaller starter homes to larger dwellings until age 40 or so, and downsizing after age 50 or 60. Younger households are net demanders and older households are net suppliers. Even though household formation is to some extent influenced by economic factors[14], it is mainly driven by factors exogenous to the

12 Recall from note 10 that the elasticity of price with respect to income is the inverse of the income elasticity of demand.
13 See, e.g., Green and Malpezzi (2003) for a brief overview of the U.S. literature.
14 Studies on data for the US (Haurin et al., 1993), UK (Ermisch, 1999) and Sweden (Åsberg, 1998) have shown that the rate of home ownership among young individuals is a decreasing function of housing prices.

housing market. This suggests a positive relation between house prices and the fraction of individuals in household formation age. Girouard et al. (2006) graphs such data across OECD countries for the period 1995-2004 and finds a positive relation. Econometric studies, however, generally fail to find a stable relationship between age structure and house prices.[15] Even if the age structure influences demand, it may not come as a surprise that there is no robust link between age structure and price, since the size and age composition of the population is largely predictable based on birth rates. Hence, new construction has ample time to adapt.

To get a quick look at the potential impact of demographics on Swedish house prices, Figure 15 graphs the ratios of the number of younger (20-29 or 20-39) to older individuals (50-59 or 50-69). These ratios were increasing in the late 1980s and early 1990s as a result of the baby boom after the war, and started to decrease after 2000. While the age structure has some potential to explain house prices in earlier years, in particular the boom in the late 1980s, it cannot be the main explanation of the continued price increase after 2000.

3.4 SUPPLY AND PRODUCTION COSTS

The conclusion from the discussion above is that the demand for housing services is quite sensitive to income (elasticity around one) and rather insensitive to price (elasticity less than one). If the price elasticity is, say, one half, it follows that a one percent income increase would have to be met by a two percent price increase unless there is a matching increase in supply. The conditions for adding to supply by new construction, hence play a crucial role for understanding the evolution of house prices. The profitability of new construction depends on the difference between the market price of a new house and the building cost. Given the long lead times in the building process, it is the expected house price a couple of years in the future rather than the current price that matters.

Figure 16 depicts the development of real construction costs in Sweden (factor price index for residential construction) along with real house prices, both indexes normalized to be one in 1975. In spite of the fact that the construction cost index does not include land costs it has increased continuously in real terms, by a total of more than 60 percent from 1975. This primarily reflects the high labor intensity in the construction industry. Adding land costs, the increase would probably be 10-20 percent larger.[16]

The contrast in volatility between the two series is striking. Construction costs have developed quite smoothly with the exception of a sharp increase in 1992 as a result of the increase in the VAT rate as part of the tax reform. Consequently, house

15 See, e.g., Lindh and Malmberg (2008).
16 The fraction of land costs as a share of total production costs per square meter of new dwellings has increased from 11 percent in 1998 to 20 percent in 2008.

prices have deviated from construction costs over extended periods following the booms and busts of the house price cycle, but with some convergence between the two series over the long term. The relation between cost and price is back at the same level today as in the late 1970s. The difference in building response is striking, however. Between 1975 and 1980, a total of 294,000 new dwellings were completed as compared with a mere 138,000 between 2005 and 2010. From any later starting point, today's house prices are high relative to production costs. Counting from the peak in 1991:1 until 2010:3, the ratio of house prices to production costs increased by as much as 46 percent. It is not clear, however, how comparable these series are in the long run and one should probably resist the temptation to conclude that this discrepancy between two indexes indicates that houses are overvalued today.[17]

The wide and extended deviations between price and cost indicate that supply is slow to adjust. The standard reasoning – Poterba (1984), Rosen and Topel (1988) – distinguishes between short- and long-run supply elasticities as a consequence of costs of adjusting capacity in the building industry. In the short run, production is limited by existing capacity and the inertia of the planning process. Hence, the marginal short-run cost of constructing an extra house is much higher than the average cost (which is what the production cost index measures) when the rate of construction is high and the industry operates at full capacity. In the longer run, capacity is adapted and new projects have time to filter through the planning process. Given this, new construction could be expected to be an increasing function of the price of existing homes and a decreasing function of the cost of producing new houses, sometimes expressed by the ratio ("Tobin's Q"). The more flexible the building industry is, the more elastic is this function in the short run and the faster will price revert towards the long run level determined by production cost.

The elasticity of supply with regard to price and production costs is generally thought to be low, although it has been found difficult to nail down econometrically. A recent example of an econometric supply study is Ball et al. (2010), which presents a simultaneous model of British house prices, construction costs and construction starts. They find an elasticity of starts with respect to the ratio of house price to construction costs of 0.15, suggesting that the adjustment of supply to demand changes would be very slow.

Since demand appears to be quite inelastic with regard to housing prices, any change in fundamentals that is not met by a corresponding change in supply is bound to have a large impact on price. Consistent with this, British and US evidence (Cheshire and Hilber, 2008, Saiz, 2010) show that measures of supply restrictions

17 One reason is that the location of new construction and the stock of existing housing differ. Construction takes place mostly in the periphery of high land price regions, whereas the stock is a mix of centrally located houses in high price regions and housing in regions where the price level is too low for any construction to be profitable.

at the local level are strongly correlated with the level and volatility of house prices. Such measures include both geographical topology and various regulatory constraints.

Two figures illustrate the relation between new construction and Tobin's Q for Sweden according to different dimensions of new construction: the number of completed one-family houses[18] (Figure 17) and the total investment in housing according to the National Accounts (Figure 18). While both measures could be expected to react positively to divergences between price and cost, their long-run trends may differ. The number of dwellings should be closely related to the number of households, whereas total investment in housing also includes renovations and additions and is more closely related to the size and quality of the stock of dwellings. Both measures correlate positively with Q, with peaks and troughs that are slightly lagged relative to the peaks and troughs of the house price cycle. The long-run developments of the two measures of construction differ substantially, however. New completions are well explained by the Q ratio until the mid 1990s, but the subsequent increase in price relative to costs is only accompanied by a modest increase.

The alternative measure of housing investment, which includes renovations and additions, has stood up somewhat better over time. At the peak reached in 2007 it was around 20 percent lower than at the previous peak in 1991. Seen in relation to disposable income, which increased by more than 40 percent over the same period, this is quite a pronounced decrease, however. The amount of construction may also be related to the total housing stock. The value of housing investment (one- and multi-family housing) at the peak in 2007 was 121 billion SEK, corresponding to 3.6 percent of the value of the stock.[19] This would seem enough to cover depreciation and some increase of the stock to match the demand increase due to income and population growth. But this is at the peak of the construction cycle and the total investment since the previous peak in the early 1990s has barely been enough to replace wear and tear.

In an international perspective, Swedish housing supply has been unusually unresponsive to the recent increase in prices. Figure 19 illustrates the development of housing investment as a fraction of GDP in countries that all experienced house price booms. In contrast to Sweden the increase in house prices triggered a building boom in Ireland, Spain and USA. As a result these countries all have experienced falling prices and overbuilding.

Overall, there is strong evidence that the addition to the housing stock in Sweden

18 Instead looking at the total number of new dwellings would give qualitatively the same picture, although with a less dramatic decline in the mid 1990s.

19 In 2007, the assessed value of all one- and multi-family dwellings was 2,548 billion SEK. Multiplying by 4/3, since the average assessed value is 75 percent of market value, yields 3,400 billion.

– whether counting units or value – over the last 15 years has been insufficient to meet the increase in demand due to the growth in population and income levels. Since house prices have been increasing much faster than production costs over this period, it appears that the lack of new construction reflects a very low price elasticity of supply.

3.5 HOUSE PRICE DYNAMICS

Much of the discussion about house prices centers on the distinction between short-run fluctuations and long-run trends – whether phrased in terms of bubbles or in some more neutral language. Short-run price movements can deviate from long-run trends for at least three reasons: supply inertia, expectations formation and credit constraints. First, as previously discussed, supply is much less elastic in the short run than in the long run (and also less elastic downwards than upwards). In the short run, supply change is limited by two factors: (i) the capacity of the construction industry and the costs of adjusting this capacity, and (ii) the supply of factors of production, in particular land. In the longer run, the size of the building industry may be infinitely elastic but the supply of land is not (at least not in urban areas). House prices should react more strongly to demand changes in the short than in the long run. As time goes and supply adjusts, prices should revert back towards a long-run equilibrium level. But due to the shortage of land, the long-run price level will increase with growing income and population.

Second, the exact nature of the dynamic adjustment towards equilibrium depends crucially on how market participants form their expectations. With rational expectations, they should realize that the price level is trend-reverting. Compared to the case of static or extrapolative expectations, rational expectations would reduce the immediate price impact of a shock to fundamentals and dampen price fluctuations more generally. As Poterba (1984) has demonstrated, there is a unique perfect foresight path for the adjustment of house prices to a shock to fundamentals. The more elastic supply is in the longer run (even if it is completely inelastic in the short run) the smaller is the initial price impact due to the feedback from expectations. As discussed above, there is some evidence that the expectations of home buyers may not be rational in certain market situations but rather tend to extrapolate past price trends (e.g. the US market in the early 2000s). Whether such deviations from rationality follow a general pattern is another and more difficult question.

Third, credit market constraints may give rise to short-run fluctuations away from fundamentals. A fraction of all home buyers, in particular first-time buyers, borrow up to the limit allowed by the bank and have negligible assets beyond their home. Effectively, their housing demand is restricted by the credit constraint imposed by the bank. Under normal circumstances the credit constraint is gradually released

as households save from their income and house values increase over time. As a result, homeowners can afford to climb up the housing ladder and move to a more expensive house. The dynamics of this process is sensitive to the development of house prices. A price increase will by itself release extra demand and hence lead to a multiplier effect on prices. Likewise, a negative price shock will lock in potential movers into their current homes and lead to a further downward price pressure.[20]

For all these reasons we would expect house-price dynamics to be cyclical. Initial price shocks could be amplified by extrapolative expectations and credit constraints. But in the longer run new construction should lead prices back towards an equilibrium level determined by fundamentals. The vast majority of econometric house price studies employ an error-correction framework to capture this interplay between the short and the long run. In such a model there is a long-run relation embedded within a short-run dynamic model. In the long-run, the *level* of the variable of interest, in this case the real price of owner-occupied homes, is related to the *levels* of a set of explanatory variables, in this case income, demographics, user cost etc. In the short run, the rate of price *change* is driven by the (current and lagged) *changes* of those explanatory variables and by the lagged *deviation* of price from its long-run level. The regression coefficient on the latter variable indicates the rate at which prices are approaching long-run equilibrium.

Error-correction models of house prices have a particularly long tradition in Britain, starting with Hendry (1984). As shown by Meen (2008), such a model originally estimated on quarterly UK data for the period 1969:3-1996:1 has remained stable through 2005. Meen's model, which includes the housing stock as an explanatory variable, exhibits a mean-reversion rate of 13 percent. This means that it will take five quarters to reduce an initial deviation from equilibrium by half. Since the model is conditioned on supply, the interpretation is that this inertia is related to expectations formation and/or the dynamics of credit constraints.

Preliminary estimates of an error- correction model of Swedish house prices, not conditioning on supply, indicates a quarterly mean-reversion rate of 8 percent and a first-order autocorrelation coefficient of 0.4. This means that there is considerable momentum in house prices; knowing that prices increased faster last quarter than warranted by fundamentals signals that they are likely to continue to increase the next quarter. Borrowing terminology from Abraham and Hendershott (1996), one can talk about this as a "bubble builder". The combination of the two dynamic mechanisms means that a disturbance to fundamentals leads to over-shooting in the short-run with a cyclical adjustment towards equilibrium. As an illustration of this interaction, consider a one-shot price increase of 10 percent

20 Models of such price-credit cycles have been developed by Stein (1995) and Ortalo-Magné and Rady (2006) among others. They have recently been successfully built into general equilibrium models, e.g. by Iacoviello and Neri (2010).

holding the fundamental long-run equilibrium price unchanged. This will, according to the model, lead to a "bubble" with further price increases by 3.2 percent in the next two quarters and the price level reaching a peak at 13.2 percent above equilibrium. Nine quarters after the shock the "bubble" is burst and house prices are back at 5 percent above equilibrium, which is almost exactly the same as in the absence of the short run feedback. Expressed differently, the "bubble burster" is more important than the "bubble builder" except in the very short run. Broadly speaking, the collective evidence from models in the error-correction tradition is that housing markets are generally relatively stable and that prolonged deviations from equilibrium are exceptions rather than the norm.

4. Summing up

Swedish house prices increased by 144 percent in real terms between the first quarter of 1995 and the third quarter of 2010. During the same period, real apartment rents increased by a mere 13 percent and real construction costs increased by only 33 percent. Does this mean that 2010 house prices are seriously overvalued? We have tried to answer this question in two steps. First, we have suggested that the user cost of housing has fallen sufficiently during this period – as a result of a general reduction of real interest rates in the world economy and a reduction of the Swedish taxation of the returns to owner-occupied housing – to warrant a substantial decrease in the rent-to-price ratio. Second, we have conjectured that the value of owner-occupied housing services has increased beyond the increase in rental apartment rents as a result of a lack of new construction. Housing supply has been very inelastic in response to increased house prices and the housing shortage has increased in main metropolitan areas. Combining these two factors, today's elevated house price levels appear to be warranted by fundamentals.

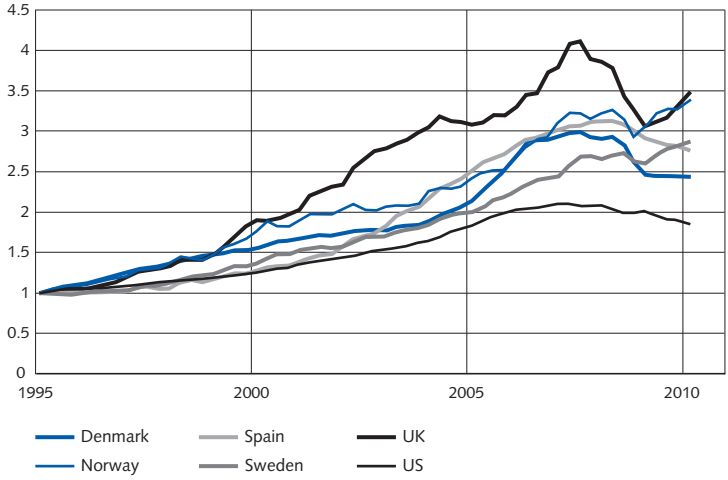
This conclusion comes with two caveats, however. The first relates to the lack of supply response. This stands in sharp contrast to the building boom in some other countries in recent years as well as the Swedish experience in the late 1980s. In part, the lack of new construction may be a legacy of the over-building in the early 1990s. But this cannot explain why there is so little new housing investment today despite the fact that the ratio of house prices to building costs appears to be at an all-time high. It may be that available cost indexes are misleading. If so, it is urgent to dig behind these numbers and sort out why it is not profitable to build despite the explosion of real house prices. Research in other countries has pointed to the role of planning processes and building restrictions.

A second caveat relates to the role of expectations. When suggesting that the current rent-to-price ratio is warranted, we have presumed that the cost of capital is well captured by the five-year after-tax mortgage rate minus expected general

consumption-goods inflation. In other words, we have assumed that households value houses based on zero after-tax capital costs. Sweden has experienced zero and even large negative real interest rates before, but that was in the 1970s and 1980s when borrowing opportunities were restricted. It could be argued that a negative real interest rate after tax would be unsustainable in today's deregulated environment and that rational pricing of long-lived assets should always be based on a positive discount rate. Further, it could be argued that capital-gains expectations should rationally anticipate that high house prices will sooner or later stimulate more new construction with falling prices as a consequence. This should rationally induce today's home buyers to expect decreasing prices in the future and, hence, to assign a higher level of user cost. In this way the two caveats are related. Today's price level is only warranted presuming that supply is permanently inelastic.

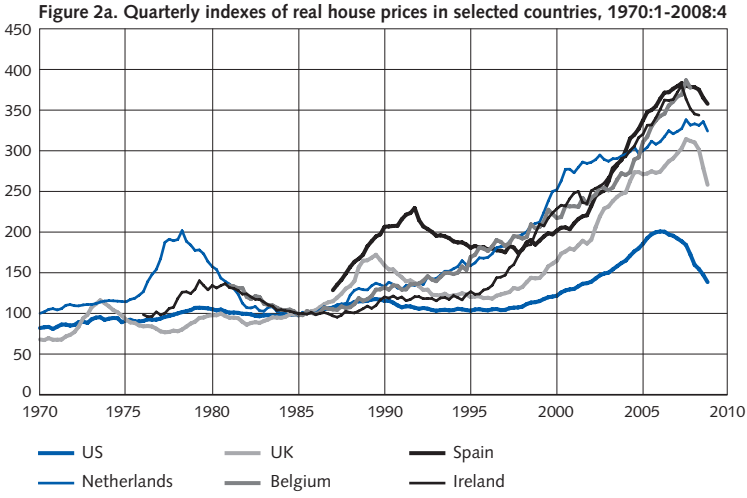
The discussion above points to two areas where we are particularly short of knowledge: the determinants of supply and the formation of expectations. Research in those two areas promises to have high returns.

Figure 1. Quarterly indexes of nominal house prices in selected countries, 1995:1-2010:1



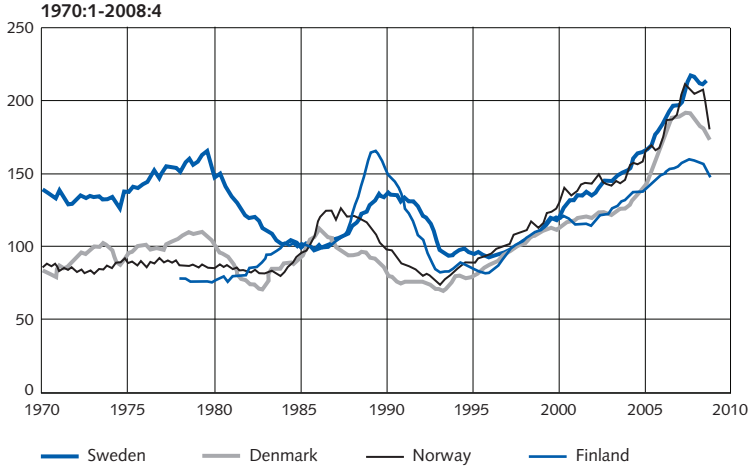
Source: BIS (http://www.bis.org/statistics/pp.htm).

Figure 2a. Quarterly indexes of real house prices in selected countries, 1970:1-2008:4



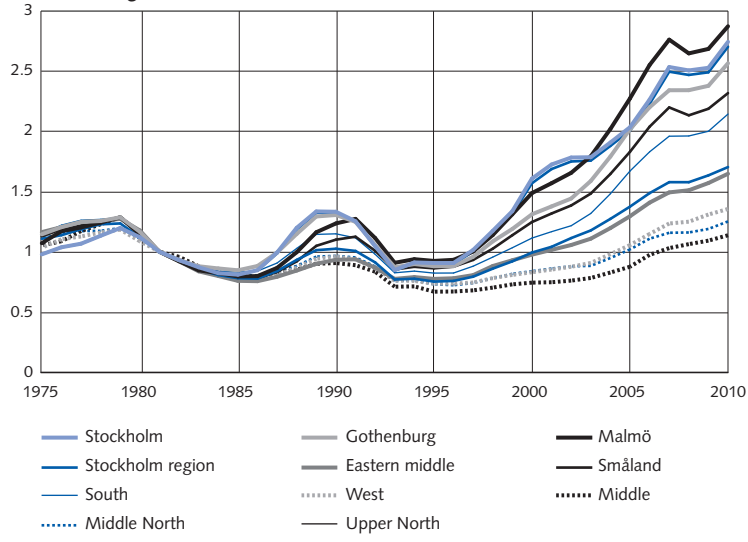
Source: BIS.

Figure 2b. Quarterly indexes of real house prices in the Nordic countries, 1970:1-2008:4



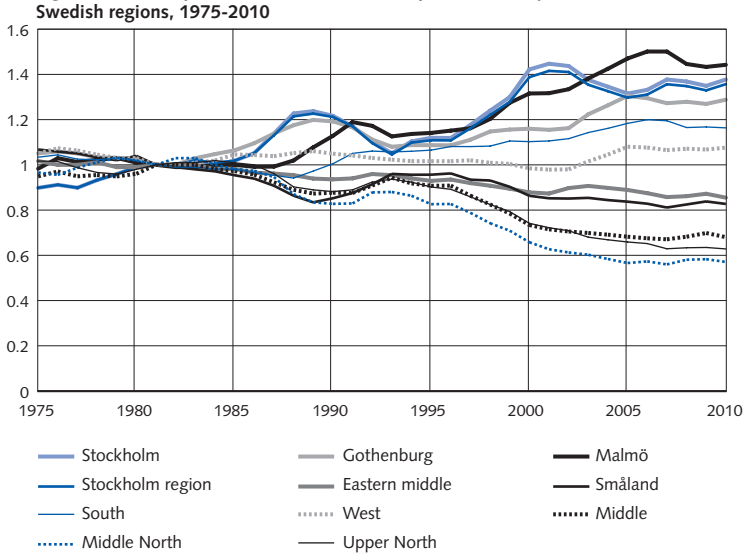
Source: BIS.

Figure 3. Yearly indexes of real prices for owner-occupied one-family houses, Swedish regions, 1975-2010



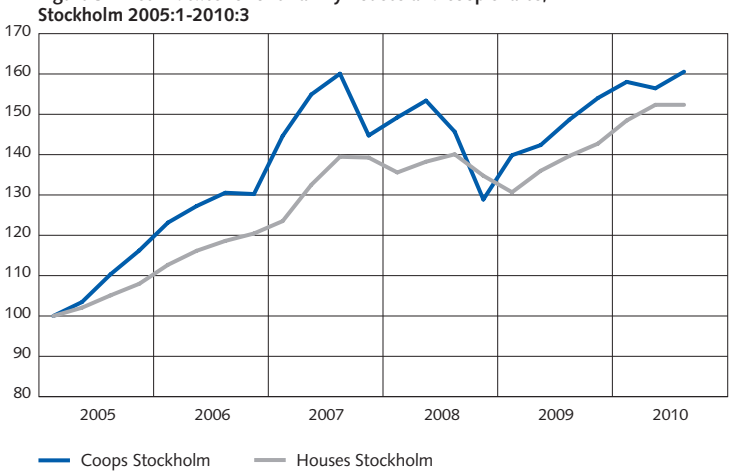
Source: Statistics Sweden.

Figure 4. Relative price indexes for owner-occupied one-family houses, Swedish regions, 1975-2010



Source: Same data as Figure 3.

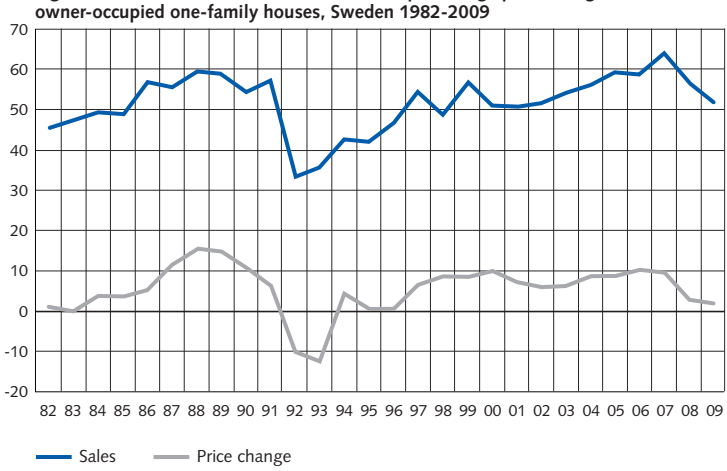
Figure 5. Price indexes for one-family houses and coop shares, Stockholm 2005:1-2010:3



Note: Coop index refers to contract date, house price to registration date.

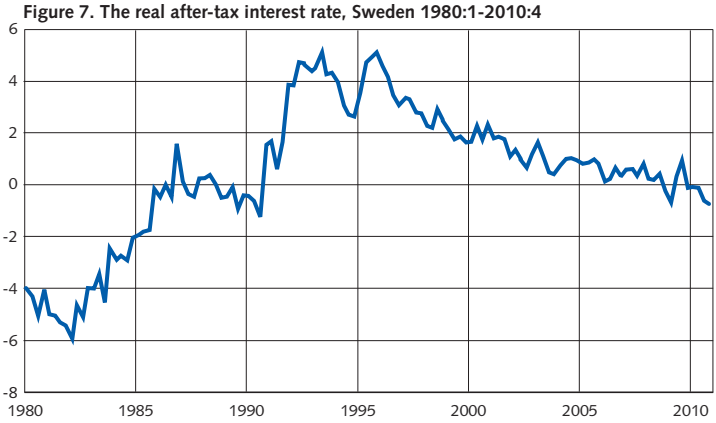
Sources: Statistics Sweden and Valueguard.

Figure 6. Number of sales (in thousands) and percentage price change, owner-occupied one-family houses, Sweden 1982-2009



Source: Statistics Sweden.

Figure 7. The real after-tax interest rate, Sweden 1980:1-2010:4



Note. The real interest rate is defined as $i(1\text{-}t) - \pi$, where i is the 5-year mortgage rate (from ECOWIN), t is the median tax rate applicable for interest deductions and π is the expected CPI-inflation based on survey data.

Figure 8. Components of the real interest rate, 1979:1-2009:4

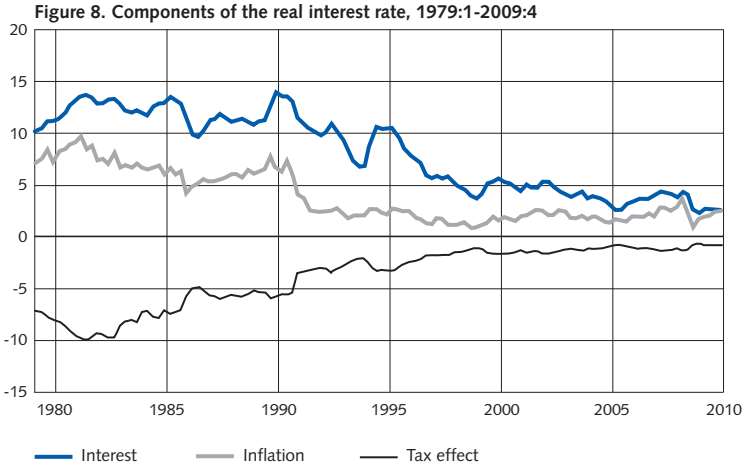
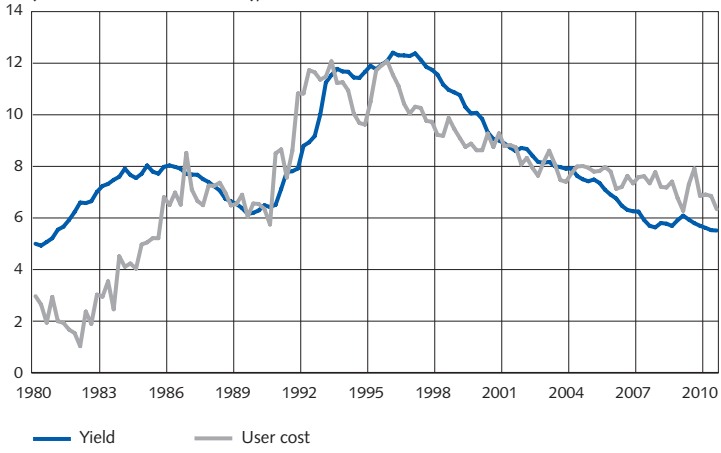
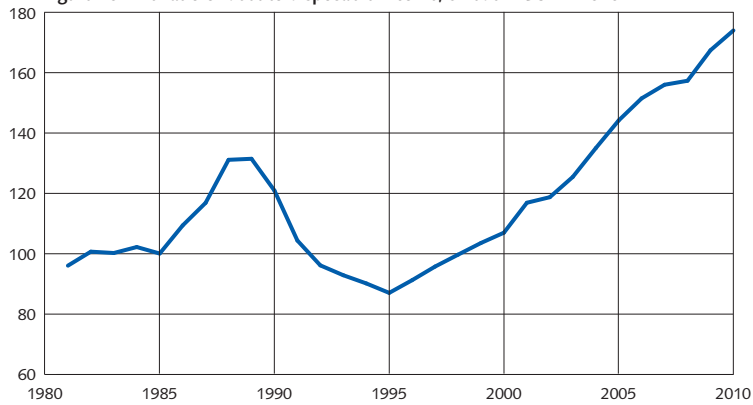


Figure 9. User cost for owner-occupied one-family house and rent-to-price ratio (normalized at 5% in 1980), 1980:1-2010:3



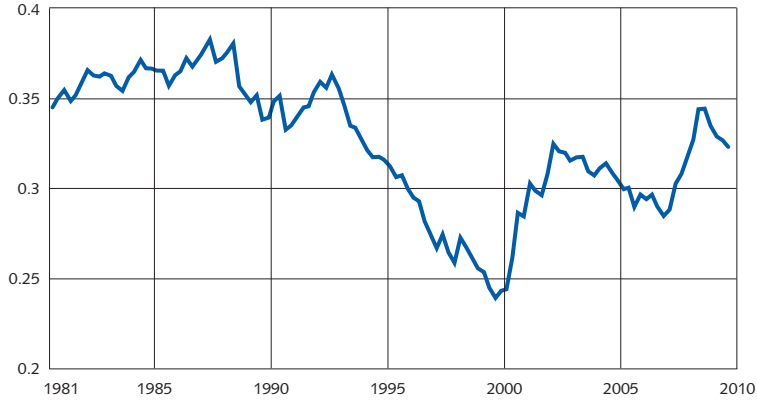
Note. Rent-to-price ratio defined as the ratio of the rent component of the consumer price index to the price index for owner-occupied houses, normalized at 5 percent in 1980. User cost defined as defined as the real interest rate from Figure 7 plus 7 percent.

Figure 10. The ratio of debt to disposable income, Sweden 1981:1-2010:1



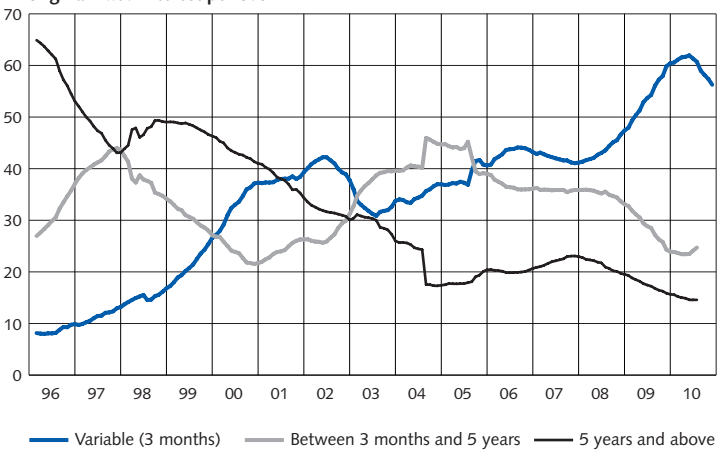
Source: Diagram 2:11, *Financial Stability* 2010:2, Sveriges Riksbank.

Figure 11. The ratio of debt to assets, Sweden 1981-2010



Source: Diagram 2:9, *Financial Stability* 2010:2, Sveriges Riksbank.

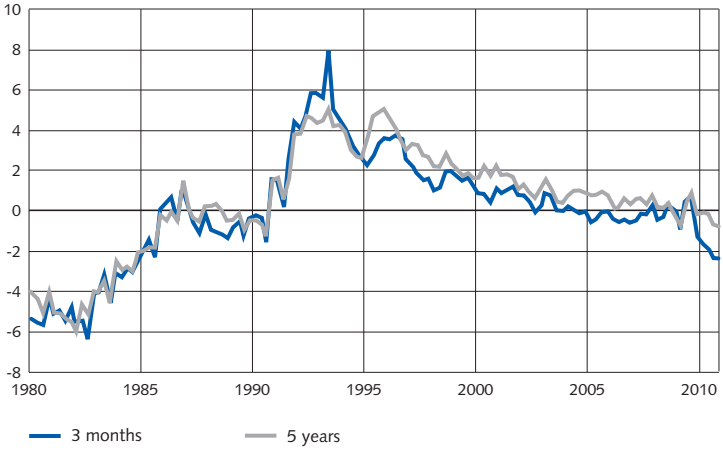
Figure 12. Breakdown of Swedish mortgage institutions' outstanding stock by original fixed interest periods



Note. Due to a change how the statistics are reported, data up to August 2010 uses the categories "Between 3 months and 5 years" and "5 years or more". This distribution of categories is not available after August 2010, at which time the statistics of outstanding loans only show "variable rate" and "fixed rate".

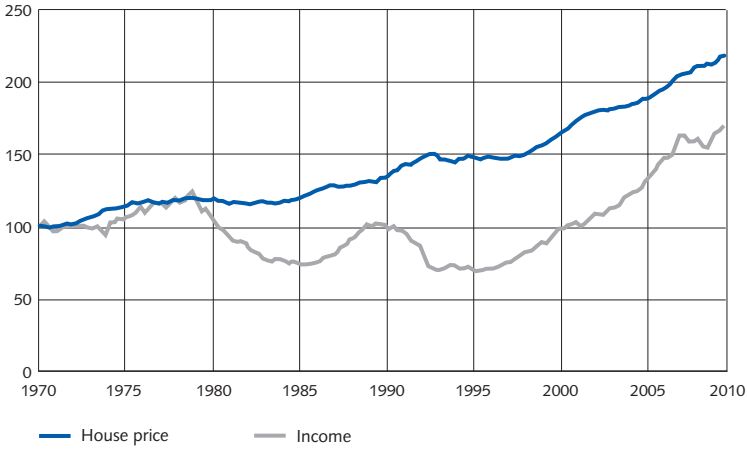
Sources: The Riksbank and Statistics Sweden.

Figure 13. Real interest rates based on-month and 5-year mortgage rates, Sweden 1980:1-2010:4



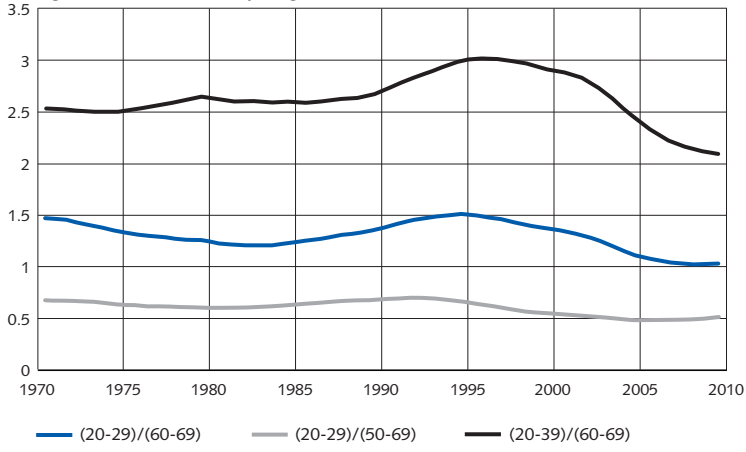
Note. Sources and definitions as Figure 7.

Figure 14. Indexes of real house price and real disposable income, Sweden 1970:1-2009:2



Note. Four-quarter moving average of disposable income (from National Accounts).

Figure 15. The number of young relative to old individuals, Sweden 1970-2009



Source: Statistics Sweden.

Figure 16. House price and factor cost, indexes (deflated by CPI), Sweden 1975:1-2010:3

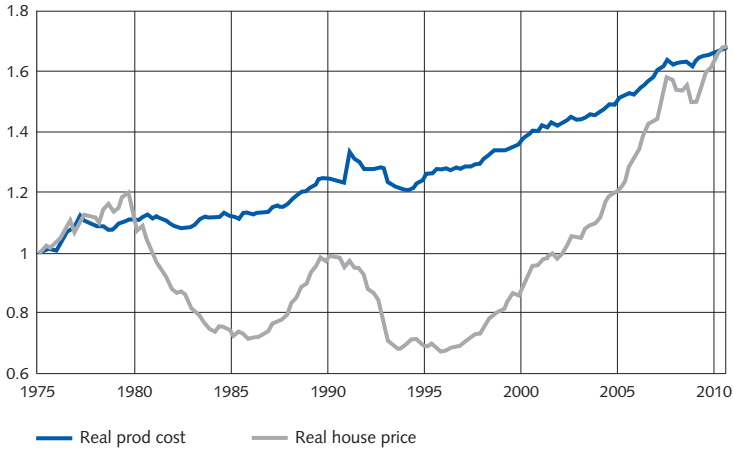
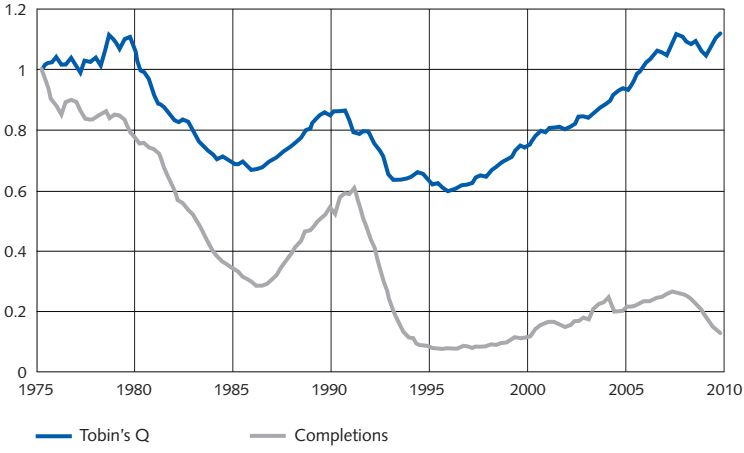


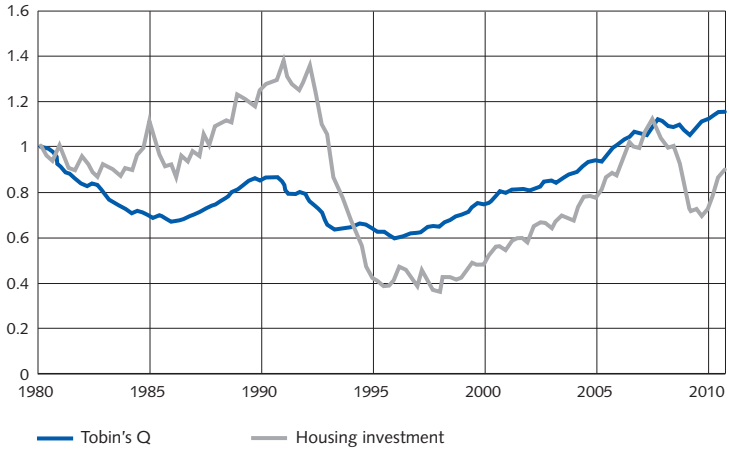
Figure 17. Tobin's Q and number of new one-family houses, indexes, Sweden 1975:1-2009:4



Note. Q defined as the ration of the price index to the construction index (from Figure 16). The index for completions is a four-quarter weighted average.

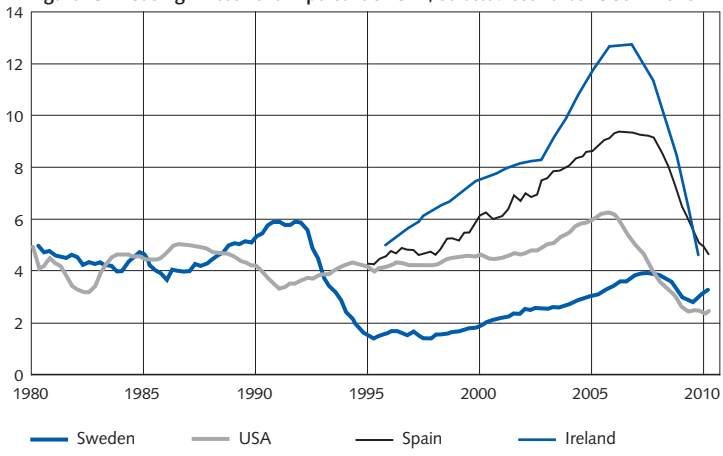
Source: Statistics Sweden.

Figure 18. Tobin's Q and housing investment (index, fixed prices), Sweden 1980:1-2010:3



Source: National Accounts. Two chained series for housing investment.

Figure 19. Housing investment in percent of GDP, selected countries 1980:1-2010:1



Source: *Monetary Policy Report*, October 2010, Sveriges Riksbank.

Appendix: Measuring house prices

Houses are heterogeneous and only a small fraction of the housing stock is transacted in any shorter time period. This creates difficult problems in measuring "the" price level of houses, in particular at a frequency that is high enough to be relevant for economic analysis. A widely accepted framework for analyzing house prices starts from the notion that a house can be described by a number of characteristics and that the price of a particular house is the price of that bundle. Denoting the characteristics by the vector X, the price of a particular house is $f(X)$. Estimating this function for different time periods, a price index can be constructed based on a house with a particular set of characteristics. In practical applications it is common to assume that $f(X)$ is constant over time and that the price of house i at time t may be written $P_{it} = \pi_t \cdot f(X_t)$. Here π_t is the price per unit of housing $f(X)$ and has the natural interpretation of a price index. Taking logs of this equation gives a standard linear regression equation. This is the *hedonic method* which is used in several countries to estimate price indexes. With access to a rich set of characteristics this is the favored method of index construction. It underlies the HOX Valueguard Index for coop shares (http://www.valueguard.se/index).
A related method is based on external valuations of $f(X)$ in a base year. Holding $f(X)$ constant, the mean of the ratio $P_{it}/f(X_i)$ can be taken as an estimate of a price index. This is essentially the method used by Statistics Sweden to construct an index of owner-occupied one-family houses. This method is only as good as the valuations that it is based on, in the Swedish case the point system that is the basis for the tax assessments. An advantage is that it allows the analyst to take account of special conditions of an individual house that are not easily entered into a regression framework.

The hedonic method requires a rich set of data on hedonic characteristics. If such data are not available a simple alternative would be to only look at median and mean sales prices, not controlling for the heterogeneity of houses. With a representative and large sample of sales the difference between the median sales price and a hedonic index may be quite small (see e.g. Englund et al. 1998 for Sweden). Another alternative is to construct a data base of paired sales of the same house sold at different points in time. Presuming that the characteristics of the houses have not changed between sales, calculating a price index based on such *repeat sales* would give an accurate price index. Such indexes are the only ones available in the United States. An advantage is that the method controls for idiosyncratic characteristics of an individual house that would go unmeasured in the hedonic approach, but a serious disadvantage is that quality changes due to renovations and additions are not taken into account.

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A macroeconomic analysis of house prices in Sweden

Carl Andreas Claussen, Magnus Jonsson and Björn Lagerwall*

House prices in Sweden have risen considerably since the mid-1990s. How can this development be explained? What role does monetary policy play for house prices? What would happen if house prices fell sharply? Are houses overvalued? This article attempts to shed light on these questions with three models for the housing market. The models are estimated on and adapted to Swedish data.

The results indicate that higher incomes, lower real interest rates and a greater preference for housing consumption are important factors behind the rise in house prices since the mid-1990s. Monetary policy affects real interest rates and incomes, it has therefore been important for the rise in house prices. However, according to the models, it would be difficult to slow down the rise in house prices by monetary policy without negative effects on the real economy.

The models indicate that a fall in house prices could have a relatively limited effect on the real economy. But, this is under the assumption that the relationships in the models are stable and that the effects on demand of lower house prices can be counteracted by a more expansive monetary policy, which cannot be taken for granted. There are many indications that house prices are currently above the long-term trend. According to the models this can be explained by such factors as higher incomes and lower real interest rates. However, it is difficult to judge whether house prices are overvalued and the conclusion will depend on the definition, method and period of time considered.

* The authors work at the Monetary Policy Department, Sveriges Riksbank. We are grateful for discussions and suggestions from many colleagues at the Riksbank. In particular, we would like to thank Karl Walentin and Magnus Åhl.

1. Introduction

House prices in Sweden have risen considerably since the mid-1990s. In real terms, prices of one- and two-dwelling buildings rose by over 130 per cent between 1996 and 2010. This means an average rate of increase of over 6 per cent a year. A number of questions arise in light of this:

- How can this rise in house prices be explained?
- What role does monetary policy play for house prices?
- What happens if house prices fall sharply?
- Are houses overvalued?

In this article we attempt to answer these questions with three different models for the housing market. The first model is a simple econometric model based on theoretical relations for the housing market. Great importance has been ascribed to adapting the model to the data. The second model is a pure statistical model with no economic theory, a so-called Bayesian VAR model. Hence, the most importance has been ascribed to adapting the model to the data. The third model is a dynamic stochastic general equilibrium model. In models of this kind the greatest importance is ascribed to ensuring that the model agrees with economic theory. All three models build on Swedish data.

According to the econometric model, the recent rapid rise in house prices can mostly be explained by higher household income and lower real interest rates. The general equilibrium model emphasises increased preferences for housing consumption, i.e. an increased demand for housing compared to other consumption, as an important explanation.

Real interest rates and incomes are affected by monetary policy. This means that monetary policy is also important for the development of house prices. However, according to the models, any attempt to slow down a rise in house prices using monetary policy could have large-scale negative repercussions for real economic growth. In the models, monetary policy has relatively little effect on house prices and large interest rate increases are therefore required to reduce the rate at which house prices are increasing. Such an increase would have an adverse effect on households' consumption and firms' investments, which would lead to a fall in GDP.

The models indicate that a fall in house prices could have a relatively limited effect on the real economy. But, this is under the assumption that the relationships in the models are stable and that the effects on demand of lower house prices can be counteracted by a more expansive monetary policy, something which cannot be taken for granted.

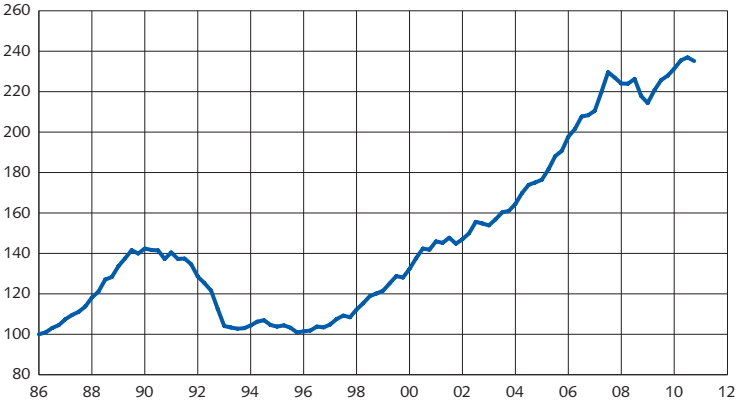
There are many indications that house prices are currently above the long-term trend. According to the general equilibrium model, house prices are currently

around 20 per cent higher than the trend. Even simple estimates of the historical average from the 1950s may indicate that house prices are above the trend. According to the models, the high house prices can be explained by such factors as higher incomes and low real interest rates. Forecasts using the BVAR model and the econometric model do not provide any evidence that house prices would fall in the future. However, it is difficult to judge whether houses are overvalued, and the conclusions will depend on the definition, method and period of time considered.

2. How can the house price development be explained?

Chart 2.1 shows the development of real prices for one- and two-dwelling buildings ("house prices" in the following) for the period 1986-2010. As we can see the prices have varied extensively. Prices rose considerably after the deregulation of the credit market at the beginning of the 1980s. Prices then fell again starting in 1990. A new period of rising prices emerged in 1996, which lasted until the financial crisis in 2007. Prices began to rise again in 2009. If we look at the period from the first quarter of 1996 to the third quarter of 2010, real prices have risen by 134 per cent.

Chart 2.1. Real prices for one- and two-dwelling buildings
Index 1986:1 = 100



Sources: Statistics Sweden and the Riksbank.

LOW INTEREST REAL RATES, HIGHER INCOMES AND HIGHER FINANCIAL WEALTH EXPLAIN MUCH OF THE RECENT INCREASE

Econometric models for the housing market are often used to analyse house-price developments. These models are estimated on historical data and explain house-price developments by a number of variables. The variables are, for example, mortgage rates, household income and wealth, monetary policy expectations and

variables measuring construction costs. Other variables such as unemployment, demographics and credit growth are also relatively common.[1]

We have estimated a simple econometric model for the Swedish housing market. When estimating the model we tested for a large number of variables. However, most of these did not work well. For example, unemployment, demographic variables, monetary policy expectations and housing investments had the wrong sign or were statistically insignificant. Even construction costs worked poorly. If construction cost (excluding the cost of land) is included in the model, the house price development is explained almost entirely by this variable. We therefore suspect that construction costs are determined along with and by the same factors as house prices and not that construction costs explain house prices to such a great extent. Different statistical tests also indicate that house prices determine construction costs. An explanation for this can be weak competition in the construction sector. Studies by Konkurrensverket (2009) and BKN (2010b) suggest that competition may be weak in the construction sector.

Several studies on Swedish data use household debt as an explanatory variable, see e.g. Hort (1998) and Barot and Yang (2002). These studies include periods when the credit market was regulated. If household credit is rationed, the growth of household debt can be an important explanatory variable. However, in a deregulated credit market, the growth of credit is determined by the same factors as house prices. The Swedish credit market was deregulated in the mid-1980s and our data begins in 1986. We have therefore chosen not to use household debt as an explanatory variable in the model.

The final model includes three explanatory variables: household real disposable income, an average after tax real mortgage rate ("the real mortgage rate") and household real financial wealth. We assume that these variables are determined outside the model, which is a normal assumption for this type of models. The model, the data and the estimations are documented and discussed in Claussen (2011). See the appendix for a short overview.[2]

The econometric model fits the actual development very well, as shown in chart 2.2. House prices rose by 29 per cent from the first quarter of 1987 to the first quarter of 1990. This is illustrated by the height of the first column in the chart.

1 See, for example, Hort (1998), Barot and Yang (2002), Adam and Fuss (2010), Franke (2010) and BKN (2010a).

2 The model is an error-correction model. With such a model we can distinguish between a long-run equilibrium price, the 'fundamental price', and a short-term equilibrium price. The model is called an 'error-correction model' as it has a built in mechanism that gradually corrects the difference between the fundamental price and the short-term price – the error – over time. A possible theoretical justification for the model is the fact that it takes time to build new houses, and the fact that the number of new houses that is added to the housing stock each year is very small compared to the existing stock. Thus, in the short run the supply of houses is very price inelastic, and a sudden increase in housing demand will lead to temporary increase in house prices. Over time the stock grows as new houses flow into the housing market.

According to the model, prices should have risen by 26 per cent.[3] Thus, only 3 percentage points are not explained by the model, which is indicated by the light grey field in the column. Similarly, the total height of the other two columns shows the total change in house prices over two other periods and the light grey portion of each column shows the unexplained part of the change in prices throughout the period.[4] As we see, the unexplained part is very small for all periods.

As far as the contribution of the explanatory variables is concerned, higher income has contributed to higher house prices in all the periods (the dark grey portion of the column). The contribution is particularly large in the last upturn, where higher real disposable income explains just over half of the rise in house prices. During this period, households' real disposable income rose by a full 2.3 per cent on average per year. In the first and second periods, the annual increases were 1.0 and 2.0 per cent, respectively. Chart 2.3 shows the development of households' real disposable income since 1986.

Changes in household financial wealth help to explain the rise in house prices in the last upturn period, but played no part in the previous two periods (blue portion of the column). Chart 2.4 shows the development of household real financial wealth since 1986.

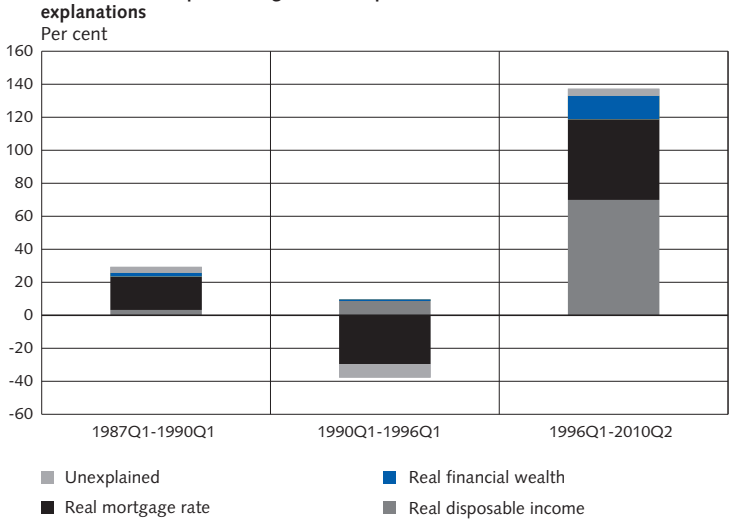
The most important explanation for the variations in house prices is variations in the real mortgage rate (the black portion of the column). 80 per cent of the rise in house prices in the latter part of the 1980s is explained by lower real mortgage rates. Similarly, falling house prices from 1990 to 1996 can to a large extent be explained by a considerable rise in real mortgage rates. Just over 35 per cent of the rise in house prices from 1996 to 2010 is explained by a reduction in real mortgage rates. Chart 2.5 shows the development of real mortgage rates.

A conclusion from the econometric model is that the growth of house prices, including the considerable rise after 1996, is well explained by the development in household real disposable income, real mortgage rates and household financial wealth.

3 We use the long-term relationship when we calculate how much the change between two moments in time should have been according to the model. Actual house prices and the price according to the long-term relationship should therefore be the same at these moments in time. In 1986, there was a large deviation between the actual price and the price according to the long-term relationship. In the first quarter of 1987, the actual price was approximately the same as the price according to the long-term relationship.

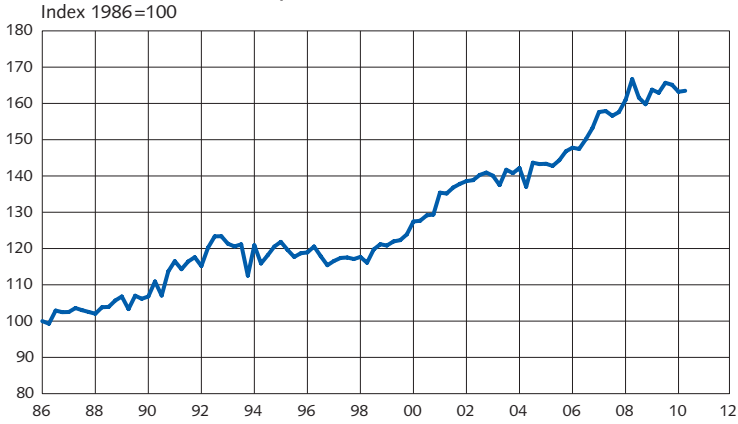
4 The long-term relationship in the model does not capture the downturn in house prices from 2008 to 2009 and we therefore regard the period from 1996 to 2010 as a single period.

Chart 2.2. House price changes in three periods and (econometric) model explanations
Per cent



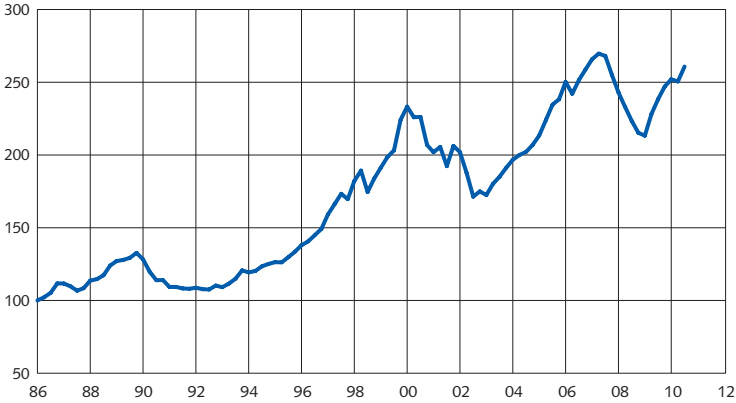
Source: Claussen (2011).

Chart 2.3. Household real disposable income
Index 1986=100



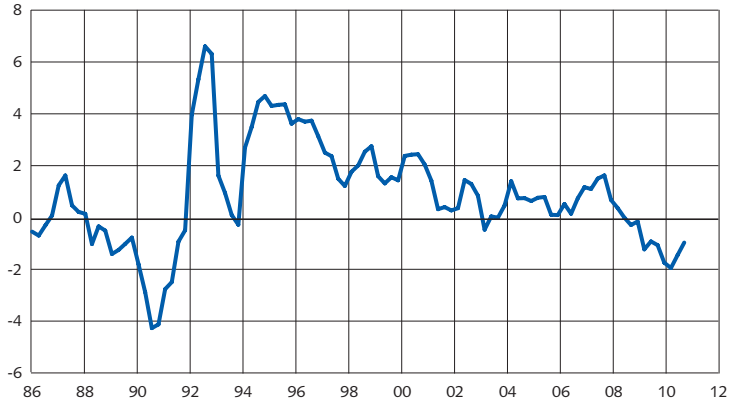
Sources: Statistics Sweden and the Riksbank.

Chart 2.4. Household real financial wealth
Index 1986=100



Sources: Statistics Sweden and the Riksbank.

Chart 2.5. Real after tax mortgage rates
Per cent



Sources: Statistics Sweden and the Riksbank.

CHANGES IN PREFERENCES ARE ALSO AN IMPORTANT EXPLANATION ACCORDING TO THE GENERAL EQUILIBRIUM MODEL

A fundamental principle in general equilibrium models is the division between endogenous and exogenous variables.[5] Endogenous variables are explained within the model whereas exogenous variables are explained outside the model. Fluctuations in the exogenous variables drive variations in the endogenous variables.

5 The general equilibrium model for house prices was developed by Iacoviello and Neri (2010). It has since been modified and estimated on Swedish data by Walentin and Sellin (2010). They provide a detailed description of the model with focus on Swedish conditions. The appendix of the current article provides an informal description of the most important assumptions and mechanisms in the model.

We normally say that the economy is exposed to "shocks" when the exogenous variables vary. If, for example, technological development, which is an exogenous variable, were to change, it would cause changes in households' and firms' decisions on consumption, investment, labour supply, etc.

The model contains nine different exogenous variables, or shocks. There are three different shocks to households' preferences and three different shocks to technological development.[6] There is also a cost shock which has a direct effect on inflation, a monetary policy shock which primarily affects the interest rate, and an inflation target shock which affects the central bank's inflation targets. In order to explain historical fluctuations in house prices, it is possible to break down the fluctuations into these shocks.

The nine shocks in the model explain together 100 per cent of the fluctuations around the trend-growth in house prices. However, only a few of these shocks explain most of the fluctuations. Historically, the most important shock has been changes in preferences for housing relative to other consumption, both with regard to upward and downward fluctuations. On average, changes in preferences have explained approximately 70 per cent of the fluctuations. Monetary policy has been less important even though in the short term these shocks have explained approximately 20 per cent.[7] The other seven shocks together explain the remaining 10 per cent.

At present, house prices are around 20 per cent above the trend according to the model. The most important explanation for this is greater preference for housing relative to other consumption. But monetary policy has also been important. Monetary policy has been more expansive than normal according to the model and monetary policy shocks have therefore driven up house prices in recent years. But, the contribution from monetary policy is significantly less than the contribution from changes in preferences. A third explanation is that productivity growth in the housing sector has been slower than normal. This has driven up prices since 1995. Although the contribution from productivity growth has declined somewhat in recent years, it has nevertheless been important for the upturn in recent years. For a more detailed discussion of the factors explaining fluctuations in house prices see Walentin and Sellin (2010).

6 In formal terms, there is a preference shock to households' utility from consuming today relative to consuming in the future, a preference shock in the consumption of leisure relative to other consumption, a preference shock in the consumption of housing services relative to other consumption, a technology shock in the goods sector, a technology shock in the housing sector and an investment-specific technology shock in the goods sector.

7 In the model, monetary policy follows a so-called "Taylor rule". This means that it normally reacts to changes in inflation and GDP. However, central banks also react to other factors, which are reflected in the monetary policy shock. The monetary policy shock kan be understood as a residual that captures changes in the interest rate over and above the changes caused by changes in inflation and GDP.

The largest proportion of the rise in house prices in recent years is explained by an increase in households' preferences for housing relative to other consumption. The model is unable to explain why this has taken place because it is a question of exogenous changes that, by definition, are not explained in the model. It is difficult to estimate preferences because they are not directly observable. However, we may wonder how these changes are to be interpreted and whether it is possible to understand why preferences for housing consumption have increased.

In certain contexts, fluctuations in house prices have been explained by changes in demand that cannot be related directly to factors such as income and interest rates. One sometimes hears statements like "a greater need for privacy", "changes in taste", and "a belief in the purchase of a property as an investment", see Iacoviello (2011). These explanations appear, at least at first sight, to be related to changes in preferences for housing.

Overall, the results from the two models indicate that high house prices are explained by higher incomes, low real interest rates and greater preferences for housing consumption relative to other consumption.

3. What role does monetary policy play for house prices?

This section illustrates how monetary policy affects house prices. The illustration is based on numerical examples of the effects of a change in the interest rate in the models. According to the models, it is costly in terms of inflation and GDP to use monetary policy to dampen increases in house prices.

SMALL EFFECT OF MONETARY POLICY ON HOUSE PRICES ACCORDING TO THE MODELS

According to the econometric model, a change in the real mortgage rate of 1 percentage point results in a change of 6 per cent in real house prices. To calculate how house prices are affected by *the repo rate*, we have estimated the real mortgage rate as a function of the repo rate. According to this estimation, a change of 1 percentage point in the repo rate leads to approximately half a percentage point change in the real mortgage rate. Thus, a change of 1 percentage point in *the repo rate* results in around a 3 per cent change in house prices.

The econometric model is based on the assumption that the explanatory variables are determined outside the model and that a change in a specific explanatory variable does not affect the other explanatory variables. However, in reality, a change in the real interest rate also affects households' income, for example, which in turn affects house prices. These indirect effects are better reflected in the BVAR model and the general equilibrium model.[8]

8 The BVAR model is described in more detail in the appendix. Note that in both the general equilibrium and the BVAR model we use the 3 month rate as a proxy for the repo rate.

According to the BVAR model, an increase in the interest rate of one percentage point leads to almost 1 per cent lower house prices during the first year, see table 3.1. House prices continue to fall in subsequent years. During the second year, they are almost 2 per cent below trend and in the third year almost 3 per cent below trend. In the long run, the higher interest rate therefore leads to approximately 5 per cent lower house prices. Higher interest rates also lead to lower house prices in the general equilibrium model. An increase of 1 percentage point in the interest rate results in almost 2 per cent lower housing prices in the first year.

Table 3.1. Effects from an increase in the interest rate of 1 percentage point
Annual change in per cent unless otherwise specified

BVAR	YEAR 1	YEAR 2	YEAR 3
Repo rate, per cent	1.0	0.8	0.7
Real house prices, per cent deviation from trend	-0.8	-1.9	-2.9
CPIF	0.2	0.3	0.2
GDP	-0.2	-0.3	-0.3
GDP, per cent deviation from trend	-0.2	-0.5	-0.7
GENERAL EQUILIBRIUM MODEL			
Repo rate, per cent	1.0	0.0	-0.1
Real house prices, per cent deviation from trend	-1.6	-1.1	-1.0
CPIF	-0.7	-0.3	-0.1
GDP	-1.0	0.2	0.2
GDP, per cent deviation from trend	-1.0	-0.8	-0.6

Sources: Statistics Sweden and the Riksbank.

In other words, monetary policy offers limited possibilities for affecting house prices in all three models. Overall, the results from the models indicate that a rise in the interest rate of 1 percentage point leads to a fall in house prices of between 2 and 5 per cent. This fall is somewhat smaller than in several other studies, but still in line with Hort (1998), see table 3.2.

Table 3.2. Effects of an increase in the real interest rate by one percentage point on house prices in several studies

	COUNTRY	ESTIMATED EFFECT ON HOUSE PRICES (PERCENTAGE CHANGE)
Hort (1998)	Sweden	-3
IMF (2005a)	United Kingdom	-6
IMF (2005b)	Netherlands	-9
Oikarinen (2005)	Finland	-2 to -8
Adams and Füss (2010)	Sweden	-8

SLOWING DOWN FAST-RISING HOUSE PRICES USING MONETARY POLICY IS COSTLY IN TERMS OF LOWER GDP AND INFLATION

According to the general equilibrium model, a higher interest rate means that households will consume less and firms will become more restrained in their investments. Lower demand leads to lower production and a lower GDP. The effect

on GDP growth from an increase in the interest rate by 1 percentage point is shown in table 3.1. GDP growth is around 1 percentage point lower.[9] In terms of deviation from its long-term trend, GDP falls by around 1 per cent during the first year and continues to be lower for several years. When production falls, demand for capital and labour also fall. This gives rise to lower salary increases, which reduce firm expenses and leads to lower prices. Inflation measured by CPIF falls by just under 1 percentage point.

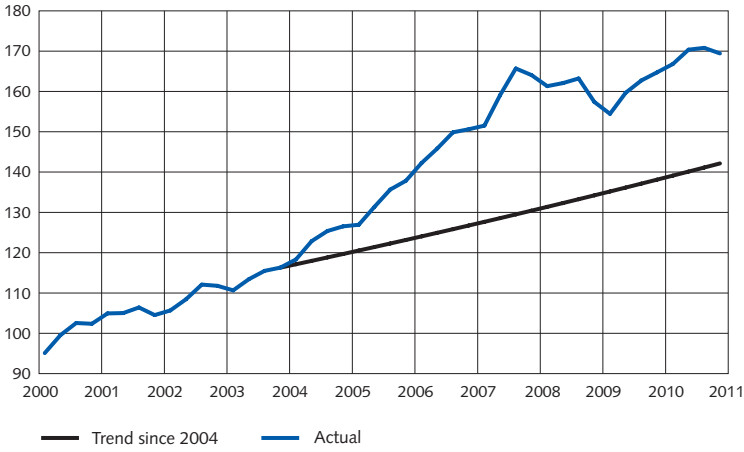
The costs of restraining rising house prices are somewhat lower in the BVAR model than in the general equilibrium model during the first year. A one percentage point increase in the interest rate results in GDP growth that is around 0.2 percentage points lower and inflation that is around 0.2 percentage points higher, see table 3.1. Inflation rises because it is positively correlated with interest in our data.[10] However, after three years, GDP deviates from its trend by about the same amount as in the two models, i.e. it is approximately 0.7 per cent lower.

These numbers indicate that it can be relatively costly to use monetary policy to restrain rising house prices. Another way to illustrate this is to first calculate the interest rate increases that would have been required if house prices were to follow their long-term trend from 2004 onward, and then calculate the changes to inflation and GDP that are associated with these interest rate increases. According to the general equilibrium model, the long-term growth, or trend, in house prices is 2.9 per cent per year. House prices were in line with this trend around 2004. The blue line in chart 3.1 shows house prices since 2000. The black line shows what house prices would have been had they followed the trend from 2004 onwards. A tighter monetary policy would have been required to bring about this trajectory. The interest rate is therefore raised in the model by more than 2 percentage points in 2004, see table 3.3. It is continually raised during subsequent years, and in 2006 and 2007 it is raised by 5 percentage points. The rate of increase is then lowered somewhat and in 2009 the interest rate is lowered by 0.6 percentage points.

9 The monetary policy transmission from interest to GDP and inflation in this example is calculated using Ramses, the Riksbank's general equilibrium model.

10 The Fisher equation may shed light on the positive relationship between the interest rate and inflation: nominal interest rate = real interest rate + expected rate of inflation. If the real interest rate is constant over time, the variations in the nominal interest rate will be explained by the variations in the expected rate of inflation, i.e. there is a positive correlation between the nominal interest rate and inflation.

Chart 3.1. Real house prices. Actual and according to the trend in the general equilibrium model
Index for 2000 = 100



Sources: Statistics Sweden and the Riksbank.

Table 3.3. House prices according to the trend from 2004 onward
Annual change in per cent unless otherwise specified

	2004	2005	2006	2007	2008	2009	2010
Real house prices, per cent deviation from trend	-5.6	-11.2	-17.2	-22.9	-15.9	-17.6	-19.1
Repo rate, per cent	2.2	3.4	5.0	5.0	0.8	-0.6	1.2
CPIF	-1.4	-2.9	-4.9	-5.8	-3.8	-1.4	-1.8
GDP	-2.2	-3.0	-4.2	-3.9	0.6	1.3	-0.9

Sources: Statistics Sweden and the Riksbank

The higher interest rate leads to significantly lower inflation. Inflation measured by CPIF is on average around 3 percentage points lower each year. GDP growth is also lower; on average almost 2 percentage points lower with the tighter monetary policy.

4. What would happen if there were to be a drastic fall in house prices?

An important question for monetary policy is how changes in house prices affect inflation and GDP. This section presents several examples that illustrate the consequences of a fall in house prices for inflation and GDP and, in turn, the consequences for monetary policy. We assume that house prices fall 20 per cent in real terms. This is less than the fall at the beginning of the 1990s when prices fell almost 30 per cent, but more than the fall in 2008.

A FALL IN HOUSE PRICES HAS RELATIVELY SMALL EFFECTS ON THE MACRO ECONOMY IN THE GENERAL EQUILIBRIUM MODEL

According to the general equilibrium model, the largest share of the historical fluctuations in house prices has been caused by shocks to preferences for housing relative to other consumption. We therefore allow the fall in house prices to be explained by a lower demand for housing. If some other shock cause the fall in prices, the effects can be different.

The fall in house price primarily affects households that use housing as collateral. When the collateral falls in value, they are forced to increase mortgage repayments. As a consequence, they reduce other consumption which therefore brings about a fall in demand in the economy, which results in a fall in GDP.

The fall in house prices holds back GDP growth primarily during the first year, during which it is around 1 percentage point lower than otherwise, see table 4.1. However, GDP's deviation from its long-term trend is about 1 per cent for a long time into the future. During the next three years, it is on average 1 per cent lower than without the fall in house prices. Lower demand presses prices downward. The effect on inflation, though, is very small; inflation falls by only 0.1 percentage points. The absence of larger effects on inflation is in part due to the definition of inflation in the model. Only prices of consumer goods are included in the measurement. The fall in house prices therefore has no direct effect on inflation.

In the model, monetary policy is intended to stabilise inflation around an inflation target and GDP growth around a long-term growth target. Lower GDP growth and somewhat lower inflation opens for more expansive monetary policy and the interest rate is therefore lowered by 0.5 percentage points. Expansive monetary policy is another reason why a fall in house prices only has a small effect on inflation. However, monetary policy does not completely offset the fall in GDP.

Thus, the effects of a fall in house prices on GDP growth are relatively small. However, the model disregards frictions in the financial sector and borrowers in the model always repay their debts. The downturn in house prices therefore only affects borrowers negatively. Lenders are not affected by fluctuations in house prices.

The absence of frictions in the banking sector is a gross simplification. If house prices were to fall sharply, the financial sector would probably be important for how the effects would spread to the rest of the economy, as demonstrated in particular by the developments in the USA since 2007. There, the fall in house prices had such a large impact as it affected the banks' balance sheets. Repayments from borrowers fell, which in turn meant a reduction in the banks' net capital. If the banks can absorb such losses with new capital, the fall in repayments only corresponds to a redistribution, which should not lead to large aggregate effects. However, if the banks' have limited access to financing and, for example, must fulfil a capital requirement, this can lead to a credit squeeze and consequences for consumption

and investments. The fact that the model does not have credit market frictions may lead to underestimation of the effects on GDP. On the other hand, the Swedish banks have – for example at the beginning of the 1990s when house prices fell dramatically – been spared from loan losses from households.

Table 4.1. Effects of a 20 per cent fall in house prices in 1 year
Annual change in per cent unless otherwise specified

GENERAL EQUILIBRIUM MODEL	YEAR 1	YEAR 2	YEAR 3
Real house prices, per cent deviation from trend	-20.0	-17.9	-15.9
CPIF	-0.1	-0.1	-0.1
GDP	-1.1	0.2	0.2
GDP, per cent deviation from trend	-1.1	-1.0	-0.8
Repo rate, per cent	-0.5	-0.5	-0.2
BVAR, SHOCK TO HOUSE PRICES			
Real house prices, per cent deviation from trend	-20.0	-20.3	-19.5
CPIF	-0.4	-0.2	-0.2
GDP	-2.0	-0.2	0.1
GDP, per cent deviation from trend	-2.0	-2.2	-2.1
Repo rate, per cent	-0.5	-0.8	-0.7
BVAR, ALL SHOCKS			
Real house prices, per cent deviation from trend	-20.0	-22.9	-22.0
CPIF	-0.5	-0.4	-0.4
GDP	-2.3	-1.3	0.2
GDP, per cent deviation from trend	-2.3	-3.5	-3.3
Repo rate, per cent	-0.3	-1.1	-1.1

Sources: Statistics Sweden and the Riksbank.

THE EFFECTS ARE SLIGHTLY LARGER IN THE BVAR MODEL

To analyse the effects of the house-price fall in the BVAR-model we first assume that the fall in house prices is caused by a "housing shock", i.e. the residual in the equation for house prices. An interpretation of this can be that there is a collapse of confidence on the housing market. The numerical example is carried out in the form of a conditional forecast in which real house prices fall by approximately 20 per cent over one year. The effects on GDP are approximately twice as large in the BVAR model compared to the general equilibrium model. GDP growth falls by around 2 percentage points compared to 1 percentage point in the general equilibrium model, see table 4.1. The interest rate is lowered by around 0.5 percentage points, which tends to counteract the negative effects of the fall in house prices.

The effects of a fall in house prices are to a large extent dependent on why they fall. In the two examples presented thus far, the cause of the fall is a separate shock to the housing market. In that case effects for the rest of the economy are small.

However, if the cause of the fall in prices is a general downturn in the economy, the effects can be more extensive, which can be illustrated using the BVAR model. Formally, we now allow the shocks that, according to the model, are the

most probable to explain the fall in prices. In this case GDP growth is around 2.5 percentage points lower during the first year, see table 4.1. GDP falls below its trend by more than 3 per cent during the second and third year. Even the interest rate goes down, which partly offsets the negative effects of both the fall in house prices and the general downturn in the economy.

In practice it can be sometimes be difficult to lower the interest rate to the extent suggested by the model since the interest rate cannot become negative. In situations where a reduction in the interest rate cannot be fully utilised to counteract the downturn in the economy, the outcome can be even worse than in these examples. A fall in house prices associated with a general downturn in the economy can lead to subdued macroeconomic growth for several years and low interest rates as a result.

5. Are houses overvalued?

The considerable rise in house prices since the mid-1990s has initiated a debate on whether houses are overvalued. However, answering this question is not straight forward, partly because different definitions exist. Three definitions that are applicable in some of our models are the following.

Houses are overvalued if

i. house prices are above their long-term trend,
ii. house prices cannot be explained by fundamental factors,
iii. predictions by the models indicate falling house prices.

MUCH INDICATE THAT HOUSE PRICES ARE ABOVE THEIR LONG-TERM TREND

According to the general equilibrium model, the long-term trend growth for real house prices has been around 3 per cent a year. Since house prices have grown much faster than this during the last 25 years – around 4 per cent per year – prices are currently well above their long-term trend. According to the model, they are about 20 per cent above trend. Neither the econometric model nor the BVAR model defines an explicit trend growth rate. These models therefore cannot provide information about the degree to which house prices currently lie above the long-term trend.

An important factor when calculating the trend is the time period that serves as its basis. The general equilibrium model is estimated on a relatively short period of time. If the trend were calculated using a longer period, the results could have be different. Chart 5.1 shows the development of real house prices for the period 1952 to 2010. It is worth noting that real house prices in 1996 were at the same level as in 1952. The average rate of increase per year is around 1.5 per cent for the entire

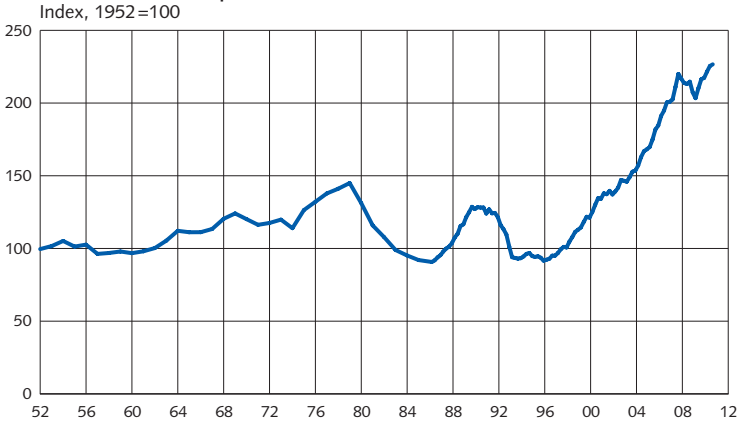
period, which can be compared to the 6 per cent rate of growth seen in the past 15 years. In this light, the strong growth of house prices since 1996 appears to be exceptional.

The trend of rapidly rising house prices over the past 15-20 years is also evident in a number of other countries. In the USA, real house prices in 1996 were at the same level as 100 years earlier. House prices began to rise significantly in the mid-1990s. Time series exist for Amsterdam going back to 1650. These show that real house prices in 1996 were largely at the same level as 300 years earlier. In Norway, house prices in 1990 were largely at the same level as 100 years earlier, but since the mid-1990s they have risen sharply.

In the public debate regarding the increase in house prices over the last 20 years a number of arguments are put forth. One argument is that it has become easier for households to obtain a mortgage. The credit market has been deregulated, competition has increased, and this has made it possible for more people to obtain a mortgage. Another argument is that the number of people living in major cities has increased.

There are many indications that house prices are above the long-term trend and that they therefore can be considered overvalued according to the first definition. However, this does not necessarily mean that house prices will fall in the future. According to the models, the most probable development is rather a slower rate of increase (see below).

Chart 5.1. Real house prices in Sweden 1952-2010
Index, 1952=100



Sources: Statistics Sweden and the Riksbank.

HOUSE PRICES CAN BE EXPLAINED IN THE MODELS

According to the econometric model, house prices have risen because household income and financial wealth have increased, and because real mortgage rates have

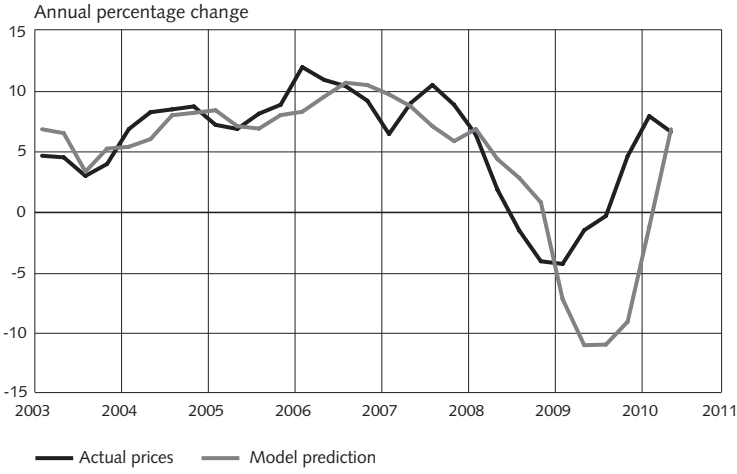
become unusually low. This means that, according to the econometric model, rising house prices can be explained by fundamental factors. Thus, according to this model and the second definition, houses are not overvalued.

The BVAR-model estimated with data up until 2002 provides an additional illustration. Chart 5.2 shows this model's predicted house prices from 2003 onward given the realised values of the input variables.[11] The model's predictions are in line with actual prices for most of the period. The exception is 2009 when actual increases are higher than according to the model. But, the model predictions and actual increases are the same by the end of the period. The house price developments can therefore be 'explained' by the model.

There are, however, possible objections to this analysis. One is that much emphasis was placed on adapting the models to the data. But models are always simplifications. For example, if an important variable is missing from the model, i.e. the model is incorrectly specified, the conclusions could be different.

In the general equilibrium model, house prices are by definition explained by the various shocks. House prices are therefore by construction neither overvalued nor undervalued, but are always fundamentally explained in the model.

Chart 5.2. Real house prices 2003-2010. Actual prices and conditional forecasts from the BVAR model
Annual percentage change



Sources: Statistics Sweden and the Riksbank.

11 The analysis follows the set-up from a speech, "Monetary Policy and the Housing Bubble", given by Bernanke (2010). The speech bases large parts of the analysis on Dokko et al (2009) and discusses monetary policy's role in the growth of house prices in the USA with a focus on the period 2002 onward. Many believe this period is characterised by the "bubble element", see e.g. Shiller (2007). One conclusion from the speech was that the US house prices could not be explained by the outcome of other variables. However, the key interest rate could be explained by the outcome of other variables.

FORECASTS USING MODELS DO NOT INDICATE THAT HOUSE PRICES WILL FALL

Forecasts from the econometric model indicate relatively stable house prices in the future. In order to forecast a sharp fall in house prices, an unrealistically high interest rate combined with very low income growth is necessary.[12]

Forecasts with the BVAR model can be created in a number of different ways. A common method is to let the model forecasts all variables in the model. This is usually called an *unconditional forecast.* Another method is to condition the forecast on a given development of one or more of the variables in the model. This is called a *conditional forecast*. In the conditional forecasts we have used the Riksbank forecasts for GDP, inflation and interest rates. Neither the unconditional nor the conditional forecasts from the BVAR model indicate that house prices will fall in the next three years. However, the rate of growth will gradually abate.

In summary, the forecasts from the two models indicate that house prices in Sweden will not fall sharply in the future. Housing is therefore reasonably valued according to the third definition.

HOUSE PRICES ACCORDING TO OTHER MEASUREMENTS

In the debate on possible overvaluation a whole range of measurements and definitions are used. Many of these cannot be directly applied to our models or to Swedish data. Two such measurements are prices in relation to rents and house prices in relation to income.

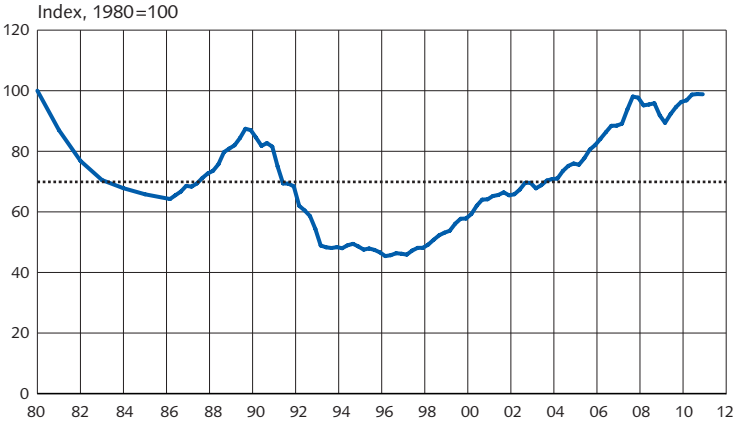
Prices in relation to rents

Housing can be purchased or rented. In market equilibrium, the price of the same housing service should be the same regardless whether it is purchased or rented. If that is not the case, households can make a profit by changing from one form of housing to another. For that reason, so-called price-to-rent ratios are often used to analyse house prices. Price-to-rent ratios for Sweden are used by IMF (2009), the National Mortgage Loan Board (BKN, 2009) and The Economist (2010), among others. All of these studies indicate that Swedish houses are much overvalued.

Chart 5.7 shows the house price index in relation to rents in Sweden. The rent component in the consumer price index, CPI, has been used to measure rent levels. The average price-to-rent ratio over the period from 1980 is well below today's level. According to the BKN's calculations, house prices can therefore fall by approximately 20-25 per cent in the coming years.

12 See Claussen (2011).

Chart 5.7. Price-to-rent ratio in Sweden
Index, 1980=100



Mean

Note. The rent component in the consumer price index, CPI, has been used to measure rents.

Sources: Statistics Sweden and the Riksbank.

However, there are a number of objections to using the price-to-rent ratios as an indicator for potential overvaluation of Swedish houses. The most important objection is that Sweden does not have market rents in the same way as in the USA, for example, which is a prerequisite in order for any analysis to be meaningful. Added to this is the more general problem of comparing rental properties, which consist of both apartments and one- and two-dwelling buildings. A comparison between rented apartments and tenant-owned apartments would be more relevant. One added difficulty is that the analysis assumes that it is easy to change between rented housing and home ownership if prices deviate from what is reasonable.

House prices in relation to income

The basic idea behind this valuation method is that if house prices are higher than normal in relation to income, housing is overvalued. In this context, income is most commonly measured in terms of disposable income per capita or GDP per capita. IMF's World Economic Outlook from October 2009 shows that house prices in relation to income are well above their normal levels in many countries. For example, in Sweden house prices in relation to disposable income were around 15 per cent above the average, which would indicate that the housing market is overvalued.

According to this valuation method, house prices should increase no more than disposable income or GDP in order to for houses not be overvalued. However, it can be completely reasonable for real house prices to rise faster than real income during certain periods. One example is if there are temporary shifts in demand for

housing services relative to other consumption, which is one of the explanations for the rapidly rising house prices in recent years according to the general equilibrium model.

In the long run, it is often reasonable to assume that consumption is a constant share of income or GDP. Housing consumption should then also grow at the same rate as the GDP in the long run. Shiller (2006) shows that the average housing area per capita in the USA has tripled since the 1940s. This is one way of reflecting increased consumption of housing. GDP per capita in the USA is currently around 3.8 times higher than in 1948. Thus, according to these calculations, consumption of housing has risen at approximately the same rate as GDP per capita.[13]

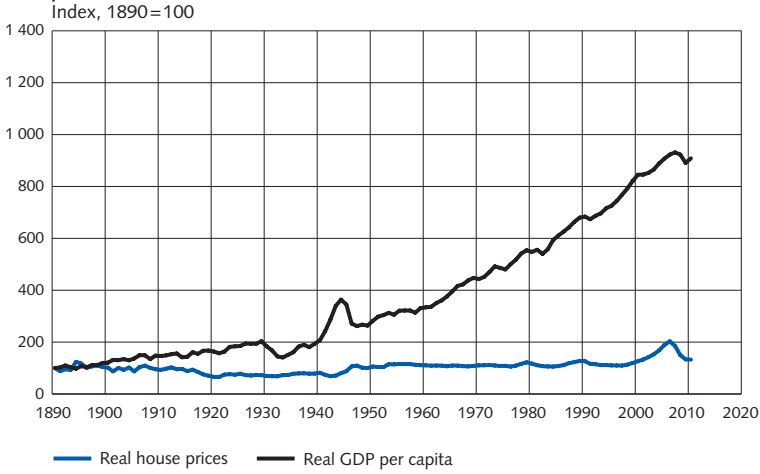
The development of real house prices is in the long run driven by the difference in productivity growth between GDP and the housing sector. If productivity growth is the same in the housing sector as in the rest of the economy, real house prices will be constant. If real house prices are to grow at the same rate as or faster than the GDP, productivity must be zero or negative in the housing sector, given that productivity growth is positive in the rest of the economy.

Chart 5.8 shows that, up until the mid-1990s, real house prices in the USA have been relatively constant while GDP rose steeply. This suggests that there is no major difference between productivity growth in the housing sector and the rest of the economy in the long run. Chart 5.9 shows a similar development for Sweden from 1952 onward.

It also seems reasonable from both a theoretical and empirical point of view for real income and GDP to grow faster than real house prices in the long run, but during certain shorter periods it can also be reasonable for real house prices to grow just as fast as or even faster than GDP.

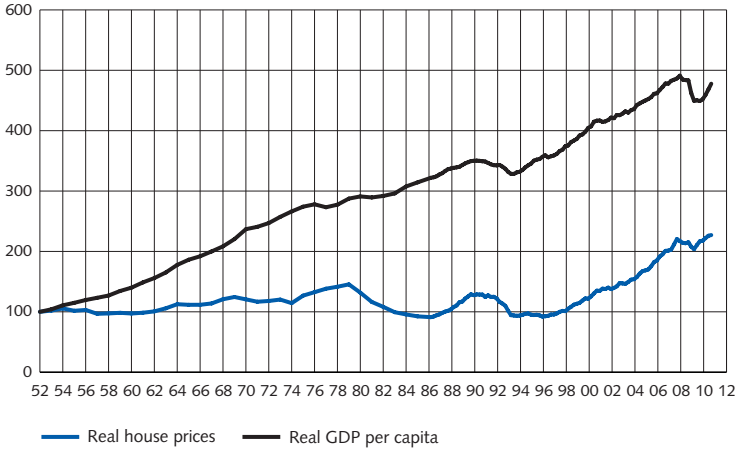
13 In addition, the quality of housing has risen since the 1940s.

Chart 5.8. Real house prices and real GDP per capita in the USA in the 1890-2010 period
Index, 1890=100



Sources: Robert J. Shiller and Historia.se.

Chart 5.9. Real house prices and real GDP per capita in Sweden in the period 1952-2010
Index, 1952=100



Sources: Statistics Sweden and the Riksbank.

6. Concluding remarks

There are many indications that house prices are currently above their long-term trend levels. According to our models, this can be explained by higher incomes, low real interest rates and an increased preference for consumption of housing. The results from the models also indicate that the costs of using monetary policy to restrain rising house prices can be high since this leads to lower real economic

growth. Finally, we find that a fall in house prices may have a relatively limited impact on the real economy and inflation. However, this is under the assumption that the fall is not due to a general downturn in the economy.

Results from models are always surrounded by uncertainty. There are several reasons for this. First, models are always based on a series of simplifying assumptions. They are linearized, and therefore abstract from non-linear effects. For example, a considerable fall in house prices can result in contagion effects for the banking sector that are difficult to capture in a linear model. Second, there is statistical uncertainty because, among other things, the period of time being studied might not be representative. Third, the results from the models assume that the model relationships are stable over time.

There are several important issues that this study has not been able to illustrate in full. For example, house prices are determined in a market influenced by both supply and demand. The supply of housing, i.e. housing construction, has been very low since the beginning of the 1990s even though prices have risen sharply. Understanding how the supply of housing is determined and how it affects house prices is important and should be central for future work.

Appendix

THE ECONOMETRIC MODEL

The econometric model explains the growth of prices for one- and two-dwelling buildings by the growth of three variables: household real disposable income, household financial wealth and real after tax mortgage rates. The model is an "error correction model". There is a long tradition of using error correction models to analyse the housing market, see for example Girouard et. al. (2006) and Borowiecki (2009). For studies on Swedish data, see Hort (1998), Barot and Yang (2002) and Adams and Füss (2010).

The four variables included in the model are explained in table A:1. The model is estimated on data from the first quarter of 1986 up to and including the third quarter of 2010. Other studies on Swedish data have used other variables, such as unemployment, demographic variables, variables measuring expectations of monetary policy, credit growth and construction costs.[14] There is no quarterly data for several of the demographic variables. In the deregulated Swedish credit market, credit growth is a poor indicator of access to credit. For that reason we have not used these variables. Our statistical estimates show that construction costs (excluding the costs of land) are determined together with house prices and can therefore not be used as an explanatory variable for house prices. The fact that construction costs rise when house prices rise can be due to weak competition in the building sector (See Konkurrensverket (2009) and BKN (2010b)). We tested for a series of other variables, none of which work in our model.[15] See Claussen (2011) for a more detailed discussion.

In the estimated model, the long-term equilibrium price (p^*) is determined by the level of household real disposable income (di), household financial wealth (df), and by real after tax mortgage rates (rr) in the equation

$$p^*_t = \underset{(0,00)}{-16,4} + \underset{(0,00)}{1,23}\, di_{t-1} - \underset{(0,00)}{0,06}\, rr_{t-1} + \underset{(0,08)}{0,15}\, df_{t-1}\,, \qquad (1)$$

where t is the period and the figures in parentheses are p-values. We tested for co-integration and find evidence of co-integration (see Claussen 2011 for details). Equation (1) means that the long-term level of the house price index in quarter t (e.g. the first quarter of 2010) is determined by the level of the three explanatory variables one quarter earlier. The reason for this specification is that Statistics Sweden's statistics on house prices are reported by the date on the bill of sale,

14 Hort (1998), Barot and Yang (2002), BKN (2010a) and Adams and Füss (2010).

15 The coefficients are assigned the wrong sign or are not significant. Unemployment and the variable measuring monetary policy expectations are stationary variables and we have not tested these in a long-term relation.

in other words the date when the purchaser is the new formal owner of the property. The delay between drafting the contract and the bill of sale is normally approximately two months.

Table A.1. Variables in the econometric model.

	SYMBOL	EXPLANATION	SOURCE
House prices	p	Statistics Sweden's house price index deflated by the CPIF. The house price index estimates the price of the existing stock of one- and two-dwelling buildings. CPIF is the consumer price index with a fixed mortgage rate.	Statistics Sweden
Disposable income	di	Households' gross income minus direct taxes, deflated with by CPIF.	Statistics Sweden
Financial assets	df	Households' stocks, bonds, bank accounts, insurance policies and other items, deflated with the CPIF.	Statistics Sweden
Real after tax mortgage rate	rr	$rr = r(1-\tau)-\pi$, where τ is the proportion of interest payments that households can deduct from their tax, π is CPIF inflation measured as annual percentage change and r is the average nominal mortgage rate. This average is a weighted average of a 3-month government certificate rate, a 3-year government bond rate and a 5-year government bond rate. The three weights are, respectively, the share of variable rate mortgages, the share of mortgages with a fixed interest period between 3 months and 5 years, and the share of mortgages with a fixed interest period exceeding 5 years.	Statistics Sweden, the Riksbank

All variables except for real interest rates after tax are in logs. For variables in logs , the estimated coefficients give the percentage change in the long-term equilibrium price following a percentage change in a given variable. Model (1) therefore means that a one percentage point rise in the real mortgage rate leads to a full 6 per cent fall in the long term equilibrium price. Similarly, the model means that if the real mortgage rate falls by 1 percentage point, house prices will rise by 6 percentage points. Several international studies contain similarly high coefficients, see table 3.2. The coefficient for real disposable income means that a 1 per cent increase in real disposable income leads to a 1.2 per cent rise in house prices. The coefficient for household financial wealth means that a 1 per cent rise in wealth leads to a 0.15 per cent rise in the long term equilibrium price.

The short-term dynamic in the model is given by

$$p_t = \underset{(0,28)}{0{,}002} - \underset{(0,00)}{0{,}10}(p_{t-1} - p^*_{t-1}) + \underset{(0,00)}{0{,}6}\Delta p_{t-3} - \underset{(0,01)}{0{,}005}(\Delta rr_t + \Delta rr_{t-1} + \Delta rr_{t-3}) + \underset{(0,00)}{0{,}21}\Delta df_{t-1}, \qquad (2)$$

where $\Delta p_t = p_t - p_{t-1}$, $\Delta p_{t-1} = p_{t-1} - p_{t-2}$, $\Delta rr_t = rr_t - rr_{t-1}$, $\Delta rr_{t-1} = rr_{t-1} - rr_{t-2}$, etc. Figures in parentheses are the p-values. The coefficient before ($p_{t-1} - p^*_{t-1}$) measures how fast a deviation between the actual housing price and the long-term equilibrium price is corrected (error correction). The coefficient of 0.1 means that 10 per cent of

this deviation is corrected each quarter. This means that about 30 per cent of the deviation disappears within one year.

If we move p_{t-1} over to the right-hand side of (2), we obtain an expression for the current house price. Chart A.1 shows actual house prices together with the short-term equilibrium price according to the model. As we may observe, the model reflects actual house prices very well.

Chart A.1. Actual real house prices and real house prices according to the econometric model

Source: Claussen (2011).

THE BVAR MODEL

A Bayesian VAR model is a VAR model with assessments, so-called priors, of, for example, means and variances. [16] An important criterion when selecting priors is that they should be independent of the data that used in the estimation. These prior perceptions are then weighed alongside the information in the data.

The BVAR model in this study includes the following variables: the house price index from Statistics Sweden, the seasonally-adjusted CPIF, the seasonally-adjusted GDP and three-month government bond rates; see also Iacoviello (2005). Log-first-differences of all variables are used, with the exception of short-term interest rates, which are included in levels. The model is estimated on data from the first quarter of 1986 to the second quarter of 2010. After analysis using different lag criteria, the model has been estimated with one lag. This means that the variables are modelled as functions of the outcomes for the variables during the immediately preceding quarter. A dummy variable which reflects the transition to current monetary policy from the 1993 regime is also included. As mentioned, the estimation is

16 VAR is an abbreviation for "vector autoregression".

supplemented with assessments, i.e. priors. We have placed priors on the means of the variables. As a test of robustness, an alternative specification with two further variables, open unemployment 15-74 years and a five-year government bond rate, have been estimated, but the results were not substantially different.

THE GENERAL EQUILIBRIUM MODEL

A detailed formal description of the general equilibrium model is found in Iacoviello and Neri (2010) and Walentin and Sellin (2010). The model has up to now primarily been used in monetary policy analysis at the Riksbank to generate scenarios in which house prices have played an important part, see for example the monetary policy report in July 2010. The model is also relatively widely spread among other central banks and institutions, for example the ECB (Lombardo and McAdam, 2008).

There are three kinds of agents in the model: households, firms and a central bank. Firms are active in the housing sector, where they produce housing, and in the goods sector, where they produce consumer goods, investment goods and input goods. Goods are produced with labour and capital, but land and input goods are required for producing new houses, in addition to labour and capital. The construction of housing requires land and for that reason the assumption that only capital and labour are used in production is too restrictive.

One important observation in the data is that, historically, house prices have risen faster than prices of other goods. In order to reflect this, it is necessary to explicitly model the production of housing. One explanation for the rapid increase in house prices, according to the model, is relatively slow technological progress in the housing sector.

There are two types of households: "patient" and "impatient". Impatient households prefer to consume their incomes relatively quickly, whereas patient households are more inclined to save and prefer to postpone consumption. Therefore, patient households are lenders and impatient households are borrowers. The impatient households are assumed to have difficulty receiving a loan. They are therefore unable to finance their housing completely with loans, but rather must pay a certain portion in cash. Fluctuations in house prices affect these households' lending and consumption possibilities, which means that the effects of fluctuating house prices can spread from the housing market to consumption and the aggregate economy.

Patient households work and consume consumer goods and housing services. They provide loans for firms' investments and impatient households' purchases of housing. Impatient households work and consume both consumer goods and housing services in exactly the same way as patient households, but they accumulate only the capital required to finance collateral on their mortgage loan.

The central bank is assumed to follow a so-called Taylor rule. This means that the interest rate reacts to the actual deviation of inflation from the inflation target and to GDP's deviation from its long-term growth level. In order to avoid excessively large variations in the interest rate, it is assumed that, it also depends on the interest rate level in the previous quarter. If inflation is at the same level as the inflation target and growth has zero deviation from its long-term level, the interest rate is constant. If inflation deviates from the target and/or GDP differs from long-term growth, the interest rate rises or falls depending on the size and direction of the deviation.

There are several reasons why the Taylor rule has become popular. It appears that monetary policy in many countries can be described relatively well using this rule. Monetary policy reacts systematically and predictably in the case of the various shocks to which the economy is continuously exposed. It normally means that monetary policy is well adjusted, i.e. from a normative perspective it is normally close to optimal, see Plosser (2008).

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Larger share of variable mortgages – how does this affect the impact of monetary policy?

Jesper Johansson, Björn Lagerwall and Henrik Lundvall*

In recent years, a growing share of households has switched to mortgages with variable interest rates. Today, approximately 55 per cent of the outstanding loans of mortgage institutions are variable loans, a figure that was barely 10 per cent in 1996. At the same time, households' total debt is growing in relation to their disposable income. Does this mean that household consumption has become more sensitive to changes in the key interest rate? This article discusses how the trend toward an increasing number of variable rate mortgages affects the impact of monetary policy on private consumption, and thereby on inflation and the utilisation of resources. It begins with a simple example that demonstrates how the key interest rate is traditionally assumed to impact household consumption. A discussion is then held about new economic research that shows how households' choice of fixed or variable interest rates affects the impact of monetary policy.

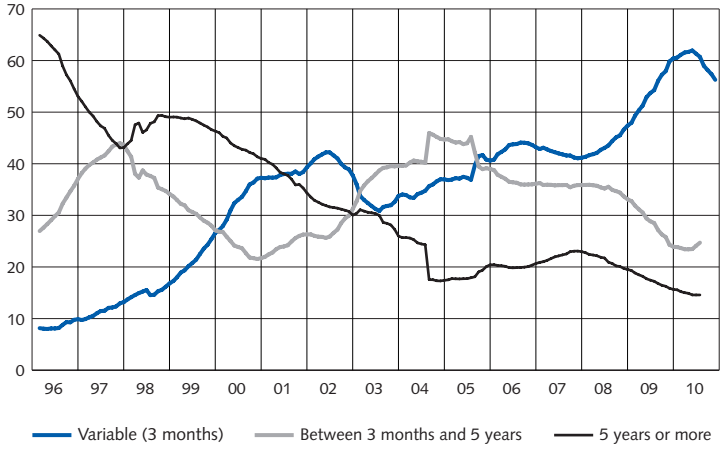
* The authors work at the Monetary Policy Department, Sveriges Riksbank. We are grateful for comments and suggestions from several collegues at the Riksbank. Especially, we thank Johanna Nilsson and Kristian Tegbring.

GROWING SHARE OF VARIABLE RATE LOANS – STATISTICS AND POSSIBLE CAUSES

Chart 1 shows the distribution of original fixed-interest periods in mortgage institutions' outstanding stock for the period 1996-2010.[1] Chart 1 clearly shows that the trend toward shorter fixed-interest periods has been ongoing for quite some time, and that the changes that occurred since 1996 are extensive, even if the statistics refer to the loan's original fixed interest period and must therefore be interpreted with a certain degree of caution. In March 1996, loans with original fixed interest periods of 5 years or more represented approximately 65 per cent of mortgage institutions' outstanding stock, while at the end of 2010 they represented around 15 per cent of the total borrowed amount.

During the financial crisis, the share of variable rate loans increased significantly. Given the information presented in chart 1, this increase appears to be an accentuation of a trend that has persisted for some time.

Chart 1. Breakdown of Swedish mortgage institutions' outstanding stock by original fixed interest periods (per cent)



Note. Due to a change the how the statistics are reported, data up to August 2010 uses the categories "Between 3 months and 5 years" and "5 years or more". This distribution of categories is not available after August 2010, at which time the statistics of outstanding loans only show "variable rate" and "fixed rate".

Sources: The Riksbank and Statistics Sweden.

At the same time as the average fixed interest period on household mortgages falls, total indebtedness of households is increasing. In 1996, the total debt of Swedish households was just under 90 per cent of their disposable income. In January 2011,

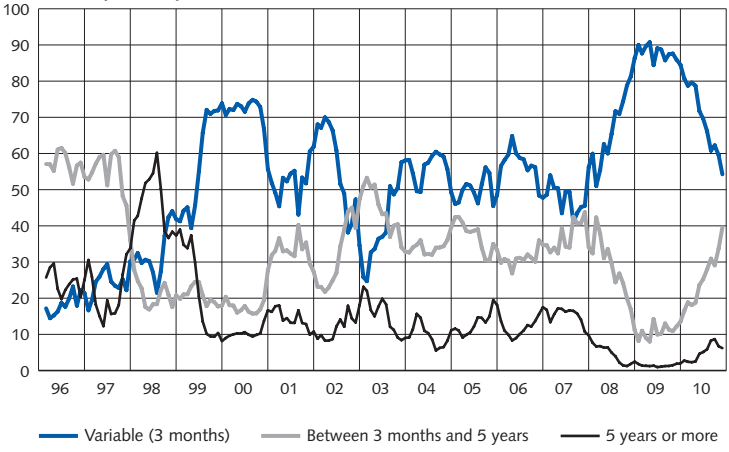
1 An alternative to the statistics about mortgage institutions' lending is Financial Markets Statistics, which contains statistics about lending by all Swedish credit institutions' for housing purposes. This series has only been available for the past six years. Due to space restrictions, these statistics are not reported here. However, it is worth noting that during the six-year period for which both series are available, both show the same general trend toward shorter fixed interest periods.

total household debt was valued at approximately 170 per cent of the households' annual disposable income. Together, these two trends present a picture of a household sector whose economy should be more markedly affected by a change in the key interest rate of a certain size.

NEW LENDING SHOWS HOUSEHOLDS' CURRENT CHOICE OF FIXED INTEREST PERIODS

Chart 2 shows the breakdown of mortgage institutions' new lending by fixed interest periods.[2] We see relatively strong fluctuations over time in the share of loans with different fixed interest periods, but we also see that the ranking among the different categories has been relatively stable from the end of the 1990s onward. Loans with variable rates have been most popular, followed by fixed interest periods between 3 months and 5 years. Least popular are loans with long fixed interest periods. However, during the period 1996-1998 most households preferred a fixed rate of between 3 months and 5 years. From the start of 2008 until the start of 2009, the share of new lending at variable rates increased from 40 to 90 per cent. During 2010, the share of variable rate loans fell again and at the end of the year was approximately 55 per cent of new lending.

Chart 2. Breakdown of Swedish mortgage institutions' new lending by fixed interest periods (per cent)



Sources: The Riksbank and Statistics Sweden.

One question that can be raised is why the share of variable rate loans has fluctuated so sharply in recent years. There is a clear co-variance in the data between the share of variable rate loans and the gap between the interest rates for

2 If primary interest is in the factors that affect the choice of fixed interest periods, new lending is the most relevant. If the question is instead what kind of effect monetary policy has, the breakdown between different maturities in the total stock of loans is most interesting.

fixed and variable loans. This is illustrated in chart 3, which shows the share of new lending that is taken up at variable rates and the gap between the five-year and three-month mortgage rate.

Chart 3. Share of new lending at variable rates and the gap between 5-year and 3-month mortgage rates (per cent)

Sources: The Riksbank, SBAB and Statistics Sweden.

Conventional economic theory does not provide a satisfactory explanation for this co-variance. According to the expectation hypothesis for the yield curve, long-term rates should be the same as the average of the expected value of future short-term rates during the relevant maturities. For example, the 5-year interest rate is approximately the same as the expected value of the 3-month rate over the next 5 years. According to this hypothesis, a large gap between long-term and short-term rates indicate quite simply the expectation that short-term rates will increase sharply. If the expectation hypothesis is correct, the household does not gain anything by choosing a variable rate, even if the variable rate is significantly lower than the interest rate of a fixed rate loan.

One possible explanation, of course, is that some households do not give any consideration to how the interest rate levels are expected to change in the future but instead base their decisions solely on today's interest rate levels. However, there are strong arguments that undermine this explanation: for many households their mortgage is by far their largest financial commitment. Short-term or otherwise rash behaviour could lead to the household taking on unnecessarily large expenses.

A research study from 2009 introduced another possible explanation for the co-variance between the share of variable rate loans and the gap between the interest on loans with different maturities. Koijen, Hemert and van Nieuwerburgh (2009) study the development of the U.S. mortgage market and say that differences in

interest rate costs between loans with different maturities can be the result of premiums on loans with fixed interest rates. The basic idea, in other words, is that the expectation hypothesis is not complete and that large differences between interest rates with different fixed-interest periods can partly be explained by premiums; when premiums are high it is relatively expensive to choose fixed rates and when they are low it is relatively inexpensive.[3]

The purpose of this article is not to investigate the causes behind the households' choice between mortgages with variable or fixed interest rates. We are merely stating that the households' choice between different fixed-interest periods varies over time and that there are a number of conceivable explanations for this variation.[4] These circumstances can be important to keep in mind during the following discussion, where the choice of the households' fixed-interest period is taken as given.

Consumption, interest rates and income – a simple theoretical background.

What effect can the increased share of mortgages at variable rates have on the impact of monetary policy? To start with, it is worth considering the "traditional" effects interest rate changes have on household demand.

IMPACT OF THE INTEREST RATE ON CONSUMPTION – THE "TRADITIONAL" CHANNEL

According to classic consumption theory, consumption's rate of increase is decided by the real interest rate and the households' general willingness to abstain from consumption today in order to consume at a future point in time. Under certain greatly simplifying conditions, the following relationship applies:[5]

Growth in consumption ≈ real interest rate – time preference

Here, the term 'time preference' captures specifically the households' relative valuation of consumption today and consumption in the future. A high rate of time preference is usually interpreted as households being impatient to consume, while a low time preference is interpreted as households being relatively patient. A positive real interest rate means that a person can consume more in later periods by abstaining from consumption today. In other words, the real interest rate can be

3 An additional explation can be that some households have credit limits, which means that the choice is controlled more by the current interest rate levels than the expected levels. When variable mortgage rates are low, costs for variable mortgages are typically lower in the beginning of the lending period. If income is low and expected to increase, the variable rate can therefore be an attractive alternative, even if the variable interest rates are expected to rise in the future.

4 See also Campbell and Cocco (2003) and Moench, Vickery and Aragon (2010).

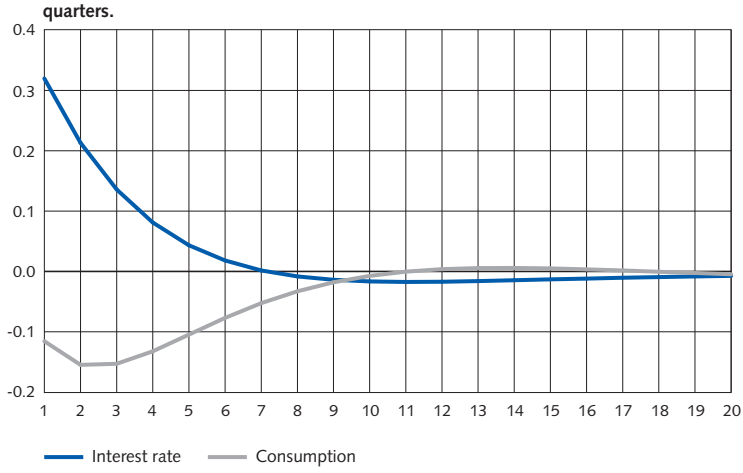
5 This relationship ignores uncertainty and assumes a logarithmic utility function.

seen as the return on saving. If a person cares as much about consumption today as in the future (and the time preference is zero) growth in consumption will be as high as the real interest rate. Conversely, consumption growth is zero if the time preference is equal to the real interest rate.

A higher interest rate leads to a faster rate of consumption growth, which redistributes consumption from today to tomorrow. It is more profitable to save. Consumption therefore tends to fall today if the interest rate rises. Higher impatience (higher time preference) has the opposite effect: a person wants to consume more today and consumption growth declines.

In so-called New Keynesian models, to which the Riksbank's Ramses model belongs, this is one channel through which the interest rate affects aggregate consumption: the interest rate is a deciding factor for a household's choice between consuming and saving. Chart 4 shows the effect of a hike in interest rates on consumption in the Riksbank's Ramses model.[6]

Chart 4. The effect on consumption of an increase to the key interest rate in Ramses. The chart shows the interest rate and consumption over a period of 20 quarters.



Note. The chart shows the effects of an exogenous monetary policy shock.

IMPACT OF INCOME ON CONSUMPTION

According to classic consumption theory, somewhat simplified, *the level* of consumption for a certain time period is decided as follows:

Current consumption level ≈ average of all future discounted income

6 The experiment in Ramses was carried out as an unexpected monetary policy shock that raises the interest rate by more than 0.3 percentage points in the first period. This means that consumption at most is 0.15 per cent lower than before the monetary policy shock. For a description of the model, see Christiano, Trabandt and Walentin (2007).

where "discounted" means that they are "calculated back to today" using the interest rate.[7] The above expression means that consumption is smoothed over time.[8] The relationship between current income and consumption is weak.[9] Assume that there are 10 periods with an income of 1 in each period.[10] The average is 1, which is also the consumption level for each period. If income falls to zero in period 1 but remains unchanged in the other periods, consumption is 0.9 (9/10), i.e. it only falls by 10 per cent. Consumption is decreased by 10 per cent in all periods and the household solves this problem by borrowing money in order to allow today's consumption to exceed today's income. Note that if income had decreased by 10 per cent in all periods, the effect on the consumption level would have been the same.

EFFECTS OF VARIABLE RATE LOANS: DISPOSABLE INCOME IS AFFECTED BY CHANGES TO THE KEY INTEREST RATE

Based on classical consumption theory, let us now approach the question of variable and fixed rate mortgages and consumption's sensitivity to key interest rate changes. In the general public debate, the difference is often described as follows: if households have variable rate mortgages, monetary policy has more of a direct impact on their disposable income, which is not affected at all in the case of fixed mortgage rates. Therefore, consumption should be more sensitive to changes to the key interest rate with variable mortgages rates. However, according to the "classical" analysis above, a fall in current disposable income only has a limited effect on consumption. The difference between consumption's sensitivity to interest rate changes between households with variable interest rates and fixed interest rates is thus small.

Some save and others borrow – what is the total effect?

In total, it is reasonable to assume that some households borrow while others save an equal amount. Assume now that we went from a scenario where everyone borrows at a fixed rate to a scenario where everyone borrows at a variable rate. What is the effect of an increase to the key interest rate? Classical theory has

7 A higher interest rate consequently results in a lower discounted value. Thus, the consumption level decreases.
8 If the time preference is the same as the real interest rate, consumption is exactly the same in all periods. See also the previous page.
9 The permanent income hypothesis (PIH) according to Friedman (1957) suggests that individuals consider their expected total future income when deciding how much to consume, instead of considering only their current income. The life-cycle hypothesis presented by Modigliani and Brumberg (1954) shows that an individual smooths consumption over a life cycle. Income follows a curve that peaks at middle age and bottoms out in childhood and following retirement. Typically, income is higher than consumption at middle age while the opposite applies for the young and following retirement.
10 This means that, in discounted tems, income is 1 in all periods.

shown that it is reasonable to expect a change in income to have a small effect on consumption. On the other hand, if total lending and borrowing activities total zero – some save and lend to others – the interest income of "the savers" will increase as much as the interest expenses of "the borrowers" increase. The extra effect on consumption from a variable interest rate is thus zero.

So what have we learned from this basic theoretical overview? The normal channel for an increase in the interest rate alters the balance between consumption and saving, and consumption normally decreases following a rise in interest rates.

A larger share of variable loans increases the effect of an interest rate increase on mortgage costs and disposable income. If a household can smooth this effect, the gap between variable and fixed loans does not matter. Furthermore, if total borrowing is zero – some households' borrowing is funded by others' saving – the aggregate effect of a larger share of variable loans should be zero.

One conclusion can be drawn from classical macroeconomic theory: for the economy as a whole, this "mortgage channel" is of limited or non-existent significance. It is reasonable that a change to the key interest rate via this channel would only result in a redistribution of resources between different types of households and not have an effect on the aggregate behaviour of households. Instead, the " normal" channels for the interest rate apply, as described above.

One important assumption behind the "classical analysis" described above is that savers and borrowers act similarly, i.e. they are assumed to have the same marginal propensity to consume given changes to income. If this is not the case, the results can be different, as has been the focus of current research.

The difference between fixed and variable loans – what does the research say?

In the analysis above, we used a very simple model to show under what assumptions the difference between variable and fixed rates can be relatively unimportant for the effects of monetary policy.

In order for a redistribution of resources between households to be of macroeconomic significance, the savers and borrowers must make different choices about consumption and saving. That the behaviour of lending and borrowing households differ in this manner is an important assumption of two recently published research projects. One was published by the European Central Bank (Calza, Monacelli and Stracca, 2009, hereafter CMS) and the other by the Bank of Spain (Rubio, 2009). The two studies are very similar to one another in their problem identification and model assumptions. They use a variation of the New Keynesian standard model, which has become a common tool in the research literature to analyse the

relationship between the mortgage market and macroeconomic developments.[11] Households are different in this type of model. Some are "impatient" while others can be described as "patient" and have a higher tendency to save today in order to be able to consume more in the future. As we saw in the simple model, these differences result in the "impatient" households wanting to "consume today" and borrowing from the banks and the other type of household saves in banks. We will hereafter refer to these two types of households as borrowing and saving households, respectively.

Another important assumption is that there is an upper limit for how much an individual household is allowed to borrow. The bank can demand collateral in the household's property to grant a loan, which means that the value of the property establishes the upper limit for how much the household is allowed to borrow.

If the household has borrowed to such an extent that no one is willing to grant any additional loans, the household's ability to smooth its consumption over time is limited. In such a situation, even a rational, forward-looking household is forced to live hand-to-mouth; income decreases must be met by a corresponding fall in consumption. One conclusion that has been known for a long time is that credit limits can increase the relationship between current income and consumption.[12]

If the difference between the households' basic thriftiness is sufficiently large, and if the households meet an upper limit for how much they are allowed to borrow, the households that are less likely to save always face a binding borrowing limit. The borrowing households, in other words, will always find themselves in situations where they want to borrow more in order to increase consumption. This is due to the lower tendency of the borrowing households to save. One reasonable interpretation of this is that a certain share of households in an economy always face limitations on what they can borrow.[13]

The basic assumptions that were just discussed entail that the consumption of borrowing households in the model always are more sensitive to income changes than the saving households. One consequence of this is that each change that causes a redistribution of resources between the two groups of households also affects aggregate consumption. This means that monetary policy in these models works via more channels than what is the case in the standard model.

In cases where all households have fixed rate loans, the central bank's decisions do not have a major impact on the borrowing households' nominal interest rate cost. This means that the extra channel for monetary policy described above is not

11 See, for example, Iacoviello (2005).
12 See, for example, Zeldes (1989).
13 In reality, there can be many different reasons for why a household finds itself in this situation. For example, young households often have rather small financial assets, at the same time as expected lifetime income is relatively high. In this kind of situation, there can be reasons for taking on a larger loan, perhaps to buy a home.

meaningful. Conversely, if all households have variable rates, direct distribution effects would arise when the central bank raises or lowers the interest rate, which tends to reinforce the effects of the changed interest rate on aggregate consumption. Both CMS (2009) and Rubio (2009) investigate the size of these effects using standard assumptions in the model. The results show that the effects are greater the higher the loan-to-value ratio, i.e. the larger the loans the borrowing households are allowed to take on for a given value of the property.

CMS (2009) find for a loan-to-value ratio of 70 per cent that the fixed interest period only has a minimal impact on the size of the effects of a given change in interest rates on aggregate consumption. However, if the loan-to-value ratio is 95 per cent, the effects of a change in interest rate on consumption are approximately twice as large if the interest rate is variable compared to if all households have fixed rates.

CMS (2009) show that the fixed interest period on households' loans under certain circumstances can be a deciding factor for how large the effect of a given change to the key interest rate is on aggregate consumption, and consequently on resource utilisation and inflation. The authors use a model that to the greatest extent possible is similar to the New Keynesian models that have become standard tools for monetary policy analysis both at universities and at central banks throughout the world.

CMS (2009) also show that there are patterns in the data that appear to support the results from the models. The authors estimate a VAR model for 19 developed countries for the period 1970-2008. [14] The estimate makes it possible to study how a given change in the interest rate affects the variables in the model, and private consumption in particular. The results show that among the countries where variable rates are most common, an interest rate increase of a certain size on average results in a statistically significant decrease in private consumption and where the maximum effect occurs after approximately a two-year lag. In countries where most households choose a fixed rate, the average effect on consumption is not significantly different from zero during the same period.

It is important to remember that this type of empirical analysis does not identify a causal relationship between the fixed interest period of household loans and the size of the effects resulting from a change in interest rates. However, the results from the estimate demonstrate that patterns found in the data largely correspond to the theoretical results.[15]

14 The empirical model contains the following variables for each of the 19 countries: private consumption, investments in housing, CPI, a real house price index, a 3-month inter-bank rate and the real, effective foreign exchange rate.

15 An additional reason to interpret the results with caution is that the division of countries is based on the share of variable rate loans in *the flow of new lending*, not on the share of variable rate loans in the outstanding stock. Moreover, CMS allows Sweden to belong to the group of countries where fixed rate loans are most common.

There are also arguments that indicate that the results should be interpreted with a certain degree of caution. Perhaps the most important is that there is very little research on the relationship between fixed interest periods and the monetary policy transmission mechanism. The analysis in the studies does not state why more households are choosing variable rates.

Conclusions: how does the trend toward variable rates affect the impact of monetary policy in Sweden?

The studies that have been discussed in the previous sections show that a larger share of variable rate mortgages tends to reinforce the impact of monetary policy. Since the share of variable rate mortgages has grown relatively quickly in recent years, it is also reasonable to assume that the key interest rate's impact on inflation and resource utilisation has gradually been strengthened during the financial crisis.

On the one hand, this means that household consumption will be affected more markedly when the Riksbank raises the interest rate: the more households that borrow at variable rates, the stronger the restraining effect of a given interest rate increase.This suggests that a given contractionary effect could be achieved by relatively small increases in the interest rate.

On the other hand, the impact of the already implemented interest rate decreases has tended to be increasingly stronger as the share of variable rate loans increased: the more households with a variable rate, the stronger the expansive effects of the low interest rate level.

Recently the share of new lending at variable rates has decreased. It is easier to switch from variable rates to fixed rates than the reverse, and it is therefore not improbable that the share of variable rate loans could decrease sharply in the future. In such a scenario, the effects of changes to the interest rate on consumption would decrease.

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Household indebtedness, house prices and the macroeconomy: a review of the literature

Daria Finocchiaro, Christian Nilsson, Dan Nyberg and Albina Soultanaeva*

In the last 15 years, household indebtedness has increased substantially in Sweden. Since the mid-90s, debt-to-income ratios have nearly doubled. Since mortgages represent about 80% of household debt, the substantial increase in indebtedness, coupled with a rally in house prices, has raised concerns about the possibility of an unsustainable credit growth. In light of these developments, this article reviews the existing economic literature on the potential explanations for, as well as the macroeconomic consequences of, the observed substantial increase in the households' leverage. Given the strong connection between real estate markets and the households' borrowing choices, the article also discusses the driving forces behind house price developments. We conclude by discussing to what extent the results of international research on this topic can be used to shed light on the current situation in Sweden.

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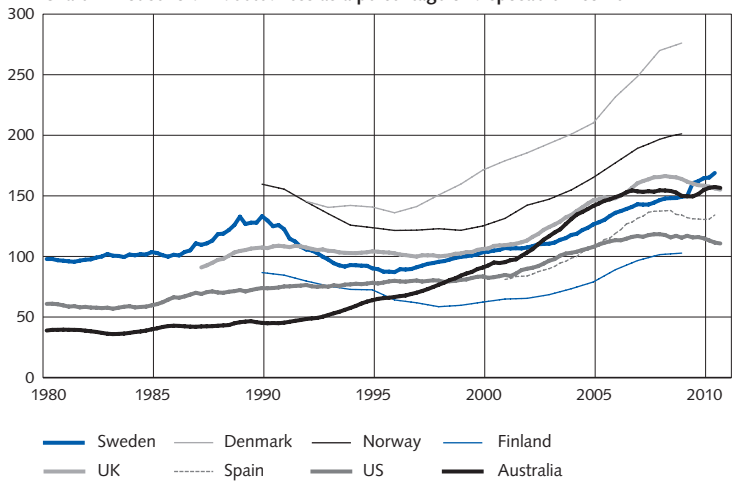
Introduction

Over the past 15 years, credit growth in Sweden has vastly exceeded the growth in the households' disposable income. As a result, Swedish households' indebtedness has increased substantially. Following the sharp decline in household debt after the banking crisis in 1992-1993, household indebtedness increased from 90% of disposable income in the mid-1990s to around 170% in 2010, see Chart 1. Other countries have experienced similar trends in the household debt-to-income ratio, some of which are shown in Chart 1.[1]

Chart 1. Household indebtedness as a percentage of disposable income

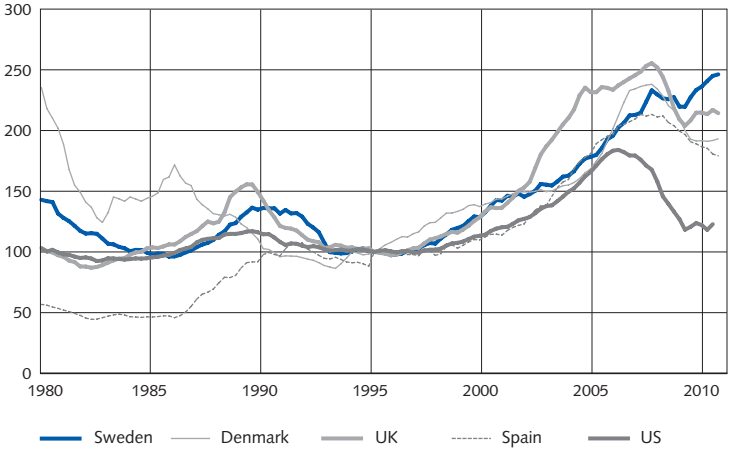


Sources: The BIS, national central banks, Reuters EcoWin and the Riksbank.

Housing credit growth is the main factor in rising household indebtedness. For most households, real estate makes up the bulk of their assets, while mortgages constitute the largest liability. House prices have been increasing in Sweden since the mid-90s. At the onset of the financial crisis, real house prices in Sweden stopped rising and even fell by about 5% in 2008-2009. Since then, real house prices in Sweden have started to increase again. Chart 2 shows the development of house prices in Sweden and some other countries.

1 The household debt/GDP ratio shows a similar pattern in Sweden (see Hansson, 2010).

Chart 2. Real house prices
Index 1995 Q1 = 100

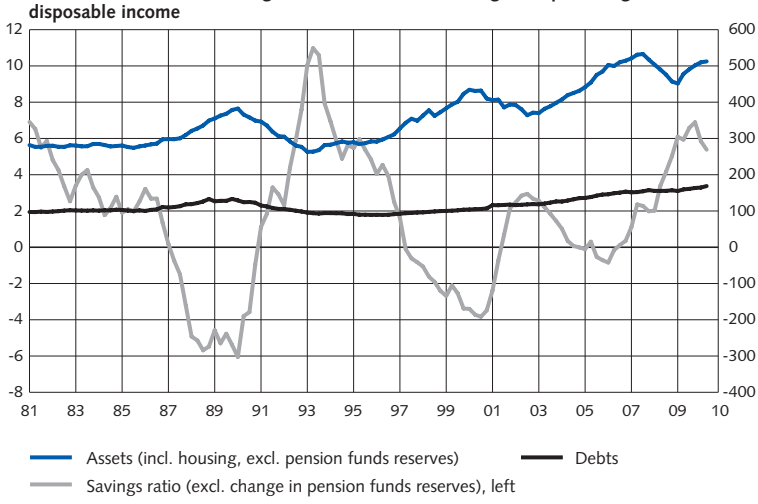


Note. Data for the US until 2010Q2

Sources: Reuters Ecowin and Statistics Sweden.

The recent prolonged increase in house prices in Sweden and in many other advanced countries has boosted the asset side of the households' balance sheets, and in many cases, households' net wealth has increased. Chart 3 shows the development of Swedish household debt, assets and savings. In the mid-1990s, the Swedish households held assets worth about three times their debt. In 2000, this ratio had increased to four, but 10 years later it is now back to three again.

Chart 3. Swedish household gross debt, assets and savings as a percentage of disposable income



Sources: Statistics Sweden and the Riksbank.

Although house prices in Sweden have continued to rise, they declined in several industrialized countries in the wake of the 2008-2009 financial crisis (Chart 2), illustrating that the asset side of the households' balance sheets can be substantially affected by fluctuations in house prices and interest rates.

Prior to financial deregulation in the mid-1980s, Swedish household debt was relatively stable at 100 per cent of disposable income. Following deregulation, household debt increased rapidly to around 140 per cent before declining during the 1992-1993 financial crisis. Since that crisis, household debt has again trended up. This raises the question of what constitutes a sustainable level of household debt.

A wave of recent theoretical and empirical research has focused on illustrating the basic mechanisms of household indebtedness against the backdrop of falling house prices in many countries. In this context, this article reviews:

- How do fundamental factors like expected income, interest rates, preferences and demographics affect household saving behaviour?
- What is the importance of credit market frictions and financial innovations in explaining the evolution of household debt?
- What is the interaction between household indebtedness and the development of house prices?
- To what extent can the rapid rise in household indebtedness be explained by an increase in credit supply?
- What data would be useful to analyse these issues? Aggregate data might obscure risks that stem from the fact that households differ in resources, constraints and preferences.
- What factors are relevant when evaluating the indebtedness of the Swedish households and possible risks to financial and macroeconomic stability? What policy conclusions can we draw for Sweden?

What is driving household debt? Some theory

The permanent income/life-cycle model is a useful starting point for considering household debt from an economic theory point of view.[2] Households save or borrow based on their expected lifetime resources, real interest rates and demographic factors. In this setting, with well-functioning financial markets, households aim to smooth out consumption even though incomes from wages and assets vary over the life cycle. This standard theory identifies a number of variables that influence the households' choice of consumption and level of borrowing:

2 See Ando and Modigliani (1963) and Friedman (1957). See also Debelle (2004) for a survey of household borrowing in the life-cycle framework and macroeconomic implications.

- **Real interest rates.** Changes in real interest rates affect consumption through different channels with opposite signs. On the one hand, a decline in the real interest rate can boost borrowing because it cuts the cost of servicing the debt and decrease savings because it increases the present discounted value of future income. On the other hand, a lower return on savings also implies lower consumption in the future given the present value of lifetime resources. This last effect can boost savings. So the net effect of real interest rates on consumption and savings is ambiguous.
- **Future income**. An increase in future income expectations drives consumption up, boosting borrowing.
- **Demographics.** Individual income profiles vary substantially with age. Demographic shifts in the age composition of the population can help explain changes in household debt.
- **Uncertainty.** The households' attitude towards risk (e.g. income uncertainty and time-varying interest rates) is also an important factor in the life-cycle consumption and borrowing decisions. With uncertainty, households choose to build up precautionary savings/wealth. If uncertainty is reduced, the households' rational response is to reduce precautionary saving.

With this framework in mind, historically low real and nominal interest rates, a substantial decrease in macroeconomic volatility, changes in taxation, or the ageing of the baby boom generation,[3] have all been pointed out as potential factors behind the observed increase in indebtedness.

In this standard model, borrowing is the result of households' optimal responses to economic conditions. However, recent research has considered partial departures from this simplified paradigm to explain why households do not necessarily reach their efficient consumption or borrowing levels. Imperfections in credit markets or irrational behaviour on the part of borrowers (and/or lenders) are just some examples of the numerous factors cited in the literature to potentially explain household over-indebtedness. Below we discuss the most important factors and describe how these alter the conclusions one would draw from the standard life-cycle/permanent income model.

Financial market imperfections and borrowing decisions

Financial markets are not perfect. The simple model sketched above abstracts from credit market imperfections, an important determinant in households' borrowing decisions. Liquidity-constrained households borrow *less* than they would optimally

3 Dynan and Kohn (2007) explore the effects of the ageing of the baby boom generation on the evolution of US household debt since 1983.

choose to do. As a result, financial deregulation and the potentially implied easier access to credit markets can boost borrowing among those households who initially were financially constrained. This last channel works not only for households who were excluded from financial markets, but also for those households who were borrowing less than they would have liked to because of binding borrowing constraints. In this sense, in a life-cycle/permanent income model augmented with a borrowing constraint, relaxing this constraint allows households to better smooth out their consumption and enhances welfare. Against this background, aggregate household debt would rise as previously constrained households reach their new optimal borrowing level.

Financial frictions and over-borrowing. Imperfection in credit markets can also induce *excessive* borrowing (see e.g., Lorenzoni, 2008, and Bianchi and Mendoza, 2011). Financial constraints are usually tied to collateral values and can amplify the effects of a downturn on the economy via their feedback effects on asset prices. When making borrowing decisions, private agents might not take into account that, during a slump, fire-sales of assets will further reduce asset prices. This will shrink their ability to borrow and exacerbate the recession. As a result, they will over-borrow during a boom and their behaviour will increase macroeconomic volatility. In this environment, by taking into consideration this amplification mechanism, the government can reduce aggregate borrowing in a boom and dampen asset sales in a slump. This channel provides a justification for a macroprudential approach in financial supervision. This mechanism and the resulting interaction between asset prices and financial distress could have been at work in the recent financial crisis.

Behavioural approaches: irrationality and over-indebtedness

Behavioural factors can also generate excessive borrowing. "Self-control" problems, "overconfidence" or a lack of "financial literacy" are some of the examples cited in the literature. All these factors can potentially generate unrealistic expectations about asset prices that can further increase borrowing above rational or optimal levels and create vicious circles.

Self-control problems. In economics, a self-control problem describes a situation where there is a conflict between short-term and long-term preferences. Households who think they should save more for retirement, but still prefer not to cut their consumption today, suffer from self-control problems. Cleary, such behaviour could importantly influence saving choices and lead to under-saving (or excess borrowing).[4]

Financial literacy, overconfidence and financial mistakes. Households might take on more debt than is rationally appropriate because they lack the knowledge

4 See Laibson (1997) and Angeletos et al. (2001).

required to make the right investment decisions, so-called "financial literacy". Agents may also hold insufficient precautionary savings or too much debt because they are overconfident and underestimate the variance of future shocks.[5] In this context, households could interpret historically low real interest rates as reflecting a permanent change in real interest rates and base their borrowing decisions on this misperception. This channel can be further strengthened if banks also change their risk attitude, for example in extended periods of low interest rates, and soften their lending standards for new loans.[6] In theory, such a permanent change in real interest rates would be justified by a permanent decrease in growth rates, in discount factors, i.e. household preferences, or a permanent cut in capital income tax rates.[7] Over time, financial markets have evolved and new, more complex, financial products have been created requiring a higher level of sophistication among investors. At the same time, economic policies that indirectly stimulate homeownership, such as interest rate deductions, or that increase the degree of individual responsibility in managing pension savings have been implemented.[8] Thus, individual financial decisions have become more relevant at a macroeconomic level. If household over-borrowing is the result of poor financial literacy, policies such us financial education and saving programmes could be a tailor-made solution to the problem.

Credit frictions and behavioural factors. A combination of credit frictions and behavioural factors can explain excessive borrowing and credit-induced asset price fluctuations. Most of the literature on credit market inefficiencies takes leverage[9] as a given variable and focuses on the equilibrium determination of interest rates. In Geanakoplos's (2010) theory of "leverage cycles", the interaction between "natural buyers", i.e., people who value an asset more or have more optimistic beliefs, and "natural sellers" determines both asset prices and leverage in equilibrium. Natural buyers are willing to pay more and, most importantly, be more leveraged to be able to hold the asset.[10] If, following bad news for the asset, they lose their ability to borrow then they will invest less in the asset. As a consequence, natural sellers will now hold the asset. Asset prices and leverage will go down and the initial bad shock to asset prices is amplified. This simple mechanism will create a "leverage

5 See Kahneman, Slovic and Tversky (1982)).
6 Ioannidou et al. (2007) find evidence of a link between short-term interest rates and banks' risk taking.
7 See Jonsson (2002).
8 In the United States, the shift from defined benefit to defined contribution pension plans has increased individuals' discretion in choosing how to allocate their retirement savings. The reform of the Swedish pension system approved in 1998 goes in the same direction. In the actual system, a share of individual contributions is deposited in capital funds chosen by the pension-saver.
9 More specifically, leverage is defined as the ratio between the asset value and the equity used to purchase it.
10 A "natural buyer" is someone who is willing to pay more than the rest of the public for a specific asset. This can reflect a higher risk tolerance, different, more optimistic beliefs or simply the fact that she/he values the asset more. Furthermore, some investors may be more expert than others at evaluating an asset because they possess more information.

cycle": leverage will be too high in booms and too low in bad times. Geanakoplos (2010b) argues that behind the recent financial crisis in the United States there are two leverage cycles reinforcing each other: in financial and in housing markets. According to his theory, the upsurge in house prices observed in the United States just before the crisis relied mainly on a credit expansion. New, more leveraged, households entered into housing markets, thus pushing up housing prices even further. Slowly, lenders started to become more alert and house prices sharply declined following the increase in the delinquency rate. The massive fall in house prices induced by the crisis has made it more difficult for households to get new loans and to refinance old loans. This has created problems for these loans as well as for the securities they back, i.e. new securitizations have also become more difficult to underwrite. The author's main conclusion is that central banks should actively monitor leverage levels in the economy.

Housing and household debt

Housing plays a key role in household indebtedness. Specifically, it is important to take into account housing-finance motives to understand household borrowing behaviour. Real estate serves two important functions: houses are investment assets but also durable goods that provide direct services for households. At a certain point in their lives, all households will need to face important decisions on whether to rent or buy, or on which kind of mortgage to subscribe. As a result, a major share of the households' wealth is held in this form and this makes the whole economy vulnerable to house price movements. Importantly, housing can also be used as collateral and variations in house prices can facilitate or impede access to credit markets. This last mechanism is emphasized in Ortalo-Magne and Rady (2006), where the "capital gains channel", i.e. the ability to move up the housing ladder when house prices are increasing, is a determinant of housing and borrowing demand for credit constrained homeowners. This can further boost house prices since more households will be able to afford more expensive homes using their capital gains.[11] Higher house prices may also require a larger amount to be borrowed.[12] In addition, tax incentives, such as mortgage interest cost deductibility, could also boost borrowing via an induced portfolio rebalancing, i.e. encouraging households to invest more in housing.

Wealth effects of increasing house prices? An increase in house prices could boost consumption and reduce savings via a housing wealth effect. This channel holds for households who are planning to downsize in the future. It works in the

11 Collateral constraints on housing play a crucial role also in Iacoviello (2005) where house price booms can amplify business cycle fluctuations by relaxing household collateral constraints.

12 In the literature, this is called the"front loading effect". The strength of this mechanism of course depends on an individual's asset position.

opposite direction for households planning to buy a bigger house. In a representative agent model these two effects cancel out, i.e. on average there are no housing wealth effects (see Buiter (2010)). In reality, the aggregate outcome of housing wealth effects depends on the demographic structure of society. Moreover, housing wealth may affect spending indirectly, via its effect on consumers' access to credit.[13]

Renting versus owning real estate. Most of the housing literature focuses on the riskiness of housing investment. Renting, however, is also a risky activity since rents are subject to fluctuations. Sinai and Souleles (2005) explicitly take into account the fact that when deciding whether to buy a house or not, households trade off these two risky activities. The rent risk is particularly high for households that expect to stay in their houses for an extended period of time. A greater spatial correlation in house prices across different markets and a high persistency in house prices over time are both factors that reduce house price risk, i.e. both factors are likely to close the gap between sale and purchase prices when a household moves. According to Sinai and Souleles, the demand for homeownership should reflect the trade-off between rent and house price risk, a prediction that is consistent with U.S. data. Most importantly, they show that expected future rents and rent variance have an important effect on house prices. Clearly, a high degree of regulation in the rental market will alter this trade-off. If renting is not a real option, households will be forced to make risky housing investments even if their expected length of stay in their house is short. Therefore, rental regulation will expose households to more house price risk.

Bubbles in housing markets. Bubbles in housing markets arise when the observed price deviates from some notion of fundamental value.[14] Many researchers have stressed the observed high volatility in house prices and have suggested that housing markets seem intrinsically prone to bubbles. An increase in household debt fuelled by investors' naively optimistic expectations regarding house prices could potentially constitute a serious threat to financial stability. Akerlof and Shiller (2008) argue that unmotivated confidence in housing investments, "money illusion" and more generally what they label as "animal spirits" historically have all been significant factors behind housing cycles.[15] Households that do not understand the difference between nominal or real quantities suffer from "money illusion". Disagreement about real interest rates between smart and illusionary investors can stimulate borrowing and lending and drive up the price of collateral (see Piazzesi and Schneider, 2007). This channel works during periods of both high and low inflation. In a low inflation environment, illusionary investors will confuse low nominal rates with low real rates and invest more in housing. During times of

13 This last effect is not considered in Buiter (2010), since he abstracts from borrowing constraints.
14 See Dillén and Sellin (2003) for a review of the literature on financial price bubbles.
15 See chapter III.1 for a review of the literature on real estate bubbles that arise from asymmetric information and agency problems.

high inflation, they will be replaced in housing markets by smart investors. Smart investors correctly understand that real rates are low and want to invest in housing. Thus, the model can potentially account for the housing boom in the high-inflation 1970s as well as in the low-inflation 2000s observed in many countries.

Why has household debt increased? Empirical results

A number of empirical studies have tried to explain the observed increase in household indebtedness and disentangle the contribution of the different potential explanatory factors identified in the theoretical literature. This has proven to be a difficult task as it is not always possible to discern between causality and mere correlation. In addition, some of the potential factors behind indebtedness, such as credit, are not easily measurable or have evolved only gradually over time, such as financial innovation. Moreover, trying to explain household indebtedness by looking at aggregate data can be misleading. In this respect, it is useful to look at household level data and analyse their portfolio composition to assess the risks connected to high indebtedness. A disaggregated analysis of house-price data, both at a regional or even at a neighbourhood level, could also be fruitful. For example, an inspection of Swedish regional data reveals that the sizable upsurge in house prices is mainly a big-city phenomenon (see chapter I.1). The sharp increase in property prices in low-income neighbourhoods observed just before the subprime crisis in the United States has been interpreted by many commentators as the result of lax credit standards. A similar analysis would also be relevant for Sweden.

Can we explain increasing household debt using "traditional channels"*?*

There are several papers that use traditional channels, such us interest rates, future income or demography, to explain the rise in household debt. Barnes and Young (2005) use a simple calibrated model in which housing is both a consumption good and an investment good to show that changes in interest rates, future income growth and demographic effects can explain the rise in the debts of the US households during the 1990s. However, these factors cannot account for rising indebtedness during the 1980s, a period characterized by high interest rates and lower income growth. Finocchiaro and Queijo von Heideken (2007) use a similar approach on Swedish data. They find that a combination of low real interest rates and lower LTV requirements can account for most of the increase in Swedish household debt since the 1990s. These studies do not consider the effect of house prices on indebtedness. Dynan and Kohn (2007) explain the rise in US household indebtedness since the early 1980s by analysing the following factors:

- **Household preferences.** There is only limited evidence of a decrease in patience or increase in risk appetite among responders of the Survey of Consumer Finances (SCF) between 1983 and 2004.
- **Interest rates.** According to the econometric models used by the Federal Reserve Board, low interest rates had a very limited effect on the saving rate between 1990 and 2000.
- **Demographic shifts.** The shift of the baby-boom generation, from the youngest to the middle age group, has partially boosted aggregate debt. However, according to their data, increasing debt is an increasing trend among all age groups, hinting at the contributions of other explanatory factors.
- **House prices and financial innovation.** Dynan and Kohn estimate that rising house prices can justify one fifth of the total increase in household debt. Their study also reports some suggestive evidence on the importance of financial innovation for the uptrend in debt. On the one hand, they downplay the role of the "democratization of credit," i.e. easier access to credit markets for previously constrained households, as this would explain only one seventh of the observed increase in household debt between 1983 and 2004. On the other hand, they stress the importance of mortgage securitization on interest rates and the interplay between house prices and financial innovations as being particularly important from a quantitative point of view.

Dynan and Kohn's main conclusion is that changes in interest rates, income growth or in preferences can only partially explain the run-up of debt, while rising house prices and financial innovation were crucial.

The role of financial deregulation

Financial innovation has increased access to credit. The last thirty years have been characterized by considerable changes in financial markets. Gradually, banks have started granting housing loans with more generous loan-to-value ratios and longer amortization periods than in the past. Changes in the capital requirement introduced by Basel II[16] and an increase in competition have further squeezed the margins on mortgage institution lending rates. Last but not least, the development of secondary markets for mortgages and the emergence of mortgage-backed securities have also played an important role and drastically changed credit markets.

Credit rationing has been reduced. The effects of financial deregulation on household debt have been widely explored in the empirical literature. Gerardi

16 Capital requirements were calculated on the basis of risk weighted assets, which implied lower risk weights for collateralized lending. More recently, the reforms included in Basel III have moved in the opposite direction.

et al. (2010) provide evidence that the deregulation of the mortgage market in the United States in the early 1980s was followed by an increase in borrowing among households with higher expected future incomes. Thus, their analysis suggests that financial deregulation has improved market efficiency. On the other hand, Mian and Sufi (2009) argue that the substantial mortgage credit expansion observed between 2002 and 2005 in subprime neighbourhoods in the United States can mainly be explained by an upsurge in credit supply. They also show that such an increase is not motivated by improvements in the creditworthiness of subprime borrowers, while it is correlated with an expansion in the rate of securitization. Interestingly, those subprime neighbourhoods have also experienced the highest number of defaults during the crisis.

Financial literacy — Do households make investment mistakes?

Household financial literacy is lagging behind. Another branch of the literature has focused on testing the ability of households to make the right financial decisions. The empirical results in Brunnermeier and Julliard (2006) support the idea that when people decide whether to buy or rent an apartment they confuse real and nominal rates, i.e. they suffer from money illusion. Their mistakes make them underestimate the real cost of future mortgage payments and cause an increase in house prices when inflation is low. Using US data, Lusardi and Tufano (2009) find that a lack of debt literacy, i.e. the ability to make simple decisions regarding debt contracts, is widespread and correlated to over-indebtedness. In their sample, individuals with lower debt literacy tend to judge their level of indebtedness as excessive. Gerardi et al. (2010b) attribute part of the massive defaults and foreclosures observed in the US mortgage market to limited financial literacy among borrowers. Their results suggest that financial mistakes can have considerable macroeconomic consequences. Based on a representative survey of 1,300 Swedish adults, Almenberg and Widmark (2011) find that both basic and advanced financial literacy substantially vary across different demographic groups and that they are an important determinant behind stock market participation or homeownership choices. In their sample, the oldest (age > 65) and youngest (age 18-29) respondents show a particularly low level of financial literacy. Among those individuals with a low level of financial literacy, one out of seven do not know what share of their mortgages are at an adjustable rate. Reassuringly, individuals with adjustable-rate mortgages also have a higher level of financial literacy. Their main policy conclusion is that many Swedish adults are not well equipped to make complex financial decisions.

The links between house prices, consumption and household debt

Housing wealth effects remain uncertain. There are contrasting results regarding the influence of house prices on household debt and the strength of the so-called "housing wealth effect". Mian and Sufi (2010a) show that, between 2002 and 2006, US homeowners responded to the upsurge in house prices by increasing their debt. More specifically, they find that the average household in their sample would increase its borrowing by 25 cents for every dollar gain in home equity. The extracted cash would then be used primarily for consumption or home improvement.[17] A recent survey study by Chakrabarti et al. (2011) reports that in 2006, on average, US homeowners increased their mortgage debt by 1% for each 1% increase in home prices. Using UK micro data, Campbell and Cocco (2005) find a large degree of heterogeneity in the house price elasticity of consumption across young and old cohorts of the population. According to their estimates, old homeowners change their consumption much more strongly in response to house prices. Thus, their results suggest that the aggregate effects of house prices on consumption should be stronger as the population ages. In contrast, Calomiris et al. (2009) argue that many of the empirical studies that find large wealth effects do not take into account the possible correlation between house prices and households' long-term income expectations, i.e. their "permanent income". Using state-level US data, they correct for the bias that this correlation could create and find that housing wealth does not have a significant effect on US consumption. Attanasio et al. (2009) reach similar conclusions for British households. However, even though the effects of house prices on consumption generate some disagreement, there is consensus on the increasingly prominent role of housing in explaining business cycle fluctuations (see for example IMF, 2008). In this respect, Leamer (2007) observes that since World War II, eight out of ten recessions in the US were preceded by changes in residential investment.

Macroeconomic implications of rising household debt

High household indebtedness can have large macroeconomic implications for two different reasons. First, as shown by the recent financial crisis, over-indebtedness can lead to financial distress and exacerbate the effects of a crisis. In this respect different policies[18] could have a preventive role in the build-up of the crisis. Second, high household indebtedness can also have important consequences in normal times by increasing households' exposure to macroeconomic fluctuations.

17 Since the illustrated link between house prices and consumption implies the existence of credit constraints, technically this is not a pure "housing wealth" effect.

18 We are not strictly referring to monetary policy, but to a broad range of policies that include financial regulations or fiscal policy that could have an impact on household debt.

Debt and financial distress

High household indebtedness impacts economic downturns. The recent financial crisis led to the most severe recession since the Great Depression. A striking similarity between the two crises is that both were preceded by a dramatic increase in household leverage: household debt exceeded 100% of GDP only twice in the last century of American history: in 1929 and in 2006.[19] Fisher's (1933) debt deflation theory highlights the active role of deteriorating credit market conditions during an economic downturn. In a nutshell, his theory implies that an interaction between high household leverage and negative supply or demand shocks can exacerbate a downturn.[20] Glick and Lansing (2010) argue there are three common patterns, observed across different countries between 1997 and 2007, that enable us to understand the role of debt in the build-up of the crisis and the subsequent economic recovery.

- First, household debt increased considerably and at a faster rate than disposable income in many countries before 2007.
- Second, there is a positive correlation between the rapid increase in household debt and house prices.
- Third, countries experiencing the largest increase in debt have also experienced the most severe depressions.

Glick and Lansing conjecture that in many countries household deleveraging will bring more defaults or considerable cuts in spending. Recent survey-based evidence shows that indeed US households responded to their deteriorated financial situation by cutting spending. More precisely, in 2009 they increased their savings by paying down part of their mortgage debt rather than increasing their contributions to retirement or savings accounts (see Chakrabarti et al., 2011).

Are highly indebted households more vulnerable to shocks?

High household debt and volatility. Higher debt can also have large macroeconomic consequences by increasing households' vulnerability to shocks, including income, interest and asset price risk:[21]

- **Income risk.** Unemployment is probably the biggest negative income shock that a household could face. To become unemployed and have a mortgage could have adverse consequences, even though unemployment insurance

19 See Mian and Sufi (2010b).
20 Interestingly, King (1994) draws a similar parallel between the 1930s and the crisis experienced by many industrialized countries in the 1990s. He stresses how the countries experiencing the most severe recessions were also those where private debt burdens were highest prior to the downturn.
21 See also Debelle (2004) and Dynan and Kohn (2007) on the macroeconomic consequences of high household debt.

may temporarily limit the drop in income.[22] The big fall in income will make it difficult to maintain the mortgage payments and a large debt and negative equity could considerably reduce households' mobility in search of a new job.[23] This negative effect can be mitigated by the fact that homeowners can better absorb a negative shock by extracting equity from their houses. In this respect, British renters are more likely than homeowners to cite "unemployment" or "higher than expected interest rates" as a reason to experience debt-repayment difficulties.[24] Using US data, Hurst and Stafford (2004) show that households with little liquid wealth are more prone to extract equity from their homes in response to a negative income shock. Moreover, there is a vast literature stressing the role of financial deregulations on macroeconomic stabilization. For example, Dynan et al. (2006) argue that developments in credit markets that have enhanced households' and firms' ability to borrow played a crucial role in the stabilization of economic activity in the mid-1980s. Campbell and Hercovitz (2006) reach similar conclusions.

- **Interest rate risk.** Increases in interest rates have a direct impact on households' ability to service their debts. The immediate impact of interest increases will depend on the number of households that have floating-rate compared to fixed-rate mortgages. This channel is particularly strong in countries where adjustable-rate mortgage (ARM) contracts are more common, like Sweden, but less so in countries with predominantly fixed-rate mortgages like France, Germany and the United States (see Debelle, 2004).
- **House price risk.** Finally, changes in house prices will have an impact on highly-indebted homeowners changing the value of the asset side on their balance sheet. In principle, households planning to move in the future are more exposed to this risk (see Sinai and Souleles, 2005). A substantial fall in house prices could shrink home equity down to a level such that the mortgage debt on a property exceeds its market value. In the United States, survey-based evidence shows that in response to the recent decline in house prices the "effective homeownership rate", i.e. the proportion of individuals with a positive amount of home equity, has fallen by more than 7 percentage points since 2007 (see Chakrabarti et al., 2011).

22 This is especially true in a country with a well-developed welfare system like Sweden.

23 For this last channel, see Sterk (2010). Empirically, both Ferreira, Gyourko and Tracy (2010) and Chan (2001) find that homeowners with negative equity are less mobile. In theory, there could be also forces that increase mobility among people with negative equity (see Schulhofer-Wohl, 2010). For example, if the loan is nonrecourse a homeowner's best choice could be to default and move. Moreover, homeowners could choose to move if they could rent out their house. However, this might be less relevant for Sweden, a country with highly regulated rental markets and full-recourse loans.

24 See Waldron and Young (2007).

To assess the relevance of these three channels is important to look at the distribution of debt across households, quantify to what extent society as a whole is exposed to the risks of high indebtedness and take into account country-specific institutional differences that may alter these mechanisms.

What is special about Sweden?

In addition to fundamental factors, local housing demand and supply characteristics are important. Using standard fundamental explanatory factors such as growth in disposable income, the age of the working population, interest rates and rent-to-price ratios, Swedish real estate markets have frequently been identified as being out of line with fundamentals (IMF, 2004, 2008, 2009; Economist, 2010). However, treating credit and housing markets as homogenous across countries could be misleading. In this respect, there are some important features of the Swedish economy such as (i) a highly regulated housing market; (ii) limited buy-to-let market; (iii) credit market structure and equity withdrawal; and (iv) debt distribution.

A highly regulated housing market

A striking feature of the Swedish housing market is the high level of regulation. Rent regulations were first introduced in 1940 and, despite some reforms in the 1970s and in the 2000s, the rental sector is still highly regulated today.[25] The largest proportion of the rental market is public and rents are set according to a cost approach. Rents in the public housing sector in practice set a cap on those in the private sector. Therefore, rents in Sweden generally do not reflect the market value of an apartment, especially in metropolitan areas. Regulations are also present in the owning segment of the housing market. The most common alternative to renting is to be member of a cooperative housing association (bostadsrättsförening). In practice, the most significant difference between being a member of a cooperative housing association and owning an apartment is that the former limits a homeowner's right to sublet the flat. These regulations create a number of distortions that need to be taken into account when evaluating households' borrowing decisions and the development of house prices in Sweden:

- First, rent regulations partially invalidate the use of the price-to-rent ratio to evaluate possible deviations of house prices from their fundamental values. In the empirical literature, large departures of house prices from rental prices are interpreted as a warning signal for the possible upsurge of a bubble. However, if rental prices are kept artificially low by regulations, the link between

25 See OECD Economic Survey: Sweden (2007) and chapter I.1 of this report for more details.

rents and prices breaks down and the rent-to-price ratio may not reflect fundamental values. As pointed out in chapter I.1, in Sweden, deviations of house prices from rents might simply reflect an increasing gap between market and regulated rents. Frisell and Yatsi (2010) criticize the use of the price-to-rent approach in Sweden and argue that behind the remarkable increase in house prices there are mainly fundamental reasons such as lower real interest rates and higher labour income. Changes in housing demand, caused for example by changes in taxation, and variation over time in the maximum LTV ratio are important factors that explain house price fluctuations in Sweden according to Walentin and Sellin (2010).[26]

- Second, as a result of the high level of regulation in housing markets, a buy-to-let market has never fully developed in Sweden. This has reduced the scope for speculation in the housing market.[27]
- Third, the main effect of rent control in metropolitan areas is to create a mismatch between demand and supply; as a result, queues for a rental apartment in central Stockholm can be as long as 10 years. This may force young households to buy a house earlier in life than they would have otherwise preferred and therefore to be more leveraged. Referring to Sinai and Souleles' (2010) research, in practice there is no real trade-off for Swedish households between renting and owning.[28] The lack of a well-developed rental market can force household to buy even if their investment time horizon is short and in this sense they are more exposed to house-price fluctuations.
- Fourth, housing regulation and a high cost of construction have contributed to a low level of new housing construction compared to other European countries (see OECD, 2007).

To summarize, the high level of regulation in housing markets may increase household exposure to house price fluctuations and distort household borrowing decisions and this calls for extra caution when evaluating the level of overheating in housing markets. On the upside, the resulting underdevelopment of a buy-to-let market may discourage potential speculation in housing markets.

Some important differences in credit markets

Most real estate contracts in Sweden are at floating interest rates and all mortgage debt is "full recourse". Adjustable-rate mortgage contracts are predominant in Sweden and account for about 2/3 of all mortgage contracts.[29]

26 See also chapter II.1 of this report.
27 In this sense, a house in Sweden is more of a consumption good than an investment good.
28 Here we mainly refer to big metropolitan areas.
29 Chapter II.2 of this report also shows that this share has been increasing over time.

Mortgage debt in Sweden is full recourse, which implies that the borrower is personally liable for the full amount of the loan, regardless of the market value of the underlying housing collateral. These factors could increase highly-indebted households' sensitivity to house price risks:

- Adjustable-rate mortgages can increase households' sensitivity to interest movements, as well as the sensitivity of house prices to interest rate movements, since in this case the change in interest rates will affect not only new borrowers but also a large share of outstanding loans.[30] This last prediction is confirmed by Assenmacher-Wesche and Gerlach (2010), who study how different housing markets affect the impact of monetary policy on property prices in different countries, including Sweden. Indeed, using a VAR analysis, they estimate a higher degree of sensitivity of house prices to monetary policy shocks in countries where ARM contracts are more common.
- Full-recourse loans may mitigate the effects of excessive borrowing on financial stability. As they are personally liable for their debts, people may be more cautious in their borrowing decisions. Moreover, in this case the issuer's/lender's recovery is not limited to the collateral. On the other hand, it implies that the cost of not being able to repay debt is particularly high for Swedish households.[31] For example, in periods of high interest rates and declining house prices, Swedish households may have a higher propensity to cut their consumption to be able to service their debts. In this respect it would be useful to use international data on countries with a similar legal framework as Sweden to quantify this effect.

Savings and home equity withdrawal

Home equity withdrawals appear limited in Sweden. Rising debt and decreasing savings have been a constant pattern in the United States for the last 20 years. Negative savings and rising debt can reflect home equity withdrawals. The situation looks quite different in Sweden. In recent years, savings have been positive and increasing most of the time. Looking at the Swedish savings rate, one could conclude at first glance that Swedish households do not refinance their mortgages for consumption purposes. However, the ratio between secured housing credit and dwelling investments shows a different picture. On average, home equity withdrawal amounted to about 4% of disposable income at the end of 2009 (see Sveriges Riksbank, 2010). However, aggregate data give only a very rough measure of this phenomenon. For policy purposes it would be more useful to undertake a

30 In theory, households should take into account interest rate risks when making their optimal choice between ARM and FRM contracts. However, Campbell (2006) shows that households' mortgage contract decisions are sometime difficult to rationalize.

31 See also chapter II.6.

micro data study, as in Mian and Sufi (2010a), and have more precise estimates in this respect.

Debt distribution

Debt distribution matters for debt sustainability. To properly assess the risks connected with high debt, it is important to look at debt distribution in society as a whole rather than at the average. In previous Financial Stability Reports, it has been argued that the current debt level in Sweden does not represent a serious threat to financial stability. However, even if the majority of Swedish households appear to have good margins in terms of their ability to service debt (see Johansson and Persson, 2006, and Sveriges Riksbank, 2009), new borrowers seem to be more exposed to unemployment and interest rate risks (see chapter II .4). Almost 60% of total debt belongs to households at the highest end of the income distribution; these are less likely to default on their mortgage payments in the event of a downturn, but also less likely to actually be hit by an unemployment shock. Nevertheless, comparing debt levels of households in different income categories does not give the full picture. This is especially true in a high-tax country like Sweden. In practice, contrary to the situation in the United States, income distribution in Sweden is basically flat. However, wealth distribution provides a different picture in that it is much more skewed.[32] In this sense, the debt-to-asset ratio could be more informative when evaluating debt sustainability. Aggregate data show that this ratio has been stable over time. A potential drawback of using this approach is that housing wealth constitutes the largest share of household wealth. Thus, in this sense households have also become more exposed to house-price fluctuations. Moreover, disaggregated data show that a significant fraction of Swedish households has little wealth.[33] In this regard, it would be useful to use both debt-to-income and debt-to-asset ratios in Sweden to estimate the probability of missing debt payments. In the United States, the second measure has a better predictive power according to Dynan and Kohn (2007).

CONCLUDING THOUGHTS

What explains the observed rise in household debt over the past two decades? Economic theory offers a rich set of potential explanatory factors such as increased expected future income, low real interest rates, diminished uncertainty, changes in demographics and financial innovation. However, empirically discerning the contribution of each of these factors has proven to be a difficult task. Many of these variables are highly endogenous or hard to measure and this has made it difficult

32 See Domeij and Floden (2010).
33 See Domeij and Floden (2010) and Domeij and Klein (2002).

to discern causality from mere correlation. In the United States, the easing of credit constraints and rising house prices have been pointed out as two important causes of increasing debt. A growing empirical literature suggests that there is also a link between a lack of financial literacy and over-indebtedness. In Sweden, there is some evidence to show that a combination of low real interest rates and more generous LTV ratios can explain most of the observed increase in debt.[34] However, we are not aware of any comprehensive study that uses micro-data to also assess the impact of increasing house prices, credit supply or changes in disposable income on household indebtedness in Sweden. Some recent survey-based evidence has documented a lack of financial literacy among Swedish households that could probably lead to an excessive build-up of debt. Moreover, even "financially educated" people could make financial mistakes and take on too much debt by judging current low levels of interest rates as permanent and the current appreciation rate in house prices as everlasting. A long period of low interest rates and increasing house prices could create and reinforce this misperception. Understanding the evolution of real-time beliefs about house price appreciation or interest rates is therefore central to understanding housing markets and household debt decisions. Collecting more data on these issues would be useful for policy purposes. Moreover, economic policies that aim to increase transparency about financial conditions, such as the decision to publish the Riksbank's projected interest rate path,[35] could also help in this respect.

Judging whether the current level of household indebtedness is sustainable or whether house prices in Sweden are driven by a bubble is an even more demanding task. There is some evidence to show that house price fluctuations could mainly be explained by fundamental factors, such as real interest rates and disposable income. Nevertheless, we believe that some caution is needed in this respect. Predicting house price bubbles has proven to be very difficult and in the last US house-price cycle economic theory provided little guidance in judging what should be a reasonable level of house prices (see Foote et al., 2010). Both debt-to-income and debt-to-asset ratios are informative measures when assessing household debt sustainability. We think that it would be useful to use both ratios, at a disaggregated level, to estimate the probability of missing debt payments in Sweden and to evaluate which of the two measures have a better predictive power.

Nonetheless, irrespective of whether or not we believe that households are over-borrowing and housing markets are overheated, there are indeed some special institutional settings in Sweden, such as the high degree of regulation in housing markets or the widespread use of ARM contracts, that may potentially increase indebted households' exposure to house-price and interest rate fluctuations. That said, whether monetary policy is the right instrument to constrain household debt

34 See Finocchiaro and Queijo von Heideken (2007).
35 Since January 2007, the Riksbank publishes its own forecast on future developments of the repo rate.

and limit the associated risks is still an open question. An increase in the policy rate would have an impact on both households and firms. The actual borrowing cost faced by indebted households is also influenced by fiscal factors, e.g. interest rate deductibility, that are disconnected from monetary policy. Increasing interest costs by gradually reducing the degree of deductibility is another example of a tailor-made solution to dampen the increasing trend in indebtedness. Moreover, a change in interest rates will affect not only new borrowers but also a large share of outstanding loans and higher interest rates may induce borrowers to amortize their loans less. On the other hand, a cap on LTV ratios, like the one mandated by Finansinspektionen since October 2010, could potentially induce people to borrow less and thus slow down the rate of increase in indebtedness. Economic policies that create incentives for people to amortize could have a dampening effect on existing debt levels. Finally, heavily regulated rental markets and high construction costs have also contributed to a shortage of housing in metropolitan areas. Limited supply may have played an important role in the development of house prices and indebtedness.

Going forward, to properly assess the risks stemming from household balance sheets and housing, regulators will need to continue developing micro data on household borrowing and assets. The assessment of micro data on the households will also need to be better integrated into aggregate models for policy simulation and analysis.

Such steps could improve our understanding of household indebtedness and the risks it poses to macroeconomic and financial stability. The Riksbank's inquiry into the risks in the Swedish housing market is a first attempt in this direction.[36]

36 See chapter IV.1 for a description of some of the new data that will be used by the Riksbank to study housing markets.

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Household indebtedness – consequences for the banks' credit losses and financial stability

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This report analyses the effect that higher indebtedness among Swedish households can have on financial stability through credit losses in the banks' lending to Swedish households and companies. We used data from a mortgage survey carried out by Finansinspektionen and apply this microdata to carry out stress tests of household finances and to study the extent to which their ability to pay is affected by various shocks. Most households are expected to be able to meet their debt obligations even in extremely stressful scenarios that entail higher interest rate expenditure or lower income. However, major losses can occur during extremely stressful scenarios since the banks' exposures to households are very large. Although this kind of development is considered to be less probable, the possibility still exists. A larger risk could be that the households decrease their other consumption expenditure, which can lead to lower demand and credit losses in the banks' corporate lending. This effect is heavily influenced by the debt level of households, which means that continued credit growth has large implications for how the economy is affected by various economic shocks. However, the overall conclusion is that the credit losses in a stressful scenario are not considered to constitute a direct threat to financial stability through capital adequacy in the major Swedish banks. However, the economy could still suffer negative effects if the debt-related expenses of households were to increase or if their income were to fall.

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1. Introduction

One lesson that was learned from many economic crises is that steep falls in property prices have played a significant role and that in many cases the crises were preceded by a credit expansion that caused indebtedness to rise sharply.[1] Once the credit expansion collapsed, the fall in asset prices was followed by more bankruptcies and a lower ability to pay among borrowers, which in turn led to an increase in credit losses in the banking sector. Assessors have long been worried about unsustainable development on the housing markets of many countries, where household indebtedness is increasing rapidly. High indebtedness could lead to situations where fluctuations in the interest rate level, given the household's other expenses and income, make it difficult for the household to handle both interest and amortisation payments. However, during the Swedish banking crisis in the 1990s, the household sector only accounted for 10 per cent of the banking sector's overall credit losses, despite the fall in housing prices and the fact that the halt to economic growth resulted in a rise in unemployment and borrowers finding it more difficult to pay their debts. Instead most of the banks' credit losses were from the commercial real estate sector. Despite these past experiences, it is not necessarily the case that the banks' credit losses would develop in the same way today if a disadvantageous economic development were to take place.

At the moment, total household debts in relation to disposable income amount to approximately 170 per cent (see chart 1), which is much higher than the highest levels recorded at the beginning of the 1990s. Today, slightly more households are in debt and the proportion of households with a very high debt ratio has increased. In recent years it has become much more common for households to take out a greater proportion of their loans at a variable interest rate, making the household sector more exposed to interest rate risk. Highly-indebted households can therefore be hit harder if they suffer a loss of income for any reason at the same time as their debt-related expenses rise.

There are also a number of key differences between the conditions that prevailed on the mortgage market in the 1990s and the conditions that prevail at the moment. One major difference is that regulations for actors on the mortgage market have changed, which has led to credit institutions allowing higher loan-to-value ratios for a long time. Combined with this is the increase in competition on the mortgage market, which has resulted in credit institutions not requiring households to amortise to the same extent as before. Today, first mortgage loans have much longer amortisation times, which was not the case in the 1990s. Another important difference is that inflation is considerably lower today than it was in the 1990s. This means that the real value of household debts does not fall (is not inflated

1 See Reinhart & Rogoff (2009).

down) to the same extent as before. Lower inflation also means that interest rates are lower, so households can bear more debt, while paying the same loan costs. Intensive reform work is currently being carried out to prevent future crises, which means that new banking rules will be introduced, increasing the costs for credit institutions when interest rates go up. Compared with the 1990s, mortgages now make up a greater share of the banks' balance sheets and there is a risk that a higher proportion of households will have problems in the future if the credit losses in the banking sector were to be higher than in the 1990s. In view of this it is relevant from a financial stability perspective to further analyse whether the current development in household indebtedness could be seen as a threat to financial stability.

From the end of 1995 to 2008 real house prices increased by more than 125 per cent. This increase coincided with a substantial increase in household debts, which went up by 175 per cent. But during the same period the disposable income of households only rose by 67 per cent. This means that household debts in relation to disposable income also increased significantly. At the same time, the interest rates for households fell and, even with a substantial rise in debts, interest expenses as a proportion of the households' disposable income did not change significantly.

When the financial crisis broke out at the end of 2008, interest rates fell heavily around the world, including in Sweden. Interest rate reductions were carried out as part of emergency crisis management and to counteract the halt in the real economy, which led to inflation forecasts being adjusted down heavily in the wake of the financial crisis. Interest rate reductions led to lower interest expenses for Swedish households in 2008-2009. Apart from a temporary dip in 2008 house prices have continued to rise and household indebtedness has continued to increase throughout this turbulent period, which can partially be explained by lower interest rates. This means that household interest expenses will increase significantly when interest rates return to their normal levels again, unless indebtedness falls. The debt burden for households has therefore increased, both in relation to disposable income and for interest expenses as a proportion of disposable income.

This report analyses the possible consequences that household indebtedness could have on financial stability through credit losses in the banks' lending. We use microdata of the financial situation of Swedish households and analyse how the households are affected by economic shocks, such as interest rate hikes and a fall in income. We will look at how these factors affect the ability of households to pay their own debts, and how the change in consumption behaviour of households can affect the ability of companies to pay and how this can lead to credit losses in the banks.

The rest of this report is organised as follows. Section 2 describes what happened to the Swedish economy during the crisis in the 1990s and relates this to the

banks' credit losses from household lending during this period. Section 3 contains a detailed description of the survey that was conducted and the data that has been used. Section 4 presents the calculations that have been carried out to study how financial stability is affected by various changes to the financial situation of households and might prevent them from meeting their obligations on the loans they have taken out. Section 4 also investigates what happens to credit losses from commercial lending if households change their consumption expenses to meet their loan obligations in various stress scenarios. Section 5 summarises the conclusions from this report.

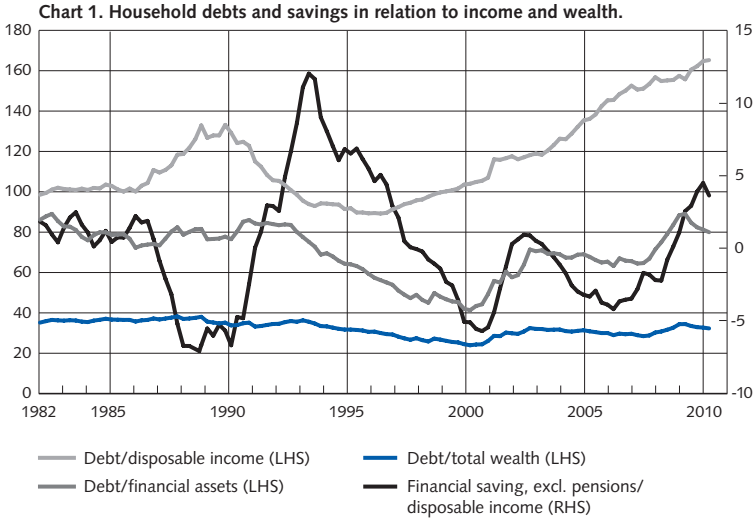
2. Development in the real economy and credit losses in the 1990s

This section looks at the economic development in Sweden at the beginning of the 1990s in order to put this report into a historic context. The focus is on the development of the real economy and the development of credit losses from household lending in this period.

Following many years of regulation, the credit markets in Sweden were deregulated in the second half of the 1980s. In the years up to 1989 companies and households borrowed even more. Debts as a proportion of disposable income rose from 101 per cent to 133 per cent between 1985 and 1989 (see chart 1). As a large proportion of this lending was for investments in real assets, debts in relation to net household wealth did not change to any significant extent. What actually happened was that the balance sheets of households increased considerably.[2] The interest rates that households were paying over these years were greatly affected by taxes, interest deductions and high inflation, which meant that the real interest rates were negative for several years, making it advantageous to borrow money.[3] Another reason why households borrowed so much was that inflation eroded debt and made it easier for households to bear it. In this same period, i.e. the second half of the 1980s, the financial savings of households fell, falling to very negative levels in the final years of the 1980s. There has therefore been high indebtedness and low savings since the end of the 1980s.

2 See Barr and Gustavsson (1993).
3 See e.g. Englund (1999).

Chart 1. Household debts and savings in relation to income and wealth.



Sources: Statistics Sweden and the Riksbank.

During the Swedish banking crisis from 1991-1993, Sweden's GDP fell while unemployment rose significantly. Household interest expenses increased rapidly in 1990-1993, amounting to an average of ten per cent of disposable income, which was much higher than during any previous period. However, debts were not eroded by inflation to the same extent as before because inflation fell heavily. Real house prices fell by a maximum of around 30 per cent between 1990 and 1995. The corresponding fall in the net real wealth of households was 20 per cent for the same period.

Although households faced a tough debt situation at the end of the 1980s and despite the economic development at the beginning of 1990s, the strain on household finances did not lead to banks suffering from particularly high credit losses from their lending to Swedish households. The average credit loss level for Swedish mortgage credits at Stadshypotek AB was calculated as being no more than around 0.25 per cent of lending per year between 1990 and 1995.[4] The credit losses which the banks incurred actually came from commercial real estate companies and finance companies, which were often heavily leveraged and were hit hard by the higher interest rates. Although a large proportion of the credit losses were from outside the household sector, the high debt ratio of households at the beginning of the crisis may have played a role in the extent of credit losses in other parts of the banks' credit portfolios. For example, the consumption behaviour of households during the crisis could have been affected by the fact that they had to meet their debt obligations and therefore reduced other consumption expenses as

4 Source: Stadshypotek AB.

the proportion of income for interest expenses increased. This had repercussions on non-financial companies as a result of a drop in demand.

The experiences from the economic crisis in the 1990s would suggest that credit losses from household lending should not constitute a major direct risk to financial stability. Despite strong credit growth and the subsequent economic decline, an overwhelming majority of households were able to pay their mortgages. However, it is not possible to rule out that the households' indebtedness affected other parts of the economy through different channels (see section 4.2). Some factors also indicate that the risk for credit losses could be larger today. The level of indebtedness that households have now is much higher than it was in the 1990s (see chart 1). However, household debts in relation to wealth is relatively unchanged, which is mainly due to rising real and financial assets. One interesting observation is that the over-lending in the 1980s was not mirrored in the ratio between debts and assets. This is because asset prices were also affected by credit growth, which gave a misleading image of the households' financial position. This ratio remains virtually unchanged, while credit growth has been very high; this indicates a similar level of over-lending as was seen at the end of the 1980s. Debts in relation to financial assets also remain mostly unchanged. It is therefore important to analyse how well households could manage a fall in income or an increase in expenses and if this could lead to credit losses in the banking sector. Central factors for the extent to which households can handle unexpected economic events include their indebtedness, how they are affected by higher interest rates and how they can influence their debt situation. The rest of this report looks at the extent to which current mortgage lending to households can contribute to credit losses in the banking sector.

3. Analysis of household indebtedness

This report analyses how different assumptions about household income and expenses affect the banks' credit losses in order to see the extent to which household indebtedness, the proportion of loans at a variable rate and small amortisations can affect financial stability. In these calculations the financial conditions of a number of households are changed and the consequences for these households are studied. The stress that household finances are subjected to is linked to the interest rate on their debt and to household income. A link between household finances and the banks' credit losses from household credits is shown later.

The central factors for the sensitivity of household finances in the various stress scenarios are household indebtedness, the proportion of loans at a variable interest rate and the buffer that households have before their other consumption has to change to ensure that their income can cover their expenses. High debts mean that

household expenses are affected more by changes to interest rates than would be the case at lower debt levels. A higher proportion of loans at a variable rate means that changes to interest rates would affect household finances more quickly than would be the case if loans were taken out at a fixed rate. Variable rate loans also mean that households do not have the same amount of time to change their debt situation to balance out changes to their expenses when there is a change to interest rates. Finally, low amortisations mean that households take longer to adapt their debt situation when conditions change; it also means that, in any calculations that are based on the assumption of low or no amortisations, there is less scope to cover unexpected economic events that households could otherwise have dealt with by changing their amortisation rate.

Household finances are studied at an individual level to calculate the effects that high loans, low amortisations and a large proportion of variable loans have on financial stability. The financial situations of individual households are studied using the data collected during the mortgage study carried out by Finansinspektionen in 2009.[5] Based on this data, it is possible to use information about household income and debts to calculate how much money a household has after interest payments and once standard expenses for households have been deducted. The following sub-section presents the data, the calculation methods and the scenarios that have been used.

3.1 DESCRIPTION OF DATA

The sample collected by Finansinspektionen contains data for households that received loans from seven different Swedish banks during the period 28-30 September 2009.[6] This sample contains a total of 6 863 loans. The information in the data includes household composition (e.g. the number of co-applicants and the number of children living at home) and the households' financial situation (e.g. household income and total debt). The margins for different households are calculated using this information. When households have a positive margin, it means that they have money left over after standard expenses have been paid and interest expenses have been deducted. When households have a negative margin, their income does not cover standard expenses and interest payments. If households have a negative margin over a long period of time, they risk running into problems making payments and the banks risk making credit losses from the household credits.

One important difference between the data used in this survey and the data used previously in Financial Stability 2009:1 to stress test the households' ability to

5 See Finansinspektionen (2010).
6 The banks included in the study are Länsförsäkringar bank, Nordea, SBAB, SEB, Handelsbanken, Skandiabanken and Swedbank.

pay is that the data collected by Finansinspektionen is for loans that were recently paid out, while the data previously used to stress test households was based on a random sample survey of Swedish households. The latter therefore includes households that have no debt, households that took out loans a long time ago and households that have recently taken out loans. This data therefore gives a reasonably good image of the debt situation in the household sector as a whole. However, it is probably not the case that households that take out new loans are representative of the average indebted household in Sweden. For example the households' loan-to-value ratios are higher in Finansinspektionen's data than for indebted households as a whole. Subsequently, an analysis of the debt situation in the broader random sample of Swedish households provides a view of the risks to stability that is not representative of the risks that may occur in the future, if the households that take out new loans are not similar to the households that already have loans. In this context Finansinspektionen's data would provide a better view of how the debt situation of Swedish households may look in the future, as households in this data represent a new inflow of indebted households.[7] However, Finansinspektionen's data may not be representative of the development in the banks' mortgage lending. For example, seasonal variations could mean that the collected sample is not representative for all periods of time. The overall assessment is that Finansinspektionen's data is a better basis for an analysis than the data used in Financial Stability 2009:1 as it provides a better indication of the risks that could occur if the current development continues.

Household margins can be calculated by using data from individual households from Finansinspektionen's data and assuming standard expenses for all these households. The assumptions made in this calculation are presented in the next sub-section.

3.2 CALCULATING HOUSEHOLD MARGINS

The income data in the data is used as the basis for calculating household margins. Standard expenses are then deducted from the income. The standard expenses are the same as those used by Finansinspektionen.[8] After standard expenses have been deducted from income, household interest expenses are taken away from the rest. Interest expenses are calculated based on the household debt in Finansinspektionen's data.[9] When calculating household interest expenses, no tax

7 Loans that are renewed in a different bank are included in Finansinspektionen's data. This means that some of the households found in the stock of indebted households will be in the data that represents the flow.
8 See Finansinspektionen (2010).
9 As the objective is to expose households to stress to see what credit losses this leads to, amortisations are not taken into consideration in this context. This is because households are expected not to pay amortisations when they are under stress.

deductions for interest paid have been made. A summary of the calculations used for household margins is set out in table 1.

Table 1. Calculating household margins.

Household's disposable income
– standard expenses for applicants (SEK 7 000)
– standard expenses for co-applicants (SEK 5 500) per co-applicant
– standard expenses for children living at home (SEK 2 500 per child)
– interest expenses (assumed interest rate x household's total debt)
– running costs for houses (SEK 4 000)
= Household margin

Table 1 above shows that the interest expenses that a household is assumed to have are not reduced by any interest deductions. There are two main reasons not to include interest deductions when calculating household margins. The first is that interest deductions are a tool that could be used to regulate debt growth in the household sector (see report III.3). As interest deductions are a possible tool to influence the lending growth rate, it is important to produce calculations under the assumption that interest deductions do not reduce interest expenses. However, one objection to this calculation method is that, for various reasons, it is unlikely that the interest deductions would be removed, which leads to the second reason for not reducing interest expenses using interest deductions, i.e. because it is important to take into consideration not only possible scenarios, but also scenarios that are improbable but possible. This ensures that the results provide an indication of the risks that household credits present for the banking sector.

Data on the number of co-applicants, the number of children staying at home and the household's total debt are needed to be able to calculate household margins in accordance with the method described in table 1. The households in the sample that have data for these variables therefore form the basis of the results presented below. A total of 6 002 households are included in the sample that is analysed in this report. Descriptive statistics for the included households are found in table 2.

Table 2. Descriptive statistics for households in the mortgage survey

	MEAN	STANDARD DEVIATION
Age	46.7	14.0
Number of co-applicants	0.64	0.49
Number of children	0.76	1.02
Total debt	1 645 703	1 539 995
Annual disposable income	443 199	445 003
Debt ratio	3.84	3.11
Number of observations	6 002	

Based on the information available for the households, the banks' credit losses for household lending are estimated given different scenarios. Descriptions of these estimates are provided in the following sections.

3.3 CALCULATING CREDIT LOSSES

In 2009 the four major Swedish banks lent a total of approximately SEK 2 000 billion to households. Credit losses on household lending are estimated to have totalled SEK 1 billion that year. This means that the level of credit losses from household lending was 0.05 per cent. Based on Finansinspektionen's data and the calculation assumptions presented above, 4 per cent of the households in the sample have a negative margin.[10] In order to calculate credit losses using different assumptions on how household income and expenses change, it is assumed that a doubling of the proportion of households with a negative margin leads to a doubling of the level of credit losses. Using this assumption, credit losses can be analysed in various scenarios with lower income and higher expenses.

3.4 DIFFERENT SCENARIOS FOR THE DEVELOPMENT OF HOUSEHOLD INCOME AND EXPENSES

Three scenarios have been set up to analyse how the banks' credit losses develop using different assumptions of lower income and higher expenses for households. In the first scenario, household expenses increase, specifically the households' interest expenses. This increase in expenses is calculated based on a situation where interest rates rise from 2.5 per cent to 12.5 per cent for households. In the two other scenarios, household income falls[11] either by reducing household income by between 6 per cent and 18 per cent, which could happen if disposable income were to fall, or by reducing income to a level corresponding to the applicant and any co-applicants being made unemployed. In the latter scenario households receive 70 per cent of their original income, or a maximum of SEK 14,960 per applicant or co-applicant in unemployment benefit. The levels of unemployment used in the sample in the calculations are 5, 10, 15 and 20 per cent, respectively.[12] These scenarios are summarised in table 3.

10 This calculation is made under the assumption that the interest rate that households had in 2009 was 2.5 percent.
11 An interest rate level of 7.5 percent is used when income falls.
12 When making these calculations, it is assumed that unemployment is divided randomly among households, that only people under 65 years old can be affected by unemployment and that everyone in the household is made unemployed if the household is affected by unemployment.

Table 3. Scenarios for household income and expenses

Scenario 1 *(Higher expenses due to a rise in interest rates)* Interest on household debts: 2.5-12.5 per cent.
Scenario 2 *(Lower income as in a loss of income and an interest rate of 7.5 per cent)* Fall in income of 6-18 per cent
Scenario 3 *(Lower income as in unemployment and an interest rate of 7.5 per cent)* Fall in income, if 5-20 per cent of households are made unemployed

It is important to note that we are only analysing how *the households' economic resilience* is affected by higher expenses (higher interest rates) and/or lower income (for example, a fall in income due to unemployment). We are not investigating how various economic events affect the economy as a whole. It is important to note that the macro-economic consequences of the stress scenarios we have used are considerable and that these consequences are what mostly affect financial stability. However, the main aim of this study is to stress test the ability of households to make payments at the micro level to see how their ability to pay changes under different economic conditions. In a further stage, an attempt is made to link the ability of households to make payments to the banks' credit losses from household lending.

The next section presents the credit losses from household lending of the four major banks in the different scenarios for household income and development.

4. Banks' credit losses and household indebtedness

4.1 BANKS' CREDIT LOSSES FROM HOUSEHOLD LENDING

Using the calculation conditions presented in the previous section, the proportion of households with a negative margin has been calculated along with the credit losses for the major banks. The credit losses for the three scenarios are presented in table 4 below. In scenarios 2 and 3, we look at an interest rate of 7.5 per cent and the starting point in these scenarios is therefore identical with scenario 1 when the interest rate is 7.5 per cent.

Table 4. The proportion of households with a negative margin and the credit losses for the banks.

Scenario 1 *(different interest rate levels)*				
Interest rate (%)	2.50	7.50	9.50	12.50
Proportion of households with a negative margin (%)	4	20	30	45
Credit losses (%)	0.05	0.23	0.34	0.51
Credit losses (billion)	1.0	4.6	6.8	10.1
Scenario 2 *(fall in income)*				
Fall in income (%)	0	6	12	18
Proportion of households with a negative margin (%)	20	27	35	44
Credit losses (%)	0.23	0.30	0.40	0.50
Credit losses (billion)	4.6	6.1	8.0	10.0
Scenario 3 *(unemployment)*				
Unemployment (%)	0	5	10	20
Proportion of households with a negative margin (%)	20	22	24	29
Credit losses (%)	0.23	0.25	0.28	0.32
Credit losses (billion)	4.6	5.1	5.5	6.5

Table 3 shows that credit losses are small compared with total lending based on the conditions used in the calculations, irrespective of which of the three stress scenarios is studied. Credit losses amount to a maximum of around SEK 10 billion per year. In order to gain an understanding of this chart, these credit losses can be linked to the total capital of the four major banks.[13] If the credit losses were to amount to SEK 20 billion (SEK 10 billion per year for two years), the aggregated capital ratio of the four major banks would fall from 10.4 to 10.0 per cent, i.e. a fall of 0.4 percentage units, according to 2009 charts.[14] Based on the historic links that have been identified, financial stability would not appear to be threatened by the banks' capital ratio being too low as a result of credit losses from mortgages.

There are several reasons why the level of credit losses is low in the calculations above. A first reason is that credit losses from Swedish mortgages are so small from the outset that an increase in the proportion of houses with a negative margin only affects credit losses to a small extent, assuming that there is a linear relationship between the two. The reason why there are low credit losses on mortgage lending from the outset could be because households reduce other consumption when their overall expenses exceed their income, rather than defaulting on their mortgage. This means that households will only default on their mortgage obligations under very extreme conditions, so banks would only experience credits losses from their mortgage lending in exceptional cases. In this context the banks' procedures for granting credits and the Swedish regulations for the payment obligations of private individuals (see report II.6) play a major role in the behaviour observed among mortgage takers. The fact that borrowers change their consumption behaviour

13 The four major banks, Handelsbanken, Nordea, SEB and Swedbank, account for around three quarters of Swedish household lending. This is why credit losses are related to the aggregated capital of these four banks.

14 The capital adequacy ratio refers to equity in relation to risk-weighted assets.

rather than not fulfilling their loan commitments means that credit losses for lending other than household lending can arise in the banking sector. Such indirect channels are discussed in more detail in the next section.

The calculations presented in table 4 are based on the assumption that the banks' credit losses increase linearly with the proportion of households that have a negative margin. If this assumption were not to prove to be a good approximation, the banks' credit losses from mortgage lending would not be estimated correctly in the calculations above. A sensitivity analysis has been carried out, where the relationship of credit losses to the financial situation of households varies, in order to illustrate the extent to which the calculations depend on the assumptions made. A first variation is to allow the credit loss level to depend not only on the proportion of households with a negative margin, but also on the size of the negative margin for these households. More specifically, the calculations change so that the proportion of households with a negative margin doubles, while the negative margin for these households increases by a factor of three, so that the credit losses will increase by a factor of six. The size of the negative margins therefore has repercussions on the size of the credit losses. Table 5 sets out the credit losses that would occur under these conditions.

Table 5. Credit losses with a non-linear connection between the proportion of negative margins and credit losses.

Scenario 1 *(different interest rate levels)*				
Interest rate (%)	2.50	7.50	9.50	12.50
Credit losses (%)	0.05	0.46	0.90	1.90
Credit losses (billion)	1.0	9.2	18.0	38.0
Scenario 2 *(fall in income)*				
Fall in income (%)	0	6	12	18
Credit losses (%)	0.46	0.63	0.94	1.34
Credit losses (billion)	9.2	12.6	18.9	26.7
Scenario 3 *(unemployment)*	4.6	6.1	8.0	10.0
Unemployment (%)	0	5	10	20
Credit losses (%)	0.46	0.56	0.67	0.87
Credit losses (billion)	9.2	11.2	13.5	17.3

The results in table 5 indicate that the credit losses would be much higher if we assumed a dependency on both the proportion of households with a negative margin and on the size of the negative margin, compared with if we only assumed a dependency on the proportion with a negative margin. However, if this were the case, the credit losses would still not be high enough to threaten financial stability in terms of capital adequacy. However, it is important to note that banks can incur other problems even if their capital adequacy is not threatened. So even if the credit losses are not high enough to threaten the banks' capital requirements, financial stability could still be affected through other channels.

A second variation of the calculations carried out above is to see to what extent household indebtedness has to fall to avoid a negative margin in the various stress scenarios. By making the assumption that household debt reduction occurs by banks writing off claims against households that have negative margins to provide these households with a margin of zero, it is possible to obtain an approximate upper limit for credit losses from mortgage lending. Calculations based on Finansinspektionen's data show that there would be credit losses of a maximum of SEK 200 billion, or 10 per cent of lending, under the conditions set out in the various stress scenarios. These kinds of credit losses would have a major impact on the capital ratios, but the probability of them occurring is extremely low.

All in all the results above indicate that there is a low risk that credit losses from mortgage lending to Swedish households would jeopardise financial stability. This conclusion is based mostly on the fact that Swedish households have historically been very good when it comes to meeting their mortgage obligations. However, if this behaviour were to change drastically, the size of mortgage lending would constitute a potential threat to financial stability.

As well as affecting the banks' credit losses from mortgage lending, the stress that households are subjected to could also affect their consumption behaviour. As mentioned earlier, these changes in behaviour may be an important explanation as to why households rarely default on their mortgage obligations. However, these changes in behaviour could have negative repercussions on demand in the economy, which would have a negative impact on company profits. This could in turn affect the probability of companies going bankrupt, which could then lead to credit losses for banks from their commercial lending. The next section studies how important this channel could be.

4.2 INDIRECT EFFECTS OF HOUSEHOLD INDEBTEDNESS

One consistent conclusion that can be drawn in the analyses of Swedish households is that the credit risk from household lending appears to be low even in a scenario where households are subjected to extreme financial stress.[15] In addition to credit losses that come directly from household lending, other channels could also affect financial stability when households are subjected to stress. One such channel is household consumption expenses. If household finances are affected negatively, for example because of a disadvantageous development in household income or debt-related expenses, this could have a negative impact on household consumption expenses. This effect can be caused by households reducing their consumption expenses to be able to meet higher debt-related expenses or because they increase their savings as they want to be more cautious. Both of these reasons contribute

15 See e.g. Financial Stability 2009:1.

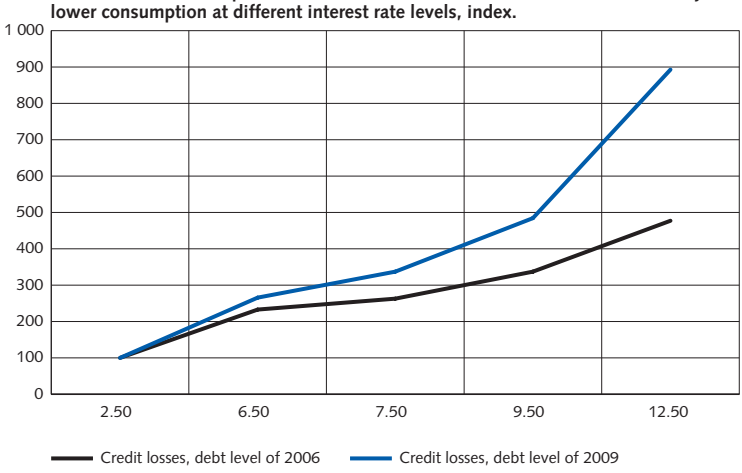
to a reduction in demand, which can affect company profits and therefore their creditworthiness. This section studies the extent to which this channel can contribute to financial instability.

One of the scenarios above is used to show the extent to which reductions in household consumption expenses can contribute to credit losses in the business sector.[16] Unlike the analysis above, the extent to which disposable income falls is now studied in this scenario. It is then assumed that household consumption expenses fall in relation to this reduction in income.[17] This reduction subsequently leads to a reduction in GDP. A model is then used that depicts the link between production and bankruptcy probability in order to link this reduction in GDP to credit losses in the business sector.[18] It is important to note that this analysis is based on narrow relationships in the economy. This means that the credit loss in the business sector should be seen as an individual effect from households' altered consumption. It is also possible that other negative effects could be felt in the economy if household interest expenses were to increase or if household income were to fall. However, this will not be analysed in this report.

Chart 2 shows the extent to which a change in household consumption behaviour affects lending in the business sector.[19] The calculations shown in this chart are partly based on the indebtedness in Finansinspektionen's data. However, one calculation is also made using the assumption that indebtedness in the household sector would be 30 per cent lower than is the case in the data. Debt for Swedish households has grown by around 30 per cent since 2006. The calculations at the lower debt level would therefore show how credit losses in the business sector would have developed in the scenario if no growth had taken place in the debt level since 2006.

16 The scenario with different interest rates is used as this scenario led to the highest credit losses.
17 An estimated elasticity of 0.44 is used in the calculations. This means that household consumption expenses fall by 4.4 percent if household income falls by 10 percent.
18 See Åsberg Sommar and Shahnazarian (2009).
19 t is assumed that there is no change to household income in the calculations.

Chart 2. The banks' expected credit losses in the business sector were caused by lower consumption at different interest rate levels, index.



Source: The Riksbank.

The results indicate that a reduction in household consumption would lead to a substantial increase in credit losses in the business sector. The results also indicate that the credit losses would be considerably higher at the higher level of indebtedness than at the lower level. This is because households are more exposed to interest rate increases at the higher level of indebtedness. Assuming that the level of indebtedness in the entire mortgage stock is as high as in Finansinspektionen's mortgage study, credit losses could be as much as SEK 40 billion higher at the current level of indebtedness, compared with the lower debt level. The high credit growth of households could therefore have a decisive role on the negative shocks that the financial system could experience. Even though the losses are high, the indirect credit risk is not considered to be a threat to the banks' capital adequacy and therefore not to financial stability either through problems concerning the banks' solvency. Although it is possible that a situation like the one analysed above could have an impact on the banks' ability to finance lending, this is not analysed in this report.

5. Conclusions

This report analyses how a high level of indebtedness among Swedish households can affect financial stability through credit losses in the banks' lending to Swedish households and companies. Using data from a mortgage survey carried out by Finansinspektionen, we were able to use microdata to carry out a stress test of household finances and to study the extent to which the ability to pay is affected by various financial shocks. Most households are expected to be able to meet their debt obligations even when they are faced with extremely stressful scenarios with

interest rate hikes and a loss of income. However, major losses can occur during extremely stressful scenarios since the banks' exposure to households is very high. Although this kind of development is considered very improbable, the possibility still exists. This means that continued credit growth can have key implications on how the economy is affected by various economic shocks. There is also a risk that households could reduce their other consumption in stressful scenarios, leading to a fall in demand and major potential credit losses in the banks' lending to companies. Despite this, the conclusion is that the credit losses in this kind of scenario are not expected to constitute a direct threat to the financial stability through capital adequacy in the major Swedish banks. However, the economy could still suffer negative effects, for example with regard to the banks' funding, if the expenses of households were to increase sharply or if their income were to fall sharply.

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A fall in house prices – consequences for financial stability

Hannes Janzén, Kristian Jönsson and Anders Nordberg*

This report studies the consequences that a fall in house prices can have on financial stability. The channels that are investigated are banks financing their lending through covered bonds and the effect on credit losses from lending to companies. The conclusion is that the creditworthiness of covered bonds should not be under threat if house prices were to fall. However, the banks' costs and access to financing can be affected despite the good credit quality of these covered bonds. The conclusion is that although the banks can suffer major credit losses, these losses are not high enough to constitute a direct threat to financial stability.

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1. How covered bonds are affected by a fall in house prices

This section looks at the consequences that a fall in house prices can have on financial stability due to banks financing their lending through covered bonds. In Sweden the banks have significantly increased lending to the public in recent years. The banks have financed most of this lending by raising capital on the financial markets, which they have mostly done by issuing covered bonds. Covered bonds currently account for almost half of the securities financing of the major Swedish banks.

When the banks issue covered bonds, they use existing mortgage credits as collateral. A covered bond is therefore linked to specially selected collateral, in what is known as the 'cover pool'. Changes to the loan-to-value ratios of mortgages affect the cover pool because it contains mortgage credits. Normally loan-to-value ratios increase when house prices fall. If the loan-to-value ratio is too high, collateral has to be removed from the cover pool, which then falls in value. This can then affect the banks' ability to issue covered bonds. It is therefore interesting to analyse if and how a fall in house prices could affect bank financing through covered bonds.

WHAT IS A COVERED BOND?

A covered bond is a kind of asset that has a very long history, particularly in Denmark and Germany. In the 1990s interest in covered bonds increased, after experiencing a lull over a long period of time. Now they are a central financing instrument for banks, particularly in Europe.

Covered bonds are different from other financial instruments as they are protected by a well-defined set of rules. In Sweden covered bonds are regulated by a specific act and by EU rules. There are also clear rules for cover pools, regulating the kind of loans that can be included, their composition and the maximum loan-to-value ratios of loans that are included as collateral. The Swedish rules also require an independent inspector, appointed by Finansinspektionen, to monitor and ensure that the assets in the cover pool adhere to the requirements.

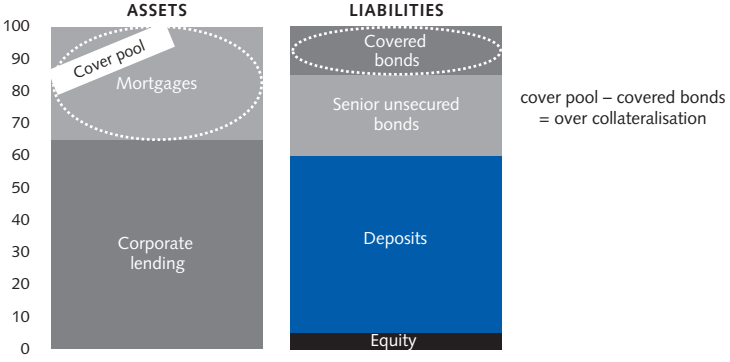
A covered bond can be described as a claim on the issuing institution. If the issuer is not able to meet its obligations, the holder of the bond has priority to specially-selected collateral that is linked to the bonds, the 'cover pool'. The cover pool contains various kind of credits, normally mortgage credits or credits for other kinds of real estate lending, but also credits for agriculture and shipping, as well as credits for governments and municipalities. However, the cover pool for the covered bonds of Swedish banks mainly contains mortgage credits.

The main difference between a covered bond and a traditional non-covered bond from a bank is therefore the rights that an investor has if the issuer goes bankrupt. For a standard bond, the holder has a non-preferential claim on the

issuer, while a covered bond gives the holder preferential rights to a specific cover pool. This means that a covered bond often has a higher credit rating than the issuer.

As mentioned earlier, Swedish mortgage institutions use existing mortgages as collateral in their cover pool and then issue covered bonds based on them. If the value of the cover pool exceeds the value of the issued bonds, it causes 'over-collateralisation' (see chart 1).

Chart 1. Illustration of a covered bond



Note. A simplified assumption has been made in the figure that all the mortgages on the assets side are included in the cover pool. This is not often the case in reality, as only loans with a certain maximum loan-to-value ratio can be included. Some banks also decide not to put all the mortgages approved in accordance with the regulations into the cover pool.

Source: The Riksbank

The loans in the cover pool remain on the banks' balance sheet. This means that the issuer still retains the credit risk in the underlying loans. The cover pool is also dynamic, so any collateral that does not qualify is removed from the cover pool and replaced with new collateral. If the credit quality of the loans falls below certain pre-determined levels, the issuer is forced to remove them and replace them with new ones. This is why an issuer of a covered bond has strong incentives to make a thorough credit assessment of the loans that are included in a covered bond. Consequently there are good reasons to consider the creditworthiness of covered bonds to be high.

Some securities also have mortgage credits as their underlying collateral, for example Residential Mortgage-Backed Securities (RMBS). Unlike covered bonds, an RMBS only has a claim on the underlying collateral and not a claim on the issuer. In addition, the cover pool for an RMBS does not have to be dynamic, which means that the issuer does not have to replace collateral whose quality has worsened. As the issuer has removed the loan from the balance sheet, a fall in the credit quality of the loan will not have an impact on the issuer. This means that the issuer does not

have as much incentive to make a well-founded credit assessment of the underlying loans. As a result the credit quality of an RMBS might not necessarily be that high. Investors are forced to rely heavily on the bond's credit rating to make sure that the underlying loans have a good credit quality. As confidence in credit ratings plummeted during the financial crisis, it was very difficult to evaluate and assess the risk of an RMBS issued by private institutions, which caused major problems on this market.

The importance of covered bonds for Swedish banks

Since the second half of 2004 Swedish banks and credit market companies have been able to apply to Finansinspektionen for permission to issue covered bonds. The first Swedish covered bonds were issued in the autumn of 2006, and in the spring of 2008 all institutions that had been approved as issuers had implemented the necessary conversion and had issued covered bonds. Seven Swedish banks and their mortgage institutions can now issue covered bonds on the Swedish market.[1]

Table 1. Swedish institutions that issue covered bonds

	RATING	VOLUME, SEK BILLION	PROPORTION OF TOTAL OUTSTANDING VOLUMES, PER CENT
Swedbank	AAA	448	27
Stadshypotek	AAA	439	26
Nordea hypotek	AAA	309	18
SEB	AAA	193	12
SBAB	AAA	155	9
Länsförsäkringar hypotek	AAA	80	5
Landshypotek	AAA	53	3

Source: SCB (Statistics Sweden) and bank reports, December 2010

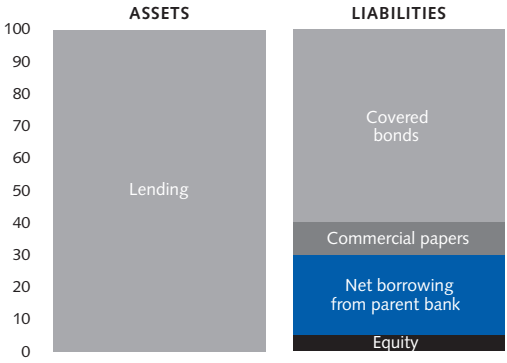
In December 2010 the outstanding volume of covered bonds on the Swedish market amounted to just over SEK 1 600 billion, corresponding to around half of Sweden's GDP. This means that it is much bigger than the market for Swedish government bonds and the fifth largest covered bonds market in Europe. The majority of the volume of Swedish covered bonds, just under 80 per cent, is denominated in Swedish krona, with the rest mostly in other Nordic currencies and euro.[2] Issues in other currencies are normally converted into Swedish krona (and other Nordic currencies) using derivative instruments.

Covered bonds are currently the single most important source of financing for Swedish mortgage institutions (see chart 2 for a simplified balance sheet of a typical Swedish mortgage institution). As well as covered bonds these institutions also

1 Stadshypotek (Handelsbanken), Landshypotek, Länsförsäkringar hypotek, Nordea hypotek, SBAB, SEB, Swedbank hypotek.
2 In September 2010 Stadshypotek was the first Nordic bank to issue covered bonds in USD.

finance lending through the issuance of certificates and net borrowing from their parent bank.

Chart 2. Simplified balance sheet of a typical Swedish mortgage institution
Standard for 2010

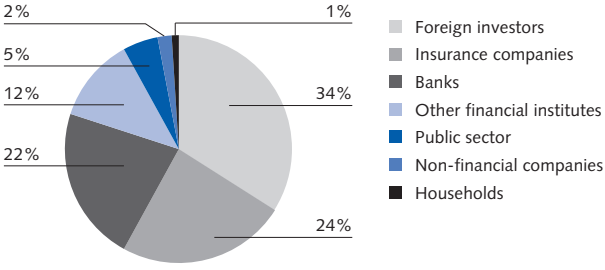


Sources: Bank reports and the Riksbank

Who buys Swedish covered bonds?

More than one third of the covered bonds issued by Swedish banks or their mortgage institutions are owned by foreign investors (see charts 3 and 4). In Sweden and other countries in the world it is mostly insurance companies, banks and other financial institutions that invest in covered bonds.

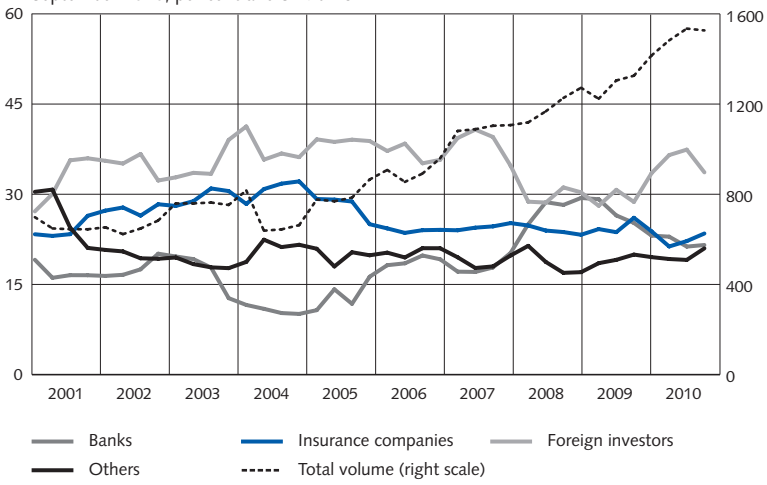
Chart 3. Investors in Swedish covered bonds
September 2010



Source: Statistics Sweden

Chart 4 shows that the total outstanding volume of covered bonds has steadily increased in recent years. Foreign investors held around 35 per cent up until the end of 2007. When the financial crisis started, they reduced their holdings, at which point Swedish banks increased their share. Last year foreign investors increased their holdings, almost returning to the same level as before the crisis.

Chart 4. History of the distribution of investors in Swedish covered bonds and total outstanding volumes
September 2010, per cent and SEK billion



Source: Statistics Sweden

HIGH CREDITWORTHINESS IN COVERED BONDS, DESPITE A FALL IN HOUSE PRICES

The market for covered bonds has expanded globally to become one of the largest bond markets in the world. Despite their size and long history covered bonds have never caused a credit loss for an investor because of a defaulted payment. This underlines the confidence that is intrinsic in the covered bonds system. All Swedish covered bonds have a AAA rating, which means that they have a low credit risk.

One reason why the credit risk is so low in Swedish covered bonds is that the underlying cover pool has a good credit quality. This is mainly because most of the cover pool contains loans to Swedish households, which have historically caused very low credit losses. There are also restrictions on the loan-to-value ratios of the collateral that can be included in the cover pool. Private houses may only be included up to 75 per cent of the value of the property, while the corresponding chart for commercial real estate is 60 per cent. All banks currently have an average loan-to-value ratio of between 40 and 60 per cent.[3] In addition all loans are removed from the cover pool if the lenders are late in paying. All these measures aim to ensure that the cover pool always includes loans that have a good credit quality.

The cover pool of Swedish banks includes loans for houses, commercial real estate, public real estate and agricultural real estate. The proportion of commercial real estate is very low. The cover pool also contains no loans to borrowers from the Baltic states.

3 The banks have used various approved methods to calculate their average loan-to-value ratios.

Table 2. Swedish institutions that issue covered bonds
Per cent

	HOUSES	COMMERCIAL REAL ESTATE	REAL ESTATE ABROAD	OTHER
Swedbank	91	0	0	9
Stadshypotek	91	4	0	5
Nordea hypotek	85	3	0	12
SEB	100	0	0	0
SBAB	100	0	0	0
Länsförsäkringar hypotek	100	0	0	0
Landshypotek	2	0	0	98*

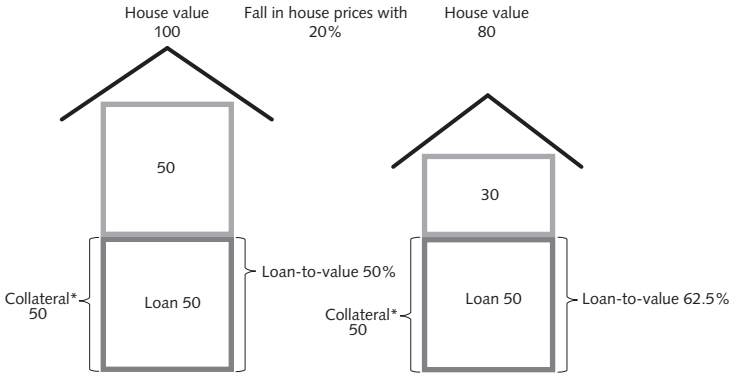
* Agricultural real estate.
Source: Bank reports, September 2010

The nominal value of the cover pool normally exceeds the nominal value of the issued bonds. This creates over-collateralisation. The average over-collateralisation in the cover pools of Swedish banks amounts to approximately 45 per cent.[4] This over-collateralisation in turn generates additional confidence for investors in covered bonds as the cover pool is larger than their claim on the bank. Normally a fall in property prices would lead to a fall in the value of the cover pool. The over-collateralisation falls because the outstanding volume of covered bonds does not fall (see chart 6). This can limit the banks' ability to issue further bonds from the existing cover pool.

Charts 5 and 6 show how a 20 per cent fall in house prices would affect two loans that are in the cover pool, but that have different loan-to-value ratios. Loan 1 has a loan-to-value ratio of 50 per cent, while loan 2 has a loan-to-value ratio of the maximum limit of 75 per cent. In the case of the first loan, the entire loan of SEK 50 is initially included in the cover pool, as there is only a 50 per cent mortgage on the house. When house prices fall by 20 per cent, the loan-to-value ratio increases to 62.5 per cent. As this new loan-to-value ratio is less than the maximum loan-to-value ratio of 75 per cent, the entire loan in the cover pool still qualifies after the fall in prices.

4 Let's take a bank that has a cover pool of 1,000 and outstanding covered bonds worth 750. The over-collateralisation would be 250, producing an over-collateralisation of 33% (250/750).

Chart 5. Loan 1, initial loan-to-value ratio of 50 per cent

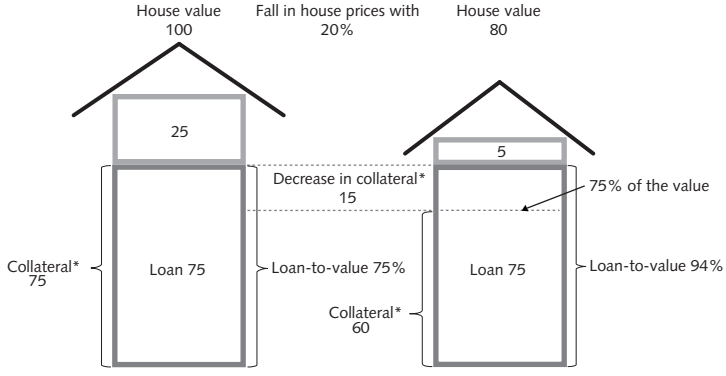


*Collateral eligible for cover pool

Source: The Riksbank

The second loan has an initial loan-to-value ratio of 75 per cent, which means that the entire loan has the exact percentage needed to be included in the cover pool at the upper limit. When the house prices fall, the value of the house falls to SEK 80; this affects the loan-to-value ratio, which increases to 94 per cent. This means that some of the loan has to be removed from the cover pool. Only SEK 60 (75 per cent of SEK 80 value of the house) can be included in the cover pool, while the SEK 15 that exceeds the limit has to be removed.

Chart 6. Loan 2, initial loan-to-value ratio of 75 per cent



*Collateral eligible for cover pool

Source: The Riksbank

The extent to which the cover pool is affected by a fall in house prices therefore depends on the loan-to-value structure of all the loans that are included. If all loans were granted at 75 per cent of the value of the house and then house prices fell by 20 per cent, the cover pool would also fall by 20 per cent. However, this is not how

mortgage institutions normally operate; they ensure that they have a relatively even distribution of loan-to-value ratios up to the maximum limit of 75 per cent. This means that the cover pool will not be affected to the same extent as house values when there is a fall in house prices. It is estimated that a fall in house prices of 20 per cent would lead to the banks' over-collateralisation falling by around 10 per cent.

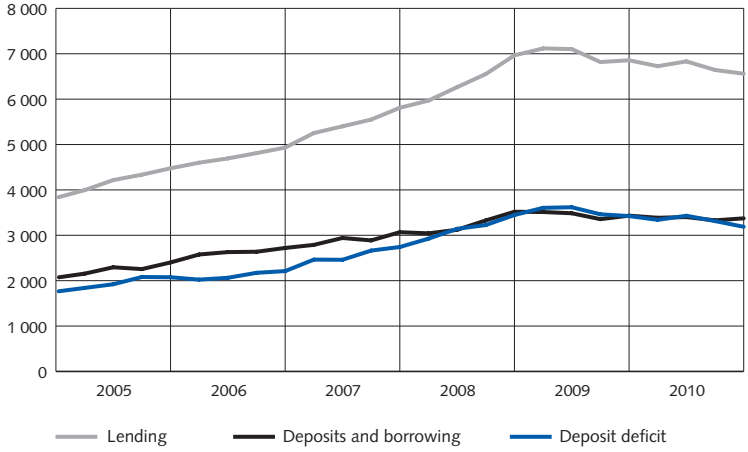
In terms of credit, banks are in a good position to deal with a fall in house prices and an increase in loan-to-value ratios; firstly, because they currently have high over-collateralisation in their cover pool. This means that banks would still have over-collateralisation, even if there were to be a reduction in over-collateralisation of 10 per cent (if house prices were to fall by around 20 per cent). Secondly, the banks are also able to fill up their cover pool if its value were to drop following a fall in house prices. The first step that banks would take is to fill their cover pool with what is known as 'substitute assets'. These are, for example, assets that are not normally included in the cover pool, for example loans to municipalities and governments. In the second stage the banks can sell some of their liquidity reserve, i.e. liquid securities that they hold to deal with unexpected events. By selling them the bank receives liquid funds that they can add to the cover pool as substitute assets.[5] In a third stage the bank can issue short-term securities, which provides them with liquid funds that they can use to increase their cover pool.

THE DIFFERENCE BETWEEN THE MATURITY OF THE BANKS' ASSETS AND LIABILITIES CREATES A REFINANCING RISK

As previously mentioned, covered bonds have high creditworthiness due to the strict rules around them and their underlying collateral. This is why they have become a popular financing alternative for Swedish banks. As the deposit deficit for Swedish banks has increased, i.e. the difference between deposits and lending (see chart 7), market financing has become even more important, which is why covered bonds have started to play a more important role.

5 If the collateral that the banks have in their liquidity reserves is classed as substitute collateral, the banks can add them directly to the cover pool rather than selling them and receiving liquid funds.

Chart 7. Deposits and lending in the major Swedish banks
SEK billion



Note. Deposit deficit = lending – deposits

Sources: Bank reports and the Riksbank

The increase in the proportion of covered bonds is positive, as they are a cheaper form of financing than bank bonds, which means that customers benefit from lower mortgage rates. However, there are limitations to how much a bank can finance lending using covered bonds. For example, if they used covered bonds too much, the over-collateralisation in the cover pool would become too small, which would create problems if the banks were not able to fill the cover pool with more approved assets. Another limitation is the fact that investors in non-covered bonds might object if the proportion of covered bonds in a banks' financing was too high. This is because the bank would then pledge and therefore reserve a lot of its best quality assets for holders of covered bonds, which would mean that only lower quality assets would be left over for other creditors.

One strategy in the banks' lending is to issue covered bonds with a much shorter maturity than the mortgages they issue. This results in lower financing costs, but is based on the banks' ability to refinance old bonds with new ones when the old ones fall due. A mortgage normally has a maturity of 20-30 years, while banks typically finance them by issuing covered bonds with a maturity of three to five years.[6] This creates a mismatch in the maturity of a bank's assets and liabilities, which in turn incurs a higher refinancing risk.

When markets are functioning normally, there is only a small risk that they will not be able to refinance. However, if there are disturbances on the financial

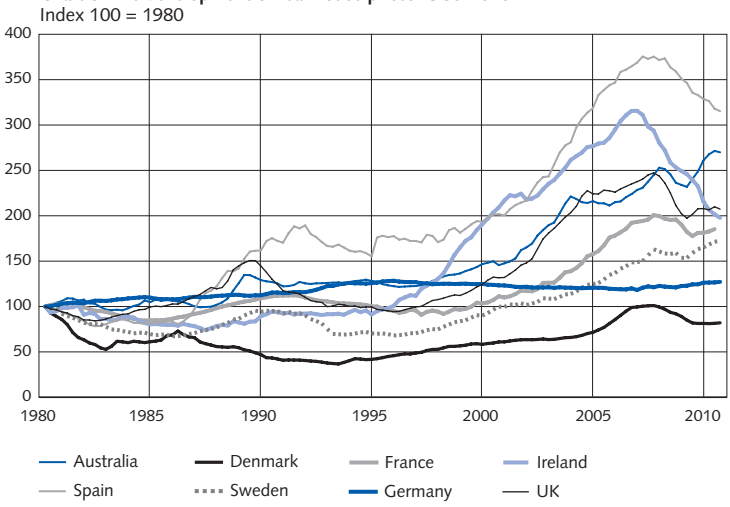
6 The public reporting of mortgage maturities differs between banks. Some banks report mortgages based on their actual maturity, while other banks report them based on when the mortgage interest rates are renewed.

markets, both internationally and in Sweden, this can lead to greater risk aversion among investors, which in turn can lead to financing becoming more difficult and the cost of issuing covered bonds more expensive.

FINANCING OPTIONS AND INTEREST EXPENSES CAN BE AFFECTED, DESPITE A GOOD CREDIT QUALITY

Unlike many European countries that experienced a strong increase in house prices at the beginning of the 2000s, the financial crisis did not lead to a turnaround on the Swedish housing market, and prices fell (see chart 8). This made Sweden one of the exceptions, along with Germany.

Chart 8. The development of real house prices 1980-2010
Index 100 = 1980

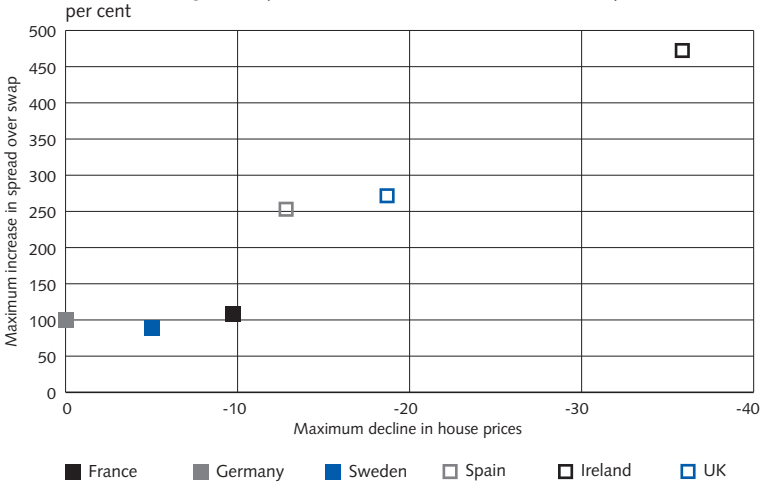


Source: Ecowin

It is possible to discern a link if you compare the fall in house prices in a number of countries with the banks' financing costs (measured as spread over swap) from issuing covered bonds in euro;[7] the higher the fall in house prices that a country suffered, the more expensive it was to finance lending by issuing covered bonds (see chart 9). In Ireland, for example, which experienced a fall in house prices of more than 35 per cent, spread over swap increased by a maximum of around 470 basis points during that period. In Sweden, house prices only experienced a small decline in this period, while Germany, where house prices did not fall at all, did not experience the same increase in prices in spread over swap.

7 Spread over swap is the cost of issuing a long-term bond that is swapped down at 3M EURIBOR, compared to financing on the interbank market at 3M EURIBOR.

Chart 9. Fall in nominal house prices, and an increase in spread over swap for covered bonds issued in euro
Maximum change in the period March 2007-November 2010, basis points and per cent



Note. For Sweden and France the period is October 2008-November 2010

Source: Iboxx and Ecowin

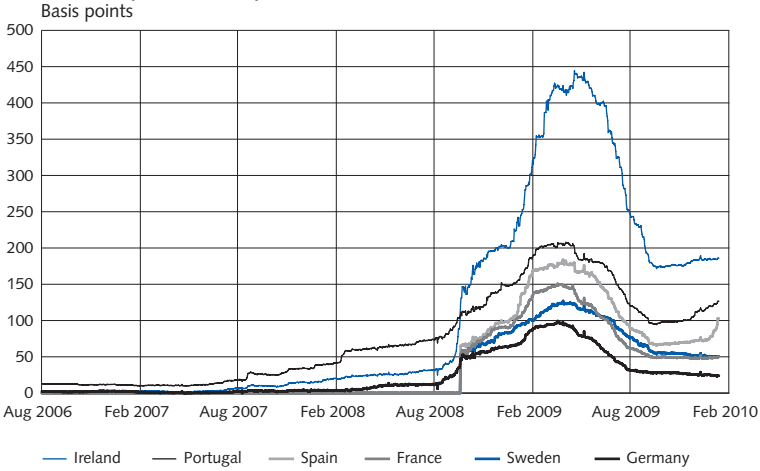
However, it is important to point out that many factors can affect these spreads. For example, in 2010 Ireland and Spain were affected by serious problems in their national finances, which led to their spreads increasing. Banks in a country suffering from problems in their national finances, where there is also a fall in house prices, run considerable risk of suffering from higher borrowing costs. However, a fall in house prices could probably be enough in many countries to impact the banks' financing costs.

There is therefore a risk that falling real estate prices in Sweden could affect the willingness of investors to buy Swedish covered bonds. Although the loan-to-value ratios of collateral linked to covered bonds would probably not rise to a critical level if house prices were to fall by 20 per cent, the level of uncertainty around bonds would increase and the value of the underlying collateral would rise if the prices of real estate were to fall quickly. A fall in real estate prices could therefore mean that Swedish banks would find it more expensive and more difficult to issue bonds, which is exactly what has happened in many other European countries.

Even if the house prices did not fall in Sweden, a fall in house prices in other countries could still affect Swedish covered bonds. During the financial crisis the cost of issuing covered bonds rose, while the systematic risk on the financial markets also increased (see chart 10). The spreads (still measured as spread over swap) followed each other in 2008 and 2009, with a positive and relatively similar correlation between different countries. This could be interpreted as the markets having the same credit and liquidity risks. The cost of issuing covered bonds rose

both in Europe and in Sweden, even though Sweden fared relatively well during the crisis compared with many other countries. This highlights just how interconnected the various markets are and how problems in one country can spread to others.

Chart 10. Spread over swap for covered bonds issued in euro
Basis points

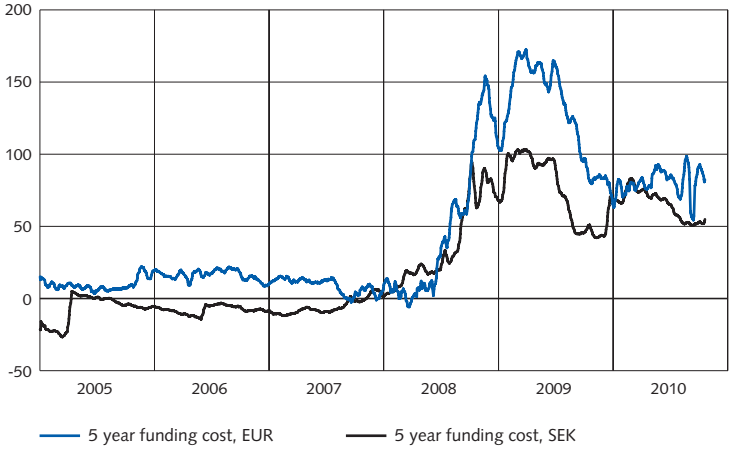


Source: Iboxx

THE COST OF ISSUING FOREIGN COVERED BONDS AND THEN CONVERTING THEM TO SWEDISH KRONA CAN ALSO INCREASE

In Sweden the demand for mortgages has risen in pace with the demand for buying houses. This has created problems for the banks to finance all its lending by issuing covered bonds in Swedish krona. A market does not currently exist that can handle such large volumes in a cost-effective way. This is why the banks also issue covered bonds denominated in other currencies, mainly in euro. This allows banks to diversify their lending among different geographic markets and investors. Historically there has been little difference between issuing covered bonds in Swedish krona and issuing them in foreign currency and then swapping them to Swedish krona (see chart 11). It has therefore been cost-effective for banks to issue on different markets.

Chart 11. Cost of issuing a covered bond in euro and swapping at 3M STIBOR compared with issuing directly in Swedish krona
In SEK and EUR, Maturity of 5 years



Sources: Bloomberg and Ecowin

The banks' total financing in foreign currency exceeds their assets in foreign currency (see table 3) and the surplus, around SEK 600 billion is converted to Swedish krona. Consequently, Swedish banks borrow Swedish krona through swaps.[8] Swedish banks are therefore very dependent not only on foreign investors (normally fund managers and pension funds) wanting to buy securities from Swedish banks, but also on banks being prepared to swap foreign financing to Swedish krona (normally foreign investment banks).

Table 3. The major banks' assets, liabilities and equity divided by currency
SEK billion

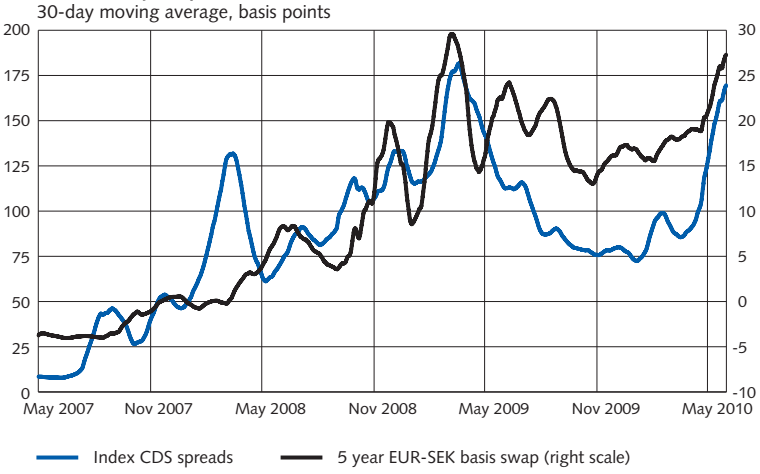
	SEK	FOREIGN CURRENCY	TOTAL
Assets	4 862	6 575	11 438
Liabilities and equity	4 237	7 201	11 438
Difference between assets and liabilities and equity	626	-626[9]	

If house prices fall in Sweden or in Europe, this will probably lead to an increase in the systematic risk of covered bonds. In this scenario it is also likely that the CDS premiums for financial institutions will increase (see chart 12).[10] When these CDS

8 In a swap transaction two currencies are exchanged at spot price, while a futures contract is set up for exchanging the currencies back again. To put it in simpler terms, the bank that receives a currency 'borrows' it during the maturity of the transaction. From this point on the term 'borrow' is used to describe this swap transaction.
9 The whole sum is not only used to finance mortgages, it is also used to finance other kinds of lending.
10 A CDS can be described as an insurance against losing an investment if the counterparty goes bankrupt. The seller of a CDS pledges to pay the nominal value in the event of bankruptcy or another credit event, and in return receives a premium from the purchaser, an amount known as the *spread*.

premiums increase, there is a risk that the cost of borrowing Swedish krona in swaps will also increase. In historic terms, there has therefore been a co-variation between higher CDS premiums for financial institutions and the cost of issuing foreign covered bonds in euro and then swapping them to Swedish krona in a 'cross currency swap'. The premium, or the spread, in this cross currency swap can be interpreted as being the additional cost that a Swedish bank has to pay to issue in foreign currency and then convert this borrowing to krona, compared with borrowing directly in Swedish krona.

Chart 12. Index for CDS premiums for financial institutions and EUR-SEK 5-year cross currency swap
30-day moving average, basis points



Note. Index for CDS premiums refers to iTraxx financials. This is an index that consists of an equally weighted average for CDSs for 25 financial institutions from Europe.

Source: Bloomberg

On the whole the creditworthiness of the banks should not generally be threatened if house prices fall. This is because the banks have a large buffer due to their high over-collateralisation in their cover pool and their ability to fill this cover pool with new assets if it falls in value.

However, both the costs and access to financing can be affected despite good credit quality. A simple comparison also shows that the higher the fall in house prices that a country suffers, the more expensive it is to finance through covered bonds. The cost of issuing covered bonds can also be affected even if house prices do not fall in Sweden. The financing costs of Swedish banks can be affected by a fall in a house prices in Europe and a subsequent increase in the systematic risk of covered bonds. The interest costs can increase in two main ways. Firstly, the interest on the bonds can increase and secondly the cost of borrowing Swedish krona in swaps can increase. If the financing costs for banks increase, it is probable that this

cost will be transferred to the customers at the same time as fewer credits will be granted.

During the financial crisis a number of tools were used to facilitate the banks' financing and thereby their loans to the general public.[11] If a fall in house prices would cause financing difficulties for the banks, one conceivable solution is to re-activate these tools.

2. How banks' credit losses are affected by a fall in house prices

This section investigates the effect that a fall in house prices can have on financial stability in terms of credit losses in the banking sector. The basis of the analysis is that a fall in house prices would probably not incur any major credit losses for the banks through payment defaults on the households' mortgages. If a household has a mortgage where the debt exceeds the market value of the house, this should not have a direct impact on the household's ability to manage its interest and amortisation payments. Instead, the banking sector is expected to incur credit losses on its lending to companies as a result of households changing their consumption behaviour following a fall in house prices. This therefore forms the basis of the analysis of model-based macro-economic developments that can be expected to take place when house prices fall. These results indicate that credit losses are normally determined by the economic development that takes place when house prices fall. In the worst case scenario, where house prices fall and GDP falls at the same time and short rates increase, the banks can experience heavy credit losses, but probably not so high that they would constitute a direct threat to financial stability.

Macro-economic effects of a fall in house prices

This report investigates the extent to which a fall in house prices can affect credit losses in the banking sector, and what kind of threat this could constitute to financial stability through the banks' capital adequacy. Falling house prices can affect the macro-economy through different channels. One such channel is households. A fall in house prices reduces the wealth of households, which contributes to a fall in consumption expenses. The fall in demand caused by lower consumption also results in a fall in GDP and inflation. This lower inflation then leads to a stimulus from the central bank as part of its monetary policy, which can help to reduce the fall in demand. The vector autoregressive model applied in report II.1 is used to show the empirical patterns and how these variables work together in this channel. This model captures the empirical connections between the variables and enables

11 See Sellin, P (2009).

the macro-economic scenario linked to a 20 per cent fall in house prices to be studied. This macro-economic scenario is set out in table 4a.

As well as affecting household wealth, the loan-to-value ratio of a household can play an important role in how households behave when there is a fall in house prices. If house prices fall, some households will have a debt that they perceive as being too high in relation to the value of their house. In this event the household would probably reduce their consumption expenses in order to amortise their debt obligations. This would then lead to a fall in demand and GDP, which would result in a fall in inflation. The monetary policy reaction to lower inflation would be to reduce the base rate, stimulating the economy and ensuring that the fall in GDP is not too steep. However, there are circumstances that could lead to monetary policy not being able to react. The fall in GDP would then be higher. Both these situations are investigated in this report by using the dynamic general equilibrium model (DSGE model) applied in report II.1. This model captures how the loan-to-value ratio can affect the macro-economic development if house prices fall. Two different scenarios are produced using the DSGE model. In one scenario it is assumed that monetary policy can react to a fall in demand, while in the second scenario it is assumed that monetary policy cannot react to a fall in demand. The two scenarios from the general equilibrium model are set out in tables 4b and 4c.

All of the factors that are presented in table 4 affect company profits and therefore company bankruptcies. The credit losses that the banks make on their lending to companies will also be affected by a fall in house prices. The effect that a fall in house prices has on the macro economy is used as the basis for investigating the extent to which credit losses are affected by a fall in house prices. These macro-economic effects are then used in a model that connects the risk of bankruptcy in the company sector to the macro-economic development.[12]

12 See Åsberg Sommar and Shahnazarian (2009).

Table 4. Macro-economic development from different models; difference compared with the main scenario, per cent

a) Scenario from the BVAR model

	YEAR 1	YEAR 2	YEAR 3
Growth in GDP	-3.0	-1.2	1.0
Growth in industrial production	-11.2	-6.3	-0.3
Short rate	-0.8	-2.4	-2.9

b) Scenario from the DSGE model, with a monetary policy reaction

	YEAR 1	YEAR 2	YEAR 3
Growth in GDP	-0.7	-0.4	0.3
Growth in industrial production	-4.9	-4.1	-2.2
Short rate	-0.5	-0.5	-0.2
Inflation	0.0	-0.1	-0.1

c) Scenario from the DSGE model, without a monetary policy reaction

	YEAR 1	YEAR 2	YEAR 3
Growth in GDP	-0.9	-0.9	0.1
Growth in industrial production	-5.4	-5.4	-2.7
Short rate	0.0	0.0	0.0
Inflation	-0.2	-0.5	-0.5

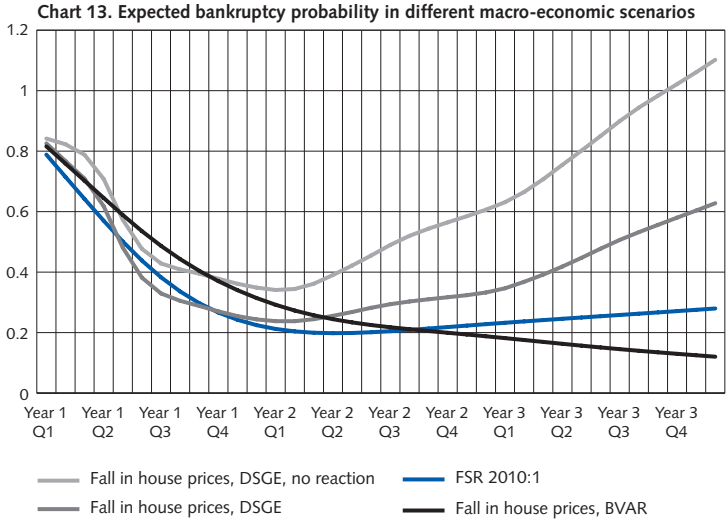
Note. The three models produce a scenario of how GDP would be modified. The historic link between GDP growth and industrial production growth is then used to produce the scenario for industrial production growth.

The risk of bankruptcy that a company runs, and therefore the credit risk that a bank runs when lending to companies, depends on the macro-economic development. If there is a decline in economic activity, the profits of Swedish companies fall as their revenues fall. However, a lower interest rate can improve the companies' situation as their costs fall. This affects the companies' ability to survive and the probability of them going bankrupt. The Åsberg Sommar and Shahnazarian (2009) model can be used to link the macro-economic scenarios in table 4 above to the probability of corporate bankruptcy and, consequently, to the credit losses in the banking sector. This model is based on a connection by which the bankruptcy probability of Swedish companies is linked to industrial production, short rates and inflation. By investigating how bankruptcy probabilities change when the macro-economic development changes, it is possible to assess the development of credit losses in the different scenarios.

Credit losses when house prices fall

The bankruptcy probabilities and the credit losses that occur in the different macro-economic scenarios are presented in table 5 and chart 13.

Chart 13. Expected bankruptcy probability in different macro-economic scenarios



Source: The Riksbank

Chart 13 would indicate that the development of expected bankruptcy in the various scenarios differs. For the scenarios taken from the equilibrium model, the probability of bankruptcy is larger than in the main scenario in Financial Stability 2010:1 (FSR 10:1). The macro scenario that comes from the BVAR model, on the other hand, presents a probability of bankruptcy that is higher than the main scenario during the first half of the observed period and lower than the main scenario during the second half of the period. The reason why the bankruptcy probability is lower at the end of the period is the strong response in the short rate in this model. Despite falling industrial production, company costs fall as a result of interest rate reductions to such an extent that the net effect of the bankruptcy probability is lower than in the main scenario.

Table 5. Credit losses in different macro-economic scenarios, SEK billion

	YEAR 1	YEAR 2	YEAR 3	TOTAL
FSR 10:1	3.4	3.3	3.2	9.9
BVAR, table 4a	4.9	2.8	1.4	9.2
DSGE, table 4b	3.6	4.7	7.1	15.5
DSGE, table 4c	5.2	8.7	12.6	26.5

Table 5 shows that the credit losses caused by the banks' lending to Swedish companies are mainly due to the macro-economic development that takes place in the wake of a fall in house prices. If house prices fall, the credit losses will increase more as the real economy falls, particularly if there is only a limited monetary policy reaction.

As a whole the results from the calculations above indicate that a fall in house prices could definitely affect the financial stability of the banking sector, but not to such an extent that it would threaten capital adequacy.

Although the analysis above indicates that a fall in house prices is not expected to affect financial stability through credit losses, it is important to remember that there are other channels through which a fall in house prices can affect financial stability. One of these channels is the banks' financing (see above).

Historic links are not always representative of future links

The analysis above is based on the assumption of linear effects and the assumption of a general effect on the creditworthiness of the companies. The approach is therefore of a macro-economic nature and not specific to any sector. One possible risk is, for example, that real estate companies could be affected more than other companies, which would therefore cause higher credit losses than expected. The model analysis is also completely dependent on historic links continuing to remain, which may not be the case in the future and could therefore be an uncertainty factor.

Conclusions

This report investigates the extent to which a fall in house prices can affect financial stability through banks financing their lending through covered bonds and the banks' credit losses from lending to companies. The conclusion is that the creditworthiness of covered bonds should not be under threat if house prices were to fall. However, the banks' costs and access to financing could be affected despite the good credit quality of the covered bonds; for example, investors could be less willing to buy Swedish covered bonds if house prices started to fall unexpectedly. This could then lead to higher mortgage rates, which could also have a negative impact on house prices. In terms of credit losses, the main conclusion is that the macro-economic development that takes place when house prices fall is a key factor for credit losses. An analysis of the credit losses in a macro-economic scenario, where monetary policy can react to a fall in house prices, shows that there would not be any major impact on credit losses in the banking sector. Although a different macro-economic development could cause large credit losses, this would probably not threaten the banks' capital adequacy either. The effect of the banks' financing and their credit losses are assessed as being the most probable channels through which a fall in house prices could affect financial stability. There are of course other channels that could have a more general effect on the economy as a whole. A strong fall in house prices would, for example, result in a drop in the mobility of the workforce if households had loan-to-value ratios of more than 100 per cent.

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Insolvent mortgage borrowers – a comparison between the USA and Sweden

Tom Andersson and Sofia Lindh*

In this article, we provide a description of how the regulations in the USA and in Sweden work when a mortgage borrower becomes insolvent. We also include a comprehensive discussion about the extent to which these rules could provide an explanation for the differences in loan-loss levels in mortgage lending in both countries. Comparisons show that the legal possibilities for a household to discharge itself from the obligation to pay its mortgage loan are greater in the USA than in Sweden. This is due primarily to the fact that borrowers in the USA can in certain cases give up or sell the property without any risk of being left with a residual debt. No such rules or loan terms exist in Sweden. Another important factor is the difference between the insolvency frameworks. The rules in the USA imply that lenders do not always have as much to gain from an insolvency procedure as Swedish lenders. The economic risks of a fall in prices on the housing market in the USA is therefore borne to a large extent by the lenders. In Sweden, it may be said that the opposite is the case.

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Introduction

In both the Swedish crisis in the 1990s and the latest global financial crisis, Swedish credit institutions' losses on mortgage lending were very limited. This is in stark contrast to the situation in the USA, where banks' and other financial institutions' severe losses on mortgage loans were themselves the very origin of the current crisis. The difference in loan-loss levels in both countries can be explained by a series of different legal, structural and economic factors. For example, it is likely that the US model, in which a large number of mortgage loans are securitised and sold, has had a negative effect on prudence in granting loans as well as the management of problem credits. Another explanation, which is often heard in the Swedish debate, is that US households have significantly greater possibilities than Swedish households of discharging themselves from the obligation to repay their debts if they get into payment difficulties and that the risks would therefore be greater for banks lending to households in the USA.

In this article, we provide a more detailed description of how the US and the Swedish regulations work when a mortgage borrower becomes insolvent. We also include a comprehensive discussion about the extent to which these rules *could provide* an explanation for the differences in loan-loss levels in mortgage lending in both countries. However, it is important to point out that this discussion only revolves around how the rules work and is not based on any empirical analysis. We are unable to comment in more detail in this article on the extent to which the rules themselves are an actual explanation for the level of the banks' loan losses.

The system in the USA

It should be pointed out to begin with that it is not possible to speak of a uniform set of insolvency regulations in the USA. The rights and obligations of lenders and borrowers in an insolvency situation may vary considerably from state to state. There are, however, several basic elements that are common to all states. The description provided below is therefore a general description of the typical procedure in a situation where a household is unable or unwilling to meet its mortgage payments.

When a household in the USA is unable to meet its payments on a mortgage loan, the lender can instigate a foreclosure process. The aim for the lender is to minimise its losses on the loan. The borrower, on the other hand, can take a number of alternative courses to avoid foreclosure. The borrower can, for example, try to negotiate with the lender on a temporary easing of the loan terms, for instance by obtaining a respite from amortisation or a reduction in the interest rate. If the lender is unwilling to negotiate, the borrower can attempt to delay or prevent foreclosure by filing for personal bankruptcy. However, if the borrower do not consider that it

is worth the trouble to fight to keep its home, he may, on his own initiative or in agreement with the lender, sell or transfer ownership of the property. In certain cases, the borrowers can thereby become free from their debts, even if those debts exceed the value of the property.

FORECLOSURE – THE LENDER'S OPTION

Foreclosure gives the lender the legal right to take possession over and sell the collateral provided for a mortgage if the borrower fails to make interest and amortisation payments under the contract. There are two main types of foreclosure procedures: *foreclosure by judicial sale* and *foreclosure by power of sale*[1]. A foreclosure by judicial sale means that the property is sold under the supervision of a court. The proceeds from the sale go firstly to the lender that granted the mortgage loan. Secondly, the proceeds go to other lenders that have taken the residential property as collateral and lastly they go to the borrower himself. Foreclosure by judicial sale is an available option in all states and required in many. A foreclosure by power of sale means instead that the lender has a right to carry out the sale without court supervision. The proceeds from the sale follow the same order of priority as in a sale supervised by a court[2].[3]

The foreclosure procedure is instigated by the lender and is normally started approximately three to six months after the first missed payment. The way in which foreclosure is managed varies greatly from state to state. The mortgage contract usually contains provisions on when a lender is entitled to instigate a foreclosure procedure. How long it then takes to sell the property also differs from state to state and may also depend on the situation on the housing market. Under normal market conditions, the process usually takes a couple of months. However, in a disadvantageous market situation, it can take a significantly longer time.

If the proceeds from the sale do not cover the loan and the lender's expenses, i.e. if a residual debt arises, most states grant the lender the right to lay claim on the borrower's other assets by pursuing a so-called *deficiency judgement*. However, even if this right exists, it is uncommon for lenders to file such a claim. This is largely due to the fact that there are seldom any other assets to lay claim on, either because the borrower simply lacks assets of any value or because the existing assets are pledged as collateral for other loans or covered by exemptions in bankruptcy law and cannot therefore be sold (see the section below on personal bankruptcy). Even if a deficiency judgement is permitted, in some states it can still not be pursued for

1 Two less common forms consist of *strict foreclosure* and *foreclosure by entry and possession*.
2 In most states, the borrower is also granted a right to repurchase (*right of redemption*), which means that the borrower has the right to repurchase the foreclosed property until it has been made subject to forced sale. In some federal states, the right of redemption continues to exist even after the property has been sold.
3 Li (2009).

certain types of mortgage loans. The state law may require that these – and other types of loans – must be *non-recourse*. This means that the lender can only require payment from the assets pledged as collateral for the loan.[4]

The financial risk of a fall in house prices is therefore largely borne by the lender. The lender cannot file a claim against the mortgage borrower for a residual debt if the mortgage loan is non-recourse or if state laws do not permit deficiency judgements. And in other cases the lender has little or perhaps nothing to gain by trying to collect a residual debt either because no assets exist or because any assets that do exist are pledged as collateral for other loans or are exempted from distraint under bankruptcy law.

THE BORROWER'S OPTIONS

If the borrower is concerned that a foreclosure may be instigated or when the lender has *de facto* given notice that it intends to start a foreclosure process, the borrower has a number of different options to attempt to avoid this happening.

Making missed payments

In several states the borrower has a certain period of time in which to make previously missed payments after the lender has given notice of foreclosure. However, that presupposes that the borrower has sufficient money to catch up with missed payments and additional charges. In the states where the borrower does not have such a right, the lender can cancel (*accelerate*) the loan or proceed with foreclosure as soon as the borrower falls behind with the payments.[5]

Renegotiation of loans

Another option is for the borrower and the lender to attempt to reach an agreement on the terms of the loan. It may be in the lender's interest to allow certain relief in the terms because a foreclosure is a costly process to go through. Foreclosure can also result in considerable losses for the lender, particularly if the value of the property has fallen since the loan was granted. An agreement can include everything from a temporary respite on interest and amortisation payments to lower interest rates or write-downs. One further option for the borrower is to attempt to obtain a loan with more favourable terms and use this to pay off the old loan.[6]

Despite the fact that seeking an agreement with the borrower would often be a cheaper solution for the lender, most insolvency cases still end with foreclosure. One explanation for this is that loans are often managed by a so-called service

4 Elias (2009).
5 See www.hud.gov and Elias (2009).
6 See www.hud.gov and Elias (2009) and also Adelino et al., (2009).

companies and not by the actual lender[7]. In general, these service companies have weak incentives to renegotiate the loan since they do not 'own' the loan themselves and therefore are not affected by any losses resulting from a foreclosure.[8] Another explanation is that the lender simply calculates that it would cost less to let the house go to foreclosure than to renegotiate the loan.[9]

In February 2009, the US government introduced the *Making Home Affordable Program* to make it easier for insolvent mortgage borrowers to renegotiate or refinance their mortgage loans. The aim is to reduce the number of foreclosures and help stabilise the US residential property market. The programme offers some financial relief for the service companies in return for adjusting borrowers' interest payments for a limited period.[10]

Personal bankruptcy

A last resort for an insolvent borrower who wishes to attempt to avoid or delay foreclosure is to file for personal bankruptcy. There are two types of bankruptcy procedure applicable to private individuals. These are governed at federal level in chapters 7 and 13 of the U.S. Bankruptcy Code. A common feature of both procedures is that foreclosure processes and other types of collection actions from lenders are automatically stayed as soon as an application for bankruptcy is submitted. This stay can only be lifted by a federal court.[11]

When a borrower files for bankruptcy under *chapter 7,* the debts are paid off by liquidation of the borrower's assets. Debts which are not covered by the liquidated assets are written off. However, certain assets are exempt from inclusion in the bankruptcy. One central exemption is the so-called *"homestead exemption"*[12], which *can* protect the borrower from losing his home in the event of personal bankruptcy. If the amount exempted is larger than the borrower's equity in the residential property, the administrator in bankruptcy cannot sell the property to pay off any debts that the borrower may have *in addition to* the mortgage loan. In this way, the property and the mortgage can be kept outside the bankruptcy. A write-off of the remaining debts can enable the borrower to regain the ability to pay interest and amortisation on the mortgage. Because it is possible that the borrower may regain his ability to pay when other debts have been written off, personal

7 Mortgage loans are managed by service companies and not by the lenders themselves because loans are securitised to a large extent.
8 See Thomson (2009).
9 See Adelino et al., (2009).
10 See www.makinghomeaffordable.gov.
11 An individual must fulfill certain criteria to be granted bankruptcy. These criteria have become more stringent in recent times, which has made it more difficult for bankruptcy to be granted.
12 The proportion of the value of the property exempt in the event of liquidation varies from state to state. In most states, the exemption applies up to a certain limit, but in some states the exemption applies to the entire property.

bankruptcy according to this procedure can be favourable for the lender granting the mortgage. However, if the borrower still will be unable to meet the payments on the mortgage a foreclosure procedure will follow.[13]

Personal bankruptcy under *chapter 13* means, instead, that the borrower may keep its assets. At the same time, he must allocate all his income to repay his debts in accordance with a repayment plan, although with certain deductions for living expenses. The borrower, or his representative, submits a proposed repayment plan to a bankruptcy court. If the court approves the repayment plan, payments will take place over a certain period, normally three or five years. If the repayment plan is fulfilled, most of the borrower's debts are written off. However, specific rules apply to mortgage loans. The payment on these loans cannot be adjusted in the repayment plan, but must instead take place according to the original loan terms. The loan is generally not written off after the repayment plan has expired. The aim of this special treatment is to ensure that the borrowers are given a chance to service their mortgages and keep their homes by obtaining relief on other types of debts. This kind of bankruptcy can also be favourable to the mortgage lender because the relief obtained by the borrower on his other debts means that he is in a better position to pay the mortgage. If, despite the bankruptcy, the borrower still are unable to service his loans during the repayment plan period, the court can dismiss the bankruptcy. As a consequence, the court can instead decide on bankruptcy through liquidation (chapter 7). In this case there is a considerable risk that the borrower may lose his home through foreclosure.[14]

Despite the fact that personal bankruptcy according to both procedures can make it easier for a borrower to pay his mortgage and keep his home, a large proportion of these cases still end up with foreclosure. This is because the borrower often fails to meet his payments to the lender even after bankruptcy. The lender also loses income since the payments are stayed during the bankruptcy procedure, while there is also a risk that maintenance of the property will not be kept up during the bankruptcy process, which will lead to a reduction in value.[15]

It should also be pointed out that even though a personal bankruptcy can in several respects be favourable for the borrower, it also leads to a number of negative consequences. Besides the fact that it can lead to a person losing his home, it also leads to a poorer credit score for the borrower. This means, first and foremost, that it becomes more difficult and more expensive to obtain credit in future. However, it can also affect such things as the possibility of renting accommodation or getting a job.

13 Li (2009), Ström & Zackrisson (2006), see also www.uscourts.gov.
14 Li (2009), Ström & Zackrisson (2006), see also www.uscourts.gov.
15 Li (2009)

Giving up the property

In the options discussed above, the borrower's aim may be to prevent or delay foreclosure in order to carry on living in the home. A household which, for financial or other reasons, is unable or unwilling to carry on living in the home has several options for divesting themselves of the property.

One option is for the borrower to simply abandon the property and deliberately allow it to proceed to foreclosure. This can be a financially advantageous strategy if the mortgage is non-recourse as the lender then cannot file a claim for any residual debts that remain after the property is sold. The borrower can then, in practice, leave the property and thus be discharged from his mortgage loan even if the sale fails to cover the full amount of the loan. However, the borrower will be liable to pay income tax on the amount that he thus avoids paying. The borrower cannot obtain a discharge in this way from other types of loans, for example unsecured loans and mortgage loans that are not non-recourse.[16]

The borrower can also seek voluntary agreement with the lender on how the property is to be divested. A first alternative, a so-called *short sale*, is when the lender allows the borrower to sell the property at a lower value than the loan and any residual debts are then written off. This can be an advantageous option for borrowers who do not have any chance of having their residual debts written off, for example if they do not have a non-recourse loan. A second alternative is for the lender and the borrower to sign a so-called *deed in lieu of foreclosure*. This means that the borrower hand over the ownership of the property to the lender. The difference between this option and the option described above in which the borrower relinquishes ownership by abandoning the property is that in this case this is done in consensus with the lender.[17]

In all of these cases, the lender suffers loan losses when the property is sold at a lower value than the size of the mortgage loan. As far as the borrower is concerned, there are also a number of negative implications in addition to the fact that the home is lost. Regardless of the form in which the property is divested, it will, for example, lead to a poorer credit score for the borrower. And, as pointed out above, this will mean that the borrower has less chance of obtaining loans in future and may also experience difficulties getting a job. As already stated, the borrower may also be obliged to pay tax on the debts written off.

The system in Sweden

When a Swedish household has a problem with payments, the lender is able to institute a distraint process similar to the US foreclosure procedure. In order to

16 Sew www.hud.gov, Elias (2009).
17 Elias (2009), see also www.freddiemac.com and www.hud.gov.

avoid distraint, the borrower's options consist of meeting the payments missed or attempting to come to an arrangement with the lender. However, an arrangement presupposes that the lender can be persuaded that it has more to gain by this than if the property is sold, which may be particularly difficult if the value of property is greater than the loan. Unlike the US system, there is no possibility for borrowers to make use of the Swedish insolvency rules to prevent foreclosure.

With regard to the borrower's possibilities of being discharged from his debts if the property is worth less than the mortgage loan, his only option, besides seeking an agreement with the lender, is to apply for so-called *skuldsanering* (debt restructuring). However, in most cases this can only be done after the property and other assets have been sold, either on the borrower's own initiative or through distraint and forced sale. In Sweden there are no rules corresponding to the rules often existing in the USA (requirements that a loan must be non-recourse or lack of rights to pursue a deficiency judgement) which forbid or prevent lenders from filing further claims after the property has been sold. Neither do the same generous exemption rules exist in insolvency law for private individuals to protect the borrower from having other assets distrained in order to repay any residual debt.

THE LENDER'S OPTIONS

If a borrower is over one month late with two or more payments or if the unpaid debts exceed a certain proportion of the sum owed, the Swedish Consumer Credit Act gives the lender the right to cancel the loan and file a claim for repayment of the entire loan amount plus accrued interest. However, reminders and demands for payment will have been sent out before an institution cancels a loan. Since the borrower can be invoiced quarterly and because the unpaid sums must amount to a certain proportion of the loan, it can take more than six months from the first missed payment before the bank is able to cancel the loan. The bank therefore enters into discussions with the borrower in order to bring about some form of arrangement to enable cancellation to be avoided.

If the borrower fails to fulfil the demand for repayment after the loan has been cancelled, the lender can apply for a payment injunction from Kronofogdemyndigheten (the Swedish Enforcement Authority). The borrower is then informed about the payment injunction. Discussions between the lender and the borrower can continue even though the case has been referred to the Enforcement Authority. If the market value of the residential property exceeds the loan amount, the bank often attempts to reach an agreement with the borrower regarding sale on the market. Provided that the payment injunction has not been contested or withdrawn (for example if the bank and borrower reach an agreement), a decision is made to issue a distraint order against the residential

property. The lender then has two months to apply for an executive sale of the property, after which the distraint order expires[18].[19]

At an executive sale, the residential property is sold and the proceeds from the sale is distributed in accordance with an established order of priority between, first, the parties with a lien on the property and, second, parties without liens. The costs for the executive sale shall in principle always be covered before the creditors are paid.[20]

If the sale does not cover the bank's claims, the borrower has a residual debt. This debt remains with the bank until it is paid or written off. If the mortgage lender has not requested a distraint order for the residential property, it can receive a distraint order for the borrowers other assets as long as this does not occur in competition with other lenders. If there are other lenders, the mortgage lenders first reference is to the lien on the residential property. Often, the lender's claim is so large that only the residential property is sufficient to cover the claim. But, if a residual debt remains after the residential property is sold, the lender can compete with other creditors for the borrower's other distrained assets.[21]

In Sweden, distraint and executive sale can only be carried out by the Enforcement Authority. There is no possibility for the lender, as in some US federal states, to sell the property on its own initiative (foreclosure by power of sale).

4 000 applications for distraint of cooperative housing and properties were received in 2010. Approximately a quarter of these were sold at executive auction.[22] In most cases, the borrower and the lender thus reached an agreement on an alternative solution to avoid distraint.

THE BORROWER'S OPTIONS

The primary option for a borrower who is unable to meet his payments on a loan is to try to get some form of agreement with the bank. If this is not possible, the process described above begins. If this ends in distraint and executive sale, leaving the borrower with a residual debt, the borrower – if he still cannot get an agreement with the bank – can apply for debt restructuring with the Enforcement Authority.

18 The borrower's obligation to pay, however, does not expire and, as a result of the decision, the lender can apply for the distraint of both the residential and other property.
19 www.kronofogden.se, see also SOU 2008:82.
20 www.kronofogden.se.
21 The rule for residential properties and tenant-owned apartments differs slightly since tenant-owned apartments are defined as personal property. For example, there is an exception in the Swedish Debt Enforcement Code that says that a tenant-owned apartment shall not be distrained if the apartment's value is unreasonable or if the apartment should be kept in respect of the needs of the borrower (see Chapter 5, section 1 of the Swedish Debt Enforcement Code). There is no similar rule for residential properties.
22 According to statistics from the Swedish Enforcement Authority.

Voluntary arrangement

An insolvent borrower can contact the bank to try to negotiate an arrangement. The aim is to reduce the burden of the loan to enable the borrower to get back on his feet. Such an agreement with the bank can involve improved terms through the adjustment of interest or repayments, for example.[23] Discussions concerning an agreement can continue even when the mortgage loan has been cancelled by the bank. As stated above, the bank would prefer to find a solution because that often means a lower loan loss.

Debt restructuring

The idea of debt restructuring is that the borrower pays off all or part of his debt according to a specific repayment plan and the debt is then written off. Debt restructuring is governed in the Swedish Debt Restructuring Act and is intended for debtors who are so indebted that they are unable to pay their debts in the foreseeable future. The procedure builds on the same principle as chapter 13 of the US bankruptcy regulations (see above). However, one important difference in the countries' rules is that a Swedish borrower cannot apply for debt restructuring in order to have his non-housing-related debts written off in order to obtain a better chance of service his mortgage loan and thereby keeping his home. The primary rule during a debt restructuring is that assets that are not considered to be necessary for the indebted person shall be sold before a debt restructuring can occur. However, there are exceptions. The indebted person could, for example, be allowed to keep a property that has a small positive equity. The mortgage then becomes excluded from the debt restructuring process and the indebted person may also reserve some of his income for servicing the mortgage. If the property has a negative equity and it is considered reasonable that the indebted person shall continue to live there during the debt restructuring, the amount of the mortgage that corresponds to the appreciated value of the property is exempt and the rest is restructured.[24]

If debt restructuring is decided on, the borrower must pay off his debt according to a specific repayment plan. The period for paying off the debt is normally five years. There is no floor or ceiling for the size of the repayments and they can be established at everything from zero kronor upwards. However, the aim is that the person subject to the debt restructuring should live at subsistence level during the repayment period and that all income over that level should go to paying off debts. When the five-year period has expired, all the borrower's debts are written off.[25]

23 See www.konsumentverket.se.
24 See www.kronofogden.se and the Swedish Debt Restructuring Act and SOU 2008:82.
25 See the Swedish Debt Restructuring Act and SOU 2008:82.

At this stage, the bank also writes off any remaining parts of the debt. According to statistics from the Swedish Enforcement Authority, just over one third of debt restructurings lead to zero arrangements, in other words the borrower does not need to pay anything at all during the restructuring period. There is therefore an incentive for the lender to attempt to avoid debt restructuring and instead write down the loan and agree on a payment plan for the customer. The borrower is then obliged to pay off the remaining part of the loan. Such a solution often generates more income for the bank than debt restructuring.

Private individuals can in principle only be granted debt restructuring once during their lifetime[26], unlike in the USA where there may be a possibility of obtaining debt restructuring under chapter 13 more than once[27]. Approximately 4,000 applications for debt restructuring were approved in Sweden in 2009. A mortgage loan formed the basis of the debt problem in 16 per cent of the cases.[28]

Before the Debt Restructuring Act was passed in 1994 it was substantially more difficult for private individuals to have their debts written off. At that time, an insolvent debtor could apply for personal bankruptcy, but in order to have his debts written off he was forced to reach a composition settlement with the lender[29], which means that the lender writes down a certain part of the debt.

PERSONAL BANKRUPTCY – AN OPTION FOR BOTH PARTIES

Private individuals can also be subject to personal bankruptcy. An application for personal bankruptcy can be submitted by both the owner of the debt and the indebted person. In a bankruptcy, the borrower's property is sold off and the proceeds are used to pay the debts in accordance with the Swedish Rights of Priority Act[30]. Debts that are not paid off remain outstanding. During the bankruptcy, the borrower loses the right of disposal over his or her assets. Instead, a trustee has the right of disposal over the borrower's assets and sells them to repay the lender and other creditors. If a property is sold in conjunction with a bankruptcy, the lender may be paid for its claim to the extent the lien is covered by the sale price. If the claim is not covered by the sale price, the lender is referred to any eventual payments to unprioritised creditors. The claim that remains after the bankruptcy is valid as long as it is not prescribed.[31]

26 www.kronofogden.se and SOU 2004:81.
27 Bankruptcy Abuse Prevention and Consumer Protection Act.
28 According to statistics from the Swedish Enforcement Authority.
29 Government bill 1993/94:123 Debt Restructuring Act.
30 The regulations set out in section 6 of the Swedish Rights of Priority Act apply to both distraint and bankruptcy.
31 See Ström & Zackrisson (2006) and Bankruptcy Act (1987:672).

Conclusions

The above comparison shows that the possibilities for a household to discharge itself from the obligation to pay its mortgage loan are greater in the USA than in Sweden. This is due primarily to the fact that in certain cases it may be legally possible for borrowers in the USA, unlike in Sweden, to give up or sell the property without any risk of being left with a residual debt. No such rules or loan terms exist in Sweden. The only possibility for a Swedish borrower to be discharged from a residual debt is to reach a debt write-down agreement with the bank or undergo a debt restructuring process. Another important factor is the difference in the US and the Swedish insolvency frameworks for private individuals. The rules for personal bankruptcy in the USA imply that the banks – even though they have a legal right to file a claim for a residual debt – do not always have as much to gain in an insolvency procedure. In addition, the US bankruptcy rules, unlike the Swedish Debt Restructuring Act, can be used to prevent or delay foreclosure. In Sweden, debt restructuring is, in principle, only granted after all assets have been sold off.

From the point of view of the borrower, this means that the financial risks involved in getting into debt are lower in the USA than in Sweden, something which is probably also important for the amount of credit households demand. All other things being equal, it is reasonable to suppose that households in the USA are willing to take on a greater burden of debt than Swedish households. And higher indebtedness on the part of households also means greater loan risks in the lending institutions.

Overall, this means that the risks involved in mortgage lending are greater in the USA than in Sweden. The possibilities of evading liability for any residual debts means that the financial risks involved in a fall in prices on the residential property market are largely borne by the lenders. In Sweden, it may be said that the situation is the opposite. The inability to leave a residential property that is burdened with a loss and get rid of the debt, in combination with relatively strict insolvency rules, mean that the risk of a fall in prices is largely borne by households themselves.

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Asset prices, financial stability and monetary policy*

Franklin Allen and Kenneth Rogoff*

The theoretical and empirical literatures on monetary policy and real estate prices are rapidly evolving. There is considerable debate about whether monetary policy should play a role in forestalling dangerous real estate bubbles that have the potential to trigger financial crises. This paper provides a selective survey of this literature. The focus is on research that incorporates financial frictions and asset price bubbles that have the potential to create the discontinuous collapses that have been witnessed periodically. The possible role of macroprudential regulation in controlling real estate prices is also discussed. Our conclusion is that monetary policy and macroprudential regulation both need to be used to guard against real estate bubbles.

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1. Introduction

This paper gives a selective review of the literature on monetary policy and real estate prices, including both empirical and theoretical contributions.[1] The literature is rapidly evolving and there is considerable debate, particularly about whether monetary policy should play a role in forestalling dangerous real estate bubbles, even if the monetary authorities can recognize them. There is no question that too much of the academic literature on central monetary policy is built on models with perfect financial markets, which essentially assume away any debt catastrophes associated with real estate crashes. The small literature that does incorporate financial frictions mainly does so in a way that creates second-order distortions, but does not yield the kind of catastrophic discontinuous collapses that have been witnessed periodically in practice.

This paper surveys recent research that attempts to incorporate financial frictions and bubbles, and to allow for a possible role for monetary policy in exacerbating leverage cycles. We discuss this literature in sections 3-6 of the paper. Section 7 discusses the view that properly tuned macroprudential regulation policy can relieve monetary policy of any need to focus on real estate prices except as a helpful indicator in predicting near and medium-term inflation and unemployment. Our read of the literature is that it is probably dangerous to adopt any extreme position. Even if macroprudential regulation is the first line of defense, it can be subject to political pressures that leave significant vulnerabilities if monetary policy is not vigilant. Fundamentally, because of the central bank's role as lender of last resort, macroprudential policy and monetary policy have to be inter-linked.

In section 2 of the paper, we give an introduction to some related empirical literature, underscoring both the importance of being alert to real estate bubbles, while at the same time showing how difficult they can be to quantify in practice.

2. Evidence on real estate prices and financial crises

The empirical literature on house price bubbles and monetary policy, while limited, still presents a strong case for continuing attempts by central banks to monitor major upward spikes in house prices as an important part of any approach to risk management. As Reinhart and Rogoff (2009) argue, credit-boom-fueled housing price spirals are particularly pernicious. In economies where a significant portion of consumers are credit constrained, a sharp rise in housing prices can have effects on consumption far in excess in of the usual relatively small wealth effects. At the same time, the financial liberalizations undertaken by many countries in the 1980s

1 We focus particularly on real estate cycles as leverage tends to be very high in this sector and, for many consumers it is both their main asset and their main liability. Equity price bubbles can in principle present similar issues where debt finance is important. Our theoretical analysis takes both kinds of cycles into account.

and 1990s have led to greatly expanded loan to value ratios in the housing market, thereby raising the financial system's vulnerability to a housing price collapse. Similar arguments can be made concerning commercial real estate.

There is, however, enormous debate surrounding how reliably central banks can identify housing price bubbles in the data. The nearly decade long global housing price boom that occurred in the run-up to the 2007 financial crisis is illustrative of the issues. In the September 2004 *World Economic Outlook* [2], IMF economists identified a number of global factors that contributed to the boom, including per capita income growth, interest rates and bank credit.

For 18 industrialized countries, covering the period 1971-2003, they report the regression below.[3]

Table 1. A cross country analysis of housing price growth, 1971-2003

EXPLANATORY VARIABLES	DEPENDENT VARIABLE (REAL HOUSE PRICE GROWTH)	
Lagged real house price growth	0.521	(0.030)
Lagged house affordability ratio	-0.144	(0.021)
Real per capita disposable income growth	0.530	(0.119)
Short term interest rate	-0.507	(0.109)
Real credit growth	0.109	(0.036)
Lagged real stock price growth	0.033	(0.009)
Population growth	1.754	(0.623)
Bank crisis	-2.426	(0.952)

Note. Standard deviations in parentheses. Number of observations: 524.

Looking at deviations from the overall cross-country regression line, the IMF researchers argue that, on average, the model is able to explain most of the increase in housing prices internationally over the sample period, 1971-2003. However, they identified four countries: Australia, Ireland, Spain and the United Kingdom, as having price increases ten to twenty percent above the level that could be explained by fundamentals. United States housing price increases, through 2003, had a deviation of a less than ten percent from the regression line

In general, a major problem in looking for housing price bubbles is that it can be hard to assess the risk of long-term structural shifts in key underlying macroeconomic parameters. For example, many analysts have pointed to the apparent trend decline in global long-term real interest rates as justifying a worldwide increase in housing prices. This point was emphasized in the IMF's April 2008 World Economic Outlook, which identified declining real interest rates as a major driver of global house price increases during the 2000s. Of course, not only did interest rates decline in the financial center countries, but they declined

2 See *IMF World Economic Outlook*, September 2004, Ch. 2, "The Global House Boom", Marco Terrones (lead author).

3 IMF WEO, September 2004, Table B2.1.

disproportionately more in periphery countries, particularly in the Eurozone, possibly in ways that were partly transitory, As has become all too painfully evident in the Eurozone periphery countries, there is always a risk that over the long run, real interest rates trends will reverse, creating problems in regions where housing purchases are heavily leveraged.

Macroeconomic volatility is another fundamental determinant of asset prices that is dangerous to extrapolate. Using relatively standard consumption capital asset pricing models, Lettau and Ludvigson (2007) showed that one could rationalize a significant share of the trend rise in risky asset prices thanks to the long period of the Great Moderation, where macroeconomic volatility fell significantly. Post 2008, of course, it is far from clear how much of this trend fall in volatility is actually permanent versus temporary.

Finally, whereas the global financial crisis revealed the malign side of financial deepening, it is also the case the financial development helped make housing a more liquid asset for many consumers, particularly in countries where it is possible to add second mortgages or refinance as housing prices rise. Rising liquidity also, in principle, can contribute to a rise in housing prices.

Indeed, after the global financial crisis and the subsequent collapse of housing prices in many countries, especially the United States, many of the above rationales for higher housing prices seem now to ring hollow. Certainly the argument that all real asset prices should be higher because of the Great Moderation (decline in macroeconomic volatility) now seems far less convincing as macroeconomic volatility has spiked. The argument that houses are worth more because they have become more liquid clearly rested far too much on pro-cyclical factors that have gone into reverse as housing prices have fallen. But other core rationales for high housing prices still stand. Whereas global risk premia have risen after the financial crisis, global real interest rates have remained at very low levels. Population growth continues to drive housing prices in many countries, particularly where, due to geography and regulation, supply remains scarce. The contrast between the United Kingdom and the United States is a good case in point. Whereas housing prices in the United States have fallen over 35% in real terms (by the Case Shiller index), they fell only 15% in the UK, and have since risen back roughly 10%. In contrast to the US, where millions of new homes are built each year in normal times, zoning restrictions have kept UK residential investment relatively small.

Just as housing prices depend on a variety of complex fundamentals, leverage is also a function of fundamentals. In the UK, if home prices remain firm and real interest rates remain low, one might expect a lower pace of deleveraging than in the United States. In countries such as Canada and Sweden, where the financial system was more resilient during the crisis, leverage and house prices are rising and now stand above pre-crisis levels.

One useful way to analyze housing price trends is to look at cross country analysis, using new data bases on housing prices (e.g., such as those presented by Reinhart and Rogoff, 2009.) It is particularly helpful to take out global factors, so as to be able to focus on idiosyncratic country trends. Even so, there are limitations. The IMF 2004 paper was prescient in calling the housing bubbles in Spain and Ireland. But in Australia, another country labeled by the IMF report as significantly overvalued at the end of 2003, trend housing prices have continued to rise sharply. Indeed, in the Economist (October 23, 2010) index of housing prices, Australia is listed as the most overvalued housing price market in the sample based on price to rent ratios (63%). (Sweden, too, is listed as very richly valued (42%).)

It certainly appears to be the case that the transmission mechanism for monetary policy has changed over time, particularly for countries such as the United States with very deep and sophisticated mortgage markets. As Leamer (2007) notes, traditionally, residential real estate investment cycles have played a surprisingly significant role in major monetary cycles, despite the fact that on average, residential real estate (and associated industries such as home furnishings) are usually at most 5 or 6 percent of GDP in normal times. But as financial liberalization has proceeded, housing price fluctuations have become increasingly important in the transmission from housing to the real economy. As the IMF *World Economic Outlook* (April 2008) argues, the effect of monetary policy on housing prices has become increasingly important relative to the effect on housing investment. As we will later discuss, recent theoretical advances also suggest that monetary policy can exacerbate bubbles in a leverage cycle.

Despite all the uncertainties, one strong argument for taking account of housing prices in monetary policy is seen in the literature on the aftermath of financial crisis. Large and very long-lasting housing price collapses are the norm. Table 2 is taken from Reinhart and Rogoff (2009), chapter 13.

Table 2 (from Reinhart and Rogoff, 2009). Real housing price cycles and banking crises

COUNTRY	CRISIS DATE	PEAK	TROUGH	DURATION OF DOWNTURN	MAGNITUDE OF DECLINE (IN PERCENT)
Advanced economies: The big 5					
Finland	1991	1989:Q2	1995:Q4	6 years	–50.4
Japan	1992	1991:Q1	Ongoing	Ongoing	–40.2
Norway	1987	1987:Q2	1993:Q1	5 years	–41.5
Spain	1977	1978	1982	4 years	–33.3
Sweden	1991	1990:Q2	1994:Q4	4 years	–31.7
Asian crisis: The big 6					
Hong Kong	1997	1997:Q2	2003:Q2	6 years	–58.9
Indonesia	1997	1994:Q1	1999:Q1	5 years	–49.9
Malaysia	1997	1996	1999	3 years	–19.0
Philippines	1997	1997:Q1	2004:Q3	7 years	–53.0
South Korea	1997		2001:Q2	4 years	–20.4
Thailand	1997	1995:Q3	1999:Q4	4 years	–19.9
Other emerging					
Argentina	2001	1999	2003	4 years	–25.5
Colombia	1998	1997:Q1	2003:Q2	6 years	–51.2
Historical episodes					
Norway	1898	1899	1905	6 years	–25.5
US	1929	1925	1932	7 years	–12.6

Sources: Bank of International Settlements and the individual country sources described in the Data Appendix in Reinhart and Rogoff (2009).

As the table illustrates, the average fall in housing prices after a financial crisis is very substantial (36%) whereas the duration of the fall (from peak to trough) lasts an average of five years, even excluding Japan.

The table contains only two pre-World War II housing price collapses, as long-dated time series on housing prices are scarce. However, other measures of housing market collapse indicate a similar pattern. Table 3 (taken from Reinhart and Rogoff, chapter 16) illustrates the depth and breadth of the housing price declines that occurred around the Great Depression.

Table 3. Indices of total building activity in selected countries in the Great Depression of the 1930s (from Reinhart and Rogoff, 2009, Chapter 16)

(1929 = 100)

COUNTRY	INDICATOR	1932
South Africa	Buildings completed (value)	100
Argentina	Permits (area)	42
Australia	Permits (value)	23
Belgium	Permits (number)	93
Canada	Permits (value)	17
Chile	Permits (area)	56
Colombia	Buildings completed (area)	84
Czechoslovakia	Buildings completed (number)	88
Finland	Buildings completed (cubic space)	38
France	Permits (number)	81
Germany	Buildings completed (rooms)	36
Hungary	Buildings completed (number)	97
Netherlands	Buildings completed (dwellings)	87
New Zealand	Buildings completed (value)	22
Sweden	Buildings completed (rooms)	119
United Kingdom	Permits (value)	91
Unites States	Permits (value)	18
Average		64
Memorandum item:		
United States	Permits (number)	25[1]
September 2005 peak = 100		

[1] Through February 2009.

Source: Carmen M Reinhart and Kenneth Rogoff, *This Time is Different: Eight Centuries of Financial Folly*, Princeton University Press 2009.

If one invokes the "Greenspan principle" that monetary policy should not try to lean against the wind in asset price bubbles, but only clean up "the mess" afterwards, then it must certainly be acknowledged that the "mess" after banking crises can be quite large.

3. The traditional view on monetary policy and real estate prices

Having provided a cursory view of the empirical literature, we now discuss the literature on the theory of monetary policy and real estate prices, also discussing further empirical work where particularly relevant.

In recent years the conventional view in the macroeconomics literature has been that the best way to conduct monetary policy is for central banks to adopt inflation targeting. Giavazzi and Mishkin (2006) give an excellent account of this.[4] Before the consensus on the desirability of inflation targeting developed, there was a widespread belief that there was a trade-off between unemployment and inflation. As the Phillips Curve illustrated, by lowering interest rates it was possible

4 This section draws on their account of inflation targeting.

to stimulate the economy and lower unemployment but at the expense of higher inflation.

Phelps (1967) and Friedman (1968) argued instead that there was a natural rate of unemployment that the economy reverted to in the long run no matter what the rate of inflation. Lucas (1972, 1973, 1976) and Sargent and Wallace (1975) ushered in the rational expectations revolution by showing that there was no long run trade-off, only a short term one. Once it became accepted that monetary policy cannot affect the unemployment rate in the long run, the next step was to realize that monetary policy should be focused on controlling inflation. After the high inflation era of the 1970s and 1980s the inefficiencies of inflation were well appreciated and this led to the desire to lower inflation rates substantially.

Kydland and Prescott (1977), Calvo (1978), and Barro and Gordon (1983) pointed out that because there is a short term tradeoff between unemployment and inflation there is a time-inconsistency problem. Governments tend to have a short term orientation because of the election cycle. As a result there is always the temptation to cut interest rates to boost the economy before an election even though there is no long run gain and in the short run there is the cost of increased inflation. Rogoff (1985) proposed, as an institutional solution to the time consistency problem, creating an independent central bank that places a significant weight on an inflation target.

These contributions provide the intellectual foundations of inflation targeting or more broadly, the establishment of an independent central bank with a conservative attitude towards inflation. As many central bank designers recognized, achieving inflation and macroeconomic stability involves a number of supporting measures, beyond establishing an independent central bank with a high weight on maintaining inflation stability. The first is establishing fiscal stability. If governments run large fiscal deficits and build up significant amounts of debt, there will be a temptation to undermine the independence of the central bank, and there is pressure to inflate away the value of this debt. If, on the contrary, governments are fiscally responsible, price stability is feasible.

The second necessary condition for a stable inflation regime to be viable is financial stability. Poor regulation and supervision of financial institutions may lead to large losses in the financial sector. This could, for example, prevent the raising of interest rates to fight inflation if the banks and other institutions were in a bad situation. Financial regulation has been mostly based on a microprudential approach. In most countries throughout most of history, banks have been regulated largely on an individual basis. The idea was that if individual banks are limited in the risks they take, there cannot be a problem in the financial system. Unfortunately, the recurrent occurrence of systemic financial crises has shown that this approach is

not correct. For financial stability to be achieved, macroprudential policies need to be designed based on systemic risks.

The third necessary measure is to determine the mandate of the central bank. Mandates may differ depending on whether they are required to just fight inflation like the European Central Bank or whether in addition they are required to maintain full employment like the Federal Reserve. In practice, the different mandates of central banks often imply greater differences in communication strategies than actual interest rate policy. In the run-up to the financial crisis, inflation targeting was a mandate that many central banks gravitated towards, albeit with widely differing interpretations encompassing a very broad range of institutions and policies. The appeal of inflation targeting as a communication device was appealing to central bankers especially because it underscores their desire for independence from fiscal policy, as well as from election cycles.

In order for inflation targeting to be implemented, in any form, a target consumer price inflation rate is chosen. This can be done by the central bank itself or by the government. The target inflation rate acts as a nominal anchor for the economy and the independent central bank has to ensure that this target is implemented. It does this by making medium term forecasts. This used to be done assuming a constant rate but the Riksbank and a number of other central banks now project a path of policy rates going forward. If inflation looks to be too high, the central bank will raise interest rates, while if it is set too low it will cut rates.

In practice many factors are taken into account in the process of setting interest rates particularly if the central bank has a dual mandate that is concerned with the level of economic activity as well as inflation. The policy response depends on the type of shock that has hit the economy and normally on how the policy maker weighs stabilizing inflation and output. One of the main issues to have arisen with inflation targeting is the extent to which asset price inflation and in particular real estate prices should be taken into account in setting interest rates. It has been widely argued that central banks should only take asset prices into account to the extent they affect consumer price inflation and economic activity (see, e.g., Giavazzi and Mishkin, 2006). The idea is that asset prices are useful for providing information and may play a role in the transmission mechanism. However, they should not be targeted. In some countries such as Sweden and Australia real estate prices are discussed and taken into account from a financial stability perspective. This is discussed further below.

A standard tool of inflation targeting central banks is Dynamic Stochastic General Equilibrium Models (DSGE). These usually do not include a banking sector, nor indeed any kind of friction in financial markets. (In the abstract world of much modern macroeconomic theory, banks are simply a device for dealing with transactions frictions and agency problems, which are simply assumed away for

analytical convenience and computational tractability.) The underlying assumption is presumably that problems in the banking sector are taken care of by regulation and systemic risk has been eliminated. To the extent there is a financial sector, it consists of bond and stock markets that are important determinants of wealth. Where a more complex financial sector has been included in such models, as in Bernanke, Gertler and Gilchrist (1999), they typically involve a distortion based on a wedge in a first order condition that leads to inefficiency rather than a discontinuous event such as a real estate bubble that causes a crisis.

4. Problems with the traditional view and new approaches

The framework described above has turned out to be inadequate to say the least. Prudential regulation has failed to maintain financial stability largely because it has not properly recognized the problem of systemic risk for banks. In practice systemic risk arises from a number of sources including common exposure to asset price bubbles, particularly real estate bubbles, liquidity provision and mispricing of assets, multiple equilibria and panics, contagion, fiscal deficits and sovereign default, and currency mismatches in the banking system. Here we focus on real estate bubbles as the cause of systemic risk since this is arguably the most important source of systemic risk.

As already mentioned above, Reinhart and Rogoff (2009) provide evidence that collapses in real estate prices, either residential or commercial or both, are one of the major causes of financial crises. In many cases these collapses occur after bubbles in real estate prices that often appear to be associated with loose monetary policy and excessive availability of credit. When the bubbles burst, the financial sector and the real economy are adversely affected.

The current crisis provides a good example of this. Allen and Carletti (2009) argue that the main cause of the crisis was that there was a bubble in real estate in the U.S. but also in a number of other countries such as Spain and Ireland. When the bubble burst in the U.S., many financial institutions experienced severe problems because of the collapse in the securitized mortgage market. Problems then spread to the real economy. Figure 1 shows the movement in real property prices in Ireland, Spain, Sweden and the U.S. It can be seen that in Ireland, Spain and the U.S. prices rose significantly and then dropped. It is interesting to note that prices have fallen much more in Ireland than in Spain or the U.S. This is why the Irish banking system has been so badly affected and why they have already required a bail out from the European Financial Stability Fund. In Spain prices have not fallen very far yet and this is one of the reasons their banking system has fared better than in Ireland (though the story is far from over yet). The figures for the U.S. are for the country as a whole. One of the important factors is that the real estate bubbles in the U.S. were regional in nature. They were focused in areas such as Las Vegas, Miami, and

Los Angeles. Many parts of the U.S. did not suffer from very large movements. Interestingly Sweden has had a very large run-up and now has real prices that are higher relative to their 1996 level than the peak that occurred in Spain.

It is wrong to say that economists missed this problem entirely. We have already discussed warnings in the IMF World Economic Outlook (September 2004) which echoed earlier warnings in the April 2003 World Economic Outlook, warnings that were repeated albeit in the run-up to the crisis. But as we will discuss below, during a bubble, there are very strong political pressures on regulators to ignore such problems, a classic symptom of the "This Time is Different" syndrome.

In fact, it can be argued that the real estate bubble in these countries was the result of loose monetary policy and global imbalances that led to excessive credit availability. These are problems that might have been addressed to help mitigate the crisis, had they been more broadly recognized and understood. Central banks, in particular the Federal Reserve in the U.S., set very low interest rates during the period 2003-2004 to avoid a recession after the bursting of the tech bubble in 2000 and the 9/11 terrorist attacks in 2001 at a time when house prices were already rising quite fast. As argued by Taylor (2008) and illustrated in Figure 2, these levels of interest rates were much lower than in previous U.S. recessions relative to the economic indicators at the time captured by the "Taylor rule". In such an environment of low interest rates, people in the U.S. started to borrow and buy houses to benefit from their growing prices. Unlike stock prices where returns are serially uncorrelated, in fact returns on housing are positively serially correlated as found by Case and Shiller (1989), Englund, Quigley and Redfearn (1998), and Glaeser and Gyourko (2007). If this correlation is due to economic factors such as market microstructure effects rather than measurement problems, this means that by lowering interest rates significantly below the current rate of house price appreciation, the Fed effectively created a profitable opportunity to buy property. Other public policies such as the tax deductibility of interest on mortgages contributed further to the advantages of buying property and the housing boom.

The issue of how much monetary policy contributed to the real estate and leverage bubble is controversial, with some observers pointing to the fact that the central bank was largely successful in achieving its inflation mandate. One narrow answer to this point is to follow the rationale of some central banks for taking into account housing prices, namely that the central bank should have a longer horizon than just a couple of years, since it is by nature extremely difficult to call the timing of financial market crashes.[5]

5 Reinhart and Rogoff (2011) discuss a range of models suggesting that countries vulnerability to financial crises can be assessed quantitatively but that the exact timing depends on factors such as confidence which can be extremely fragile.

Figure 1 illustrates the run-ups in property prices in Spain and Ireland we have already discussed. According to Taylor (2008) and as shown in Figure 2, these countries also had loose monetary policies relative to the Taylor rule. Spain, which had one of the largest deviations from the rule, also had the biggest housing boom as measured by the change in housing investment as a share of GDP. Other countries in the Eurozone such as Germany did not have a housing boom. Their inflation rates and other economic indicators were such that for them the European Central Bank's interest rates did not correspond to a loose monetary policy. Sweden did not deviate nearly as much as Spain and Ireland from the Taylor rule. The rise in prices there may therefore reflect changes in fundamentals rather than being a bubble.

There is considerable debate about whether the Taylor rule provides a firm indication of the "correct" level of interest rates. Furthermore, it is difficult to use monetary policy to lean against asset price bubbles in individual countries in a single currency area such as the Eurozone. Bernanke (2010) has argued that the Taylor rule is sensitive to the choice of inflation measure and to whether actual or forecasted inflation and output gaps are used. Once changes in these measures are introduced, it is no longer clear whether interest rates were unusually low given the state of the economy or whether house prices were unusually high given interest rates and the state of the economy. Bernanke (2010) concludes that Taylor`s claim is not persuasive enough. He suggests that what seems to have played a crucial role in setting the stage for the crisis is financial innovation in the form of mortgage contracts and securitization. Rather than interest rates being set too low, the implications of financial innovation for monetary policy transmission were not understood by monetary policy makers. This failure together with weak financial regulation and supervision set the stage for the crisis.

However, on the other side of this debate there is a considerable amount of evidence accumulating that low interest rates increase risk-taking by banks both in terms of real estate and other loans. This is the so-called risk-taking channel of monetary policy. Maddaloni and Peydró (2010) consider the impact of low interest rates and securitization on bank lending standards and risk-taking using data from the Euro area and the U.S. They find evidence that low short term (policy) interest rates result in a softening of lending standards and increase in bank risk-taking. This effect is magnified when supervision standards for bank capital are weak, interest rates are held low for an extended period, and the more securitization there is in an economy. Their results are more in line with Taylor's view that loose monetary policy is an important cause of the crisis.

Jiménez, Ongena, Peydró, and Saurina (2010) consider the impact of short term interest rates on banks' risk taking. They use a unique data set from Spain on all loans since 1984 as well as all loan applications since 2002 up until the beginning of

2009 that can be matched with relevant bank and firm information. They find that loose monetary policy in terms of low short term interest rates leads banks to take greater risks when granting loans, particularly banks with lower capital. Low long term rates have much smaller effects. Ioannidou, Ongena and Peydró (2009) study data from the credit register in Bolivia and find similar results.[6]

As Allen and Gale (2000, 2007) have argued, asset price bubbles are also caused by growth in credit. During the recent crisis, credit expanded rapidly in the countries with a loose monetary policy due to the presence of global imbalances. Several Asian countries started accumulating large amounts of reserves in the late 1990s and these grew to high levels. Figure 3 illustrates that this acquisition of reserves was an Asian phenomenon. In Latin America and Central and Eastern European countries reserves did not increase significantly. There are a number of reasons behind this accumulation. Allen and Carletti (2010) argue that the Asian countries affected by the crisis of 1997 started accumulating reserves in response to the tough conditions that the International Monetary Fund imposed on them in exchange for financial assistance. The motivations for the reserve accumulation of China, which is the largest holder, are probably more complex than this. Beside the precautionary reason, China started accumulating reserves to avoid allowing its currency to strengthen and damage its exports as well as to increase its political power.
The accumulated reserves were mostly invested internationally. Much of it was invested in U.S. dollars in debt securities such as Treasuries, and Fannie and Freddie mortgage-backed securities. The large supply of debt in the U.S. helped to drive down lending standards to ensure that there was enough demand for debt from house buyers and other borrowers. However, funds did not only flow to the U.S. Spain and Ireland (among others such as Portugal and Greece) also ran large current account deficits as shown in Figure 4. Interestingly Sweden has not run a large deficit as the figure shows. This also suggests that price rises in Sweden might not have been driven to quite the same extent as in the United States by low interest rates and abundant credit. Nevertheless, the authorities still need to be alert to high private leverage even if Sweden overall is a net creditor to the rest of the world.

The burst of a real estate bubble has a clear effect on the stability of the financial sector as documented in Reinhart and Rogoff (2009). In the current crisis, for example, the sudden drop in securitized asset prices starting in the summer of 2007, triggered by the fall in real estate prices and the large volatility that followed, worsened the balance sheets of financial institutions significantly and froze several financial markets including the normally stable interbank market.

6 There is now a large literature with similar results using a variety of data sets on the importance of the risk-taking channel. See, e.g., Gambacorta (2009), Altunbas, Gambacorta and Marques-Ibanez (2010), Bekaert, Hoerova and Lo Duca (2010), and Delis and Kouretas (2010).

The financial crisis then spread to the real sector. The burst of a bubble can, however, also create direct damaging effects on the real economy. In Spain during the current crisis, for example, the bursting of the property bubble led to a doubling of unemployment in the country to around 20 percent. However, the financial sector was not affected as much as one might infer, at least initially, thanks to strict financial regulation and the use of some macroprudential instruments such as countercyclical loan loss ratios. (Whether Spain's better macroprudential regulation will prove enough in the face of other structural weaknesses remains an open question as the European debt crisis unfolds.) The fact that the burst of a bubble can affect both the financial and the real sector significantly underlines the importance of preventing bubbles.

While most of the macroeconomic literature has argued that central banks should not target real estate and other asset prices, there are a number of papers that stress the importance of asset prices. Kiyotaki and Moore (1997) emphasize problems when asset prices collapse through collateral and other effects. Borio and Lowe (2002) and Borio, English and Filardo (2003) argue the question is not so much about pricking asset price bubbles, but whether central banks should lean against the buildup of financial imbalances which may later unwind at a much larger cost. Bordo and Jeanne (2002a, b) propose a model to investigate the optimal response of monetary policy to asset price booms when this risks leading to large collapses in lending and economic activity. They argue that taking preemptive action using monetary policy to prevent large run ups in asset prices can be desirable if significant falls in asset prices can have serious effects on real output. None of these papers model asset price bubbles or the possible role of interest rates in causing them.

Very few central banks have taken the approach of targeting real estate prices. Cecchetti (2005) and Cagliarini, Kent and Stevens (2010) give the examples of Australia and Sweden. In Australia in 2003 an increase in interest rates that was partially justified to the public by developments in the housing markets led to a softening of the real estate market and a fall in nominal house prices in a number of areas of the country.

Sweden's central bank, the Riksbank, has for some time considered property prices when making interest rate decisions. Ingves (2007, pp. 433-434) explains the rationale for this in the following way.

> "Let me say at the outset what I and other members of the Executive Board have said on many occasions – Sveriges Riksbank does not have a target either for the level of house prices or for house price inflation, or for any other asset price for that matter. However, when we observe long periods of high growth rates in asset prices and debt, growth rates that appear to be unsustainable in the long

> run, our view is that it is not reasonable to completely ignore that there may be risks associated with this, even though it is difficult to give consideration to these risks in any simple manner in our regular forecasting process. What this view has meant in practice is fairly marginal changes in the timing of our interest rate changes, and substantial public oral and written focus on the issue."

Ingves gives the example of February 23, 2006 when the Executive Board of the Riksbank voted to raise the interest rate by 0.25% because of house price increases.

The current practice of the Riksbank is well illustrated by the Executive Board minutes for their October 2010 meeting. There was an extensive discussion of the potential danger from a future drop in housing prices and the likelihood of this occurring. On the one hand, there was a considerable expansion in households' mortgage debt and housing prices might continue to rise as a result. On the other hand, marginal mortgage holders who have new loans and the highest levels of indebtedness were not perceived as particularly vulnerable as they could pass extreme stress tests. In the end there was a divergence of opinions but interest rates were increased with the fears about the housing market going forward playing some part in the decision.

5. Theories of real estate bubbles

One interpretation of the Riksbank's policy is that if there is evidence of a growing bubble in real estate central banks may want to take actions to try and cool such bubbles. In order to understand why this kind of response makes sense and what other policies should be used to combat bubbles in real estate prices and prevent financial crises it is necessary to have a theory of bubbles. What is missing from the Taylor (2008) explanation and much of the other macroeconomics literature on this topic is a theory of why low interest rates and credit expansion lead to real estate bubbles.

Standard neoclassical theory and the efficient markets hypothesis suggest that bubbles cannot occur. In practice, one important factor in the development of bubbles appears to be the amount of liquidity provided by the central bank as money or credit. Kindleberger (1978; p. 54) emphasizes the role of this factor in his history of bubbles: "Speculative manias gather speed through expansion of money and credit or perhaps, in some cases, get started because of an initial expansion of money and credit."

The sequence of events in the current crisis is, in fact, often observed. Kaminsky and Reinhart (1999) study a wide range of crises in 20 countries including 5 industrial and 15 emerging ones. A common precursor to most of the crises considered is financial liberalization and significant credit expansion. These are followed by an average rise in the price of stocks of about 40 percent per year

above that occurring in normal times. The prices of real estate and other assets also increase significantly. At some point the bubble bursts and the stock and real estate markets collapse. In many cases banks and other intermediaries were overexposed to the equity and real estate markets and about a year later on average a banking crisis ensues. This is often accompanied by an exchange rate crisis as governments choose between lowering interest rates to ease the banking crisis or raising interest rates to defend the currency. Finally, a significant fall in output occurs and the recession lasts for an average of about a year and a half.

Arguably the most important reform to prevent future crises is to design policies that ensure that asset price bubbles are minimized. In order to do this we need tractable models of bubbles that can be used as a basis for policy analysis. Developing such theories has so far proved a difficult task.

Much of the early theoretical literature was concerned with showing that bubbles do not arise in standard models. Tirole (1982) argued that with finite horizons or a finite number of agents, bubbles in which asset prices deviate from fundamentals are not consistent with rational behavior. Santos and Woodford (1997) have argued that the conditions under which bubbles arise in standard general equilibrium frameworks are very special.

Building on the overlapping generations model of Samuelson (1958), Tirole (1985) showed that bubbles could exist in infinite horizon models in which all agents are rational. A large literature based on developments of this model has developed. Recent contributions include Caballero and Krishnamurthy (2006), and Farhi and Tirole (2010). An important issue with these models is the extent to which the OLG framework is consistent with the kind of bubbles in real estate and stock markets that are documented in Kaminsky and Reinhart (1999), Reinhart and Rogoff (2009) and elsewhere where bank credit appears to play an important role and the bubbles grow very quickly before bursting.

A second branch of the bubbles literature builds on asymmetric information models where everybody rationally believes that they may be able to sell the asset at a higher price even though it is above its fundamental. Allen, Morris and Postlewaite (1993) developed a discrete-time, finite-horizon model where the absence of common knowledge led to bubbles in asset prices. However, the model is not very robust. Conlon (2004) and Dobles-Madrid (2010) develop more appealing versions of this kind of model that are more robust.[7]

A third branch develops agency theories of bubbles. Allen and Gorton (1993) constructed a model with continuous time and a finite horizon in which an agency problem between investors and portfolio managers could produce bubbles even though all participants were rational. Allen and Gale (2000) develop a model with

7 See also Diamond and Rajan (2009).

an agency problem in discrete time where bubbles arise as a result of an expansion in credit. Barlevy (2009) extends this kind of model to allow for more general debt contracts and dynamic considerations. Allen and Gale (2003, 2004, 2007) and Adrian and Shin (2008) explicitly focus on the relationship between lending and asset price bubbles.

The difficulty in reconciling bubbles with rational behavior resulted in many authors such as De Long, Shleifer, Summers, and Waldmann (1990) developing asset pricing models based on irrational behavior. Herring and Wachter (1999) provide a behavioral theory based on "disaster myopia". Recent contributions in this strand of the literature, which involve slight deviations from rationality and provide appealing models of bubbles, include Abreu and Brunnermeier (2003) and Scheinkman and Xiong (2003).

Given the evidence in Maddaloni and Peydró (2010) and the other papers mentioned above that low interest rates lead to increased risk taking, perhaps the most promising theory of bubbles to analyze monetary policy is agency theories. Allen and Gale (2000, 2003, 2007) show how a risk shifting problem in the banking system can lead to asset bubbles. The model is particularly applicable to real estate. Credit expansion interacts with risk shifting in two ways. By encouraging investors to fund risky investments at the current date, credit expansion has a contemporaneous effect on asset prices. However, the anticipation of future credit expansion can also increase the current price of assets and it turns out that this may have a greater effect on the likelihood of an eventual crisis. The first version of the model shows how asset prices are related to the amount of credit and how uncertainty about asset payoffs can lead to bubbles in an intermediated financial system because of risk shifting. In this version default and the resulting crisis is caused by low payoffs to risky assets. In the second version of the model, a dynamic model is developed where it is expectations about the future level of credit that are important in determining asset prices. Here default and crisis result from the actions of the central bank rather than the outcome of any exogenous uncertainty about real economic variables. The third version of the model shows how anticipated credit expansion can lead to financial fragility, in the sense that a crisis occurs unless the realized credit expansion is quite large. In other words a financial contraction is not needed to burst the bubble.

In practice the real estate market in many countries operates without bubbles for long periods of time. The Allen and Gale model does not incorporate an explanation of this but rather focuses on how a bubble can arise. An important extension is to understand why there appear to be two regimes, one where fundamentals drive real estate prices and one where there is a bubble. For example, suppose that in normal times those investing with borrowed money will receive a steady stream of income from investing in safe investments. If they invest in a risky asset to shift risk and the

investment does not turn out well they will be unlikely to be able to borrow going forward. There is therefore an important issue as to whether a short run gain from taking a risk is worth it given the alternative of an ongoing safe stream of income. Only when circumstances are right will it be worthwhile to engage in the risky investment that drives the bubble. One of the important inputs into this trade-off is likely to be interest rates that are perceived to be temporarily low. Thus by creating a very favorable environment for real estate investment it is possible to depart from normal times and set off a bubble.

Another factor that seems important in setting off real estate bubbles in the kind of model outlined is the availability of credit. This is where global imbalances and the large current account deficits of countries such as the U.S., Spain and Ireland seem to have played an important role in the setting off and continuation of the bubble.

The other important feature that needs to be incorporated in such a model is the positive serial correlation of real estate returns found by Case and Shiller (1989), Englund, Quigley and Redfearn (1998) and Glaeser and Gyourko (2007). This empirical observation is important as it shows that if real estate prices are currently rising, then it is likely this will continue. For example, Glaeser and Gyourko (2007) find that a $1 increase in one year will on average be followed by a $0.71 increase the following year. Thus once a real estate bubble has started it is likely that it will persist for some time. This positive serial correlation of returns is currently not well understood. One possibility is that the search nature of the market microstructure means that idiosyncratic and aggregate shocks are difficult to disentangle and this results in the correlation. Another possibility is that the data is inadequate. Much more research needs to be done on this topic.

The kind of theory of real estate bubbles sketched above can provide a justification for the type of policy outlined by Ingves (2007). By avoiding low interest rates it may be possible to prevent the start of a bubble and by maintaining interest rates at relatively high levels and restricting credit it may be possible to cool them off and prevent real estate prices going to very high levels. This will also reduce the severity of any subsequent collapse and possible crisis that will follow. The other thing that this type of theory suggests is that discretionary macroprudential policies that make it more expensive to trade real estate may have an important role to play in preventing or dampening bubbles and subsequent financial crises. We turn to a discussion of these two kinds of policy next.

6. What should be the role of monetary policy in preventing real estate bubbles?

How should a central bank with a policy of flexible inflation targeting give consideration to house prices and credit growth? The current state of the literature precludes any simple answer to this question.

Many major financial crises result from the bursting of real estate bubbles. These financial crises can be very costly. As a result it is important that central banks try to predict and prevent bubbles. However, separating out bubbles from rises in prices due to changed fundamentals and determining when they are going to burst is difficult.

In an important early paper, Borio and Lowe (2002) argue that while it is difficult to predict asset price bubbles and in particular property bubbles, it is not impossible. They provide evidence that rapid credit growth combined with large increases in real estate prices can lead to financial instability. In low inflation environments they suggest that inflationary pressures can first appear in asset prices rather than in the prices of goods and services. They argue that in such cases it may be appropriate to use monetary policy to prick asset bubbles and to preserve financial and monetary stability.

Bubbles, in particular real estate bubbles, seem to be related to loose monetary policy and excessive credit supply. As argued in the previous section one way to prevent them is then through interest rate policy. In particular, very low interest rates at a time when property prices are static or increasing should be avoided. Once they have started increasing, an important question is whether interest rates should be raised to prick them. It may be possible and desirable to do this in economies with a high degree of homogeneity as in small countries like Sweden or possibly medium sized countries like the U.K.

The problem is more complicated in heterogeneous economies like the U.S., the Eurozone, and China. Different regions within these economies differ in terms of economic fundamentals and the rate of property price increases. Using interest rates to prick bubbles will not be so desirable because this will adversely affect the areas that do not have bubbles. The recent events in the Eurozone constitute a clear example. The interest rate policy followed by the European Central Bank was correct for countries like Germany where there was no bubble but it was inappropriate for Spain and Ireland, where it arguably contributed to the creation of the property bubbles. A tighter policy may have been effective for preventing the bubble in these countries but at the cost of a recession or at least slower growth in some of the other countries.

Even in small homogeneous countries, using interest rates to prick real estate bubbles may be difficult for political reasons. In particular when such policies are first introduced, it may be difficult to explain why it is worth causing a recession to

burst a property bubble. The recent crisis and its effects on the real economy may have made such arguments much easier to make, however.

Assenmacher-Wesche and Gerlach (2008, 2010) have argued that it is extremely costly in terms of reductions in GDP to use monetary policy to deal with real estate bubbles. They use a vector autoregression methodology to study the relationships between inflation, economic activity, credit, monetary policy and property and equity prices in 17 OECD countries using quarterly data from 1986-2006. Among other things they find that to offset a 15 percent rise in residential property prices the central bank might have to depress real GDP by 5 percent. This suggests that monetary policy should not be used to prick real estate bubbles as it is simply too costly.

They do not use a theory of bubbles in their analysis. An important issue is that much of the time, as discussed above, real estate markets do not have bubbles. For example, it seems that in the U.S. property prices were determined by fundamentals from the 1930's through to the 1990's. There were no sudden run-ups and collapses in prices. This suggests that there are important threshold effects. Much of the time when prices are driven by fundamentals large rises in interest rates will be required to reduce property prices even a few percent as their results suggest. However, in bubble times this may not be the case. The rise in Japanese interest rates at the beginning of 1990 that pricked the Japanese stock and real estate bubbles took many years to have its full effect but this has been dramatic. Much careful empirical work based on theories of bubbles is needed to understand how effective monetary policy can be in controlling property bubbles.

In summary, while raising interest rates to dampen or prick real estate bubbles may have a role to play in some small countries such as Sweden, in large countries like the U.S. or monetary areas such as the Eurozone it is likely to be costly to do this. In both cases, however, macroprudential policies are likely to be needed to try to control property bubbles. We turn to these next.

7. Macroprudential policies to prevent real estate bubbles

The previous sections have highlighted systemic risk arising from bubbles in real estate prices. This section discusses the macroprudential regulatory measures and the policies that might be put in place to deal with this source of systemic risk. What is most important is that the new macroprudential regulation deals with systemic risk and no longer only with the risk of failure of single financial institutions. The current crisis has clearly shown that the microprudential approach to financial regulation is not sufficient to prevent systemic crises.

What exactly is meant by the term macroprudential regulation? Christensson, Spong and Wilkinson (2010) provide a nice summary. They identify three policy steps associated with macroprudential regulation and supervision:

1. Countercyclical regulatory policy
2. Control of contagion risk
3. Discretionary policies

The first involves increasing financial institutions' capital reserves when the economy is growing and financial institutions are not under stress. The second requires stronger supervision of systemically important firms, counterparty risk and financial infrastructure. The final one involves timely interventions by regulators and supervisors to deal with growing imbalances and risk exposures. In particular, it is necessary to intervene to cool down real estate and other asset price bubbles. It is this kind of macroprudential intervention that we will focus on in the discussion below. Countercyclical capital ratios and control of contagion risk are key policies but our interest here is in real estate bubbles and crises.

Before considering the details of discretionary macroprudential policy, an important issue is how likely it is that such interventions will actually be deployed. Christensson et al. (2010) provide some interesting insights into this question. They point out that the Financial Stability Reports (FSRs) that are currently produced by about 50 central banks involve an attempt to undertake many of the steps that will be necessary in undertaking discretionary macroprudential regulation. In particular the financial stability reports attempt to identify and track the key economic and financial risks that are likely to lead to a financial crisis. Christensson et al. (2010) consider the FSRs of the Netherlands, Norway, Spain, Sweden, and the U.K. over the period preceding and during the crisis. The authors find that these FSRs were successful in identifying many of the risks and unsustainable trends that led to the financial crisis. However, many were regarded as low probability events not worthy of action and several factors that were not important in the crisis were also identified. The authors' conclusion is that it is unrealistic to expect macroprudential regulation and supervision to reliably prevent a financial crisis. Nevertheless these kinds of intervention may be able to contribute positively to the prevention and ability to manage a crisis.

Whether or not interest rates can be used, it may often be desirable to use other forms of discretionary macroprudential regulation to prevent bubbles. Some possible macroprudential policies to prevent or dampen real estate bubbles include the following.

i. Mandatory reductions in loan to value ratios.
ii. Increases in taxes on real estate transfers.
iii. Increases in annual real estate taxes.
iv. Elimination of tax deductibility of interest.
v. Direct restrictions on real estate lending.

The first measure would involve limits on loan-to-value ratios that would be lowered as property prices increase at a faster pace. This can be effective for residential property but may be difficult to enforce for commercial property. The reason is that firms may be able to use pyramids of companies that effectively increase leverage. The second measure is to have property transfer taxes that are greater the higher is the rate of property price increases. The third is a shift towards higher annual real estate taxes as the bubble grows to make owning real estate less attractive. For those countries that have tax deductibility of mortgage interest, eliminating it may help reduce property prices. Finally, perhaps the most direct measure is to impose restrictions on real estate lending in regions where property prices are booming.

There is some evidence that as a result of its stimulus policies China is experiencing real estate bubbles in a number of major cities such as Beijing, Shanghai and Shenzhen. The government has tried a number of these macroprudential policies to cool these real estate markets. However, it seems that their success has so far been limited.

As discussed in the previous section, one of the major causes of bubbles is excessive credit. During the recent crisis it has been suggested that excessive credit emerged because of large global imbalances. To prevent bubbles in the future, it is important to solve this problem. While it is individually advantageous for countries to self-insure by accumulating reserves, this is an inefficient mechanism from a global perspective.

As argued above, the accumulation of reserves by the Asian countries was at least partly a response to the policies that the IMF imposed on a number of countries during the Asian crisis in the late 1990s. Part of the problem was the fact that East Asian countries were not well represented in the senior staff of the IMF. It is therefore important to reform the governance structure of the IMF and of the other international organizations to ensure that the Asian countries receive equal treatment when they need financial help. This would reduce the need of these countries to accumulate reserves as a self insurance mechanism.

To reduce the large accumulation of reserves by China, other measures are necessary, however. For example, senior Chinese officials have proposed having a global currency to replace the dollar. This has the advantage that reserves can be created initially without large transfers of resources and the attendant risk of a crisis. All countries could be allocated enough reserves in the event of a crisis so that they could survive shocks. The problem is that an international institution like the IMF would need to implement the currency. There would then again be the issue of whether all countries, and in particular the Asian ones, are properly represented in the governance process of this institution.

A more likely medium term scenario is that the Chinese Rmb becomes fully convertible and joins the U.S. dollar and the euro as the third major

reserve currency. With three reserve currencies there would be more scope for diversification of risks and China itself would have little need of reserves. This is perhaps one of the most practical solutions to the global imbalances problem. The Chinese have already taken some steps in this direction. They have started to allow the settlement of trade in Rmb. They have also allowed the issue of Rmb bonds by Western companies such as McDonalds in Hong Kong. Of course, the most important aspect of being a reserve currency is full convertibility of the Rmb. That is still some way off and this is the sense in which this solution to the global imbalances problem is a medium term one.

Another important issue is whether countries should pursue policies to limit capital inflows. As has been argued already, countries like Spain and Ireland have run large current account deficits in the years preceding the crisis. These seem to have contributed to the emergence of bubbles in those countries. Going forward, it is important for countries to control their current account deficits if capital inflows are being invested in real estate and driving up prices.

8. Concluding remarks

We have suggested that the empirical evidence in Reinhart and Rogoff (2009) and elsewhere suggests there is a strong relationship between run ups in property prices, which then collapse, and the occurrence of financial crises. Since such crises have large effects on real output and inflation this suggests that real estate prices should be taken account of when conducting monetary policy, particularly in small homogeneous countries like Sweden. The traditional approach to inflation targeting, where asset prices only play a limited role in the determination of monetary policy, needs to be adapted. The models on which policies are based should incorporate a financial sector where property price bubbles can arise and lead to a financial crisis. Unfortunately, much research remains to be done to develop such models.

In the absence of such models, thorough discussion of the influences of monetary policy on the housing sector of the type currently undertaken by the Executive Board of the Riksbank seem a very sensible input to the setting of interest rates. The problems involved in detecting real estate bubbles and the uncertain effects of interest rates on them mean that monetary policy alone is unlikely to deal with the problem. Macroprudential policies are likely to be needed to buttress the effects of monetary policy. Controlling bubbles is a difficult task that needs as many tools as possible.

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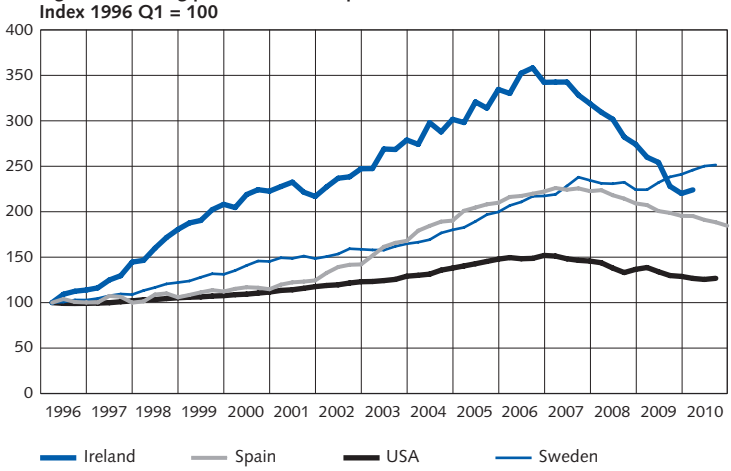
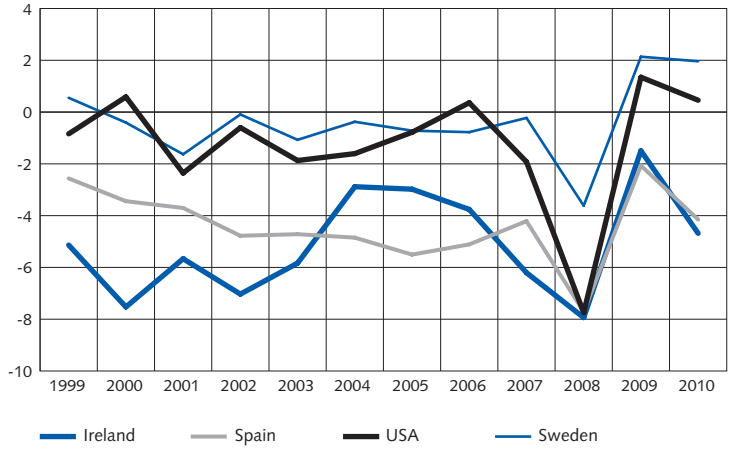
Figure 1. Housing prices in Ireland, Spain, Sweden and the U.S.
Index 1996 Q1 = 100



Sources: Irish Dep. of the Environment, Banco de España, FHFA, Statistics Sweden, OECD.

Figure 2. Deviations from the Taylor Rule in Ireland, Spain, Sweden, and the U.S.
Per cent

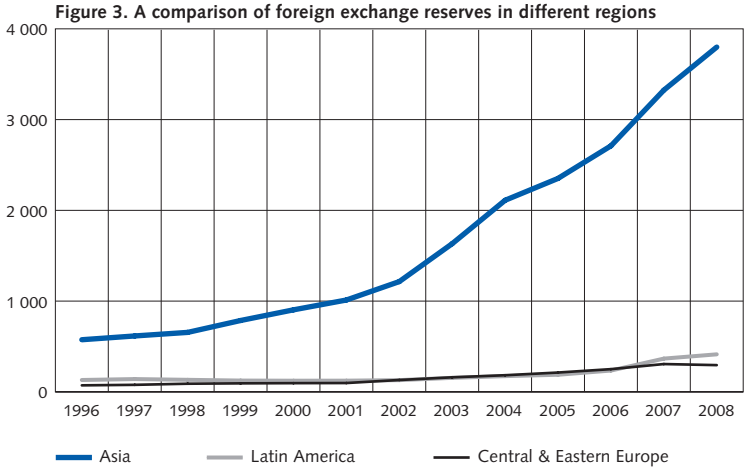


Source: Data on inflation and output gap from the IMF World Economic Outlook Database and calculated the implied interest rate according to the formula

$TR_t = CPI_t + (\text{average IR over the sample period}) + 0.5*(CPI_t - 2\%) + 0.5*\text{output gap}_t$,

where TR_t is the implied interest rate in period t, CPI_t is the consumer price index and IR is the central bank's official interest rate.

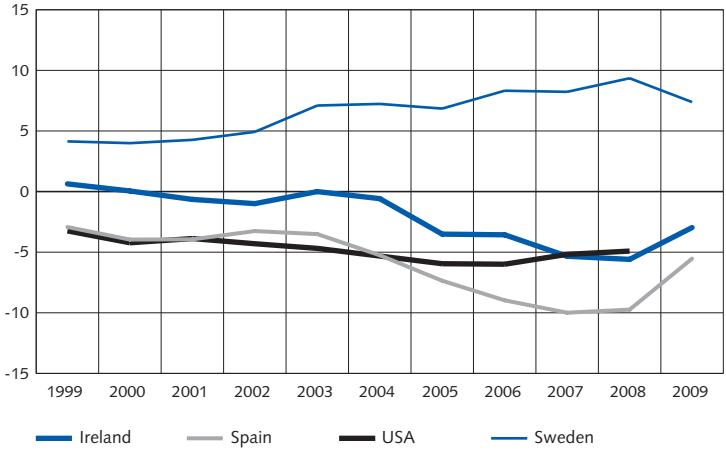
Figure 3. A comparison of foreign exchange reserves in different regions



Note: Asia is the six East Asian countries China, Hong Kong, Japan, Singapore, South Korea, Taiwan – province of China.

Source: IMF website.

Figure 4. Current account deficits as a % of GDP in Ireland, Spain, Sweden and the U.S.



Source: Eurostat.

Housing market dynamics and macroprudential tools

Davis, E.P., Fic, T.M. and Karim, D*

Against the background of the subprime crisis, where housing was implicated in the financial crisis in countries such as the US, as well as the ongoing discussions regarding Basel III, we survey the literature on housing market dynamics with a view to finding possible links to banking crises as well as potential macroprudential tools for dampening disruptive tendencies. We then go on to estimate house price equations and evaluate NiGEM macromodel simulations for Sweden with the same aim. Light is cast on the appropriateness of macroprudential intervention in housing, possible instruments to employ, and the interrelation of macroprudential with monetary policies.

Keywords: Macroprudential policy, bank regulation, house prices, housing markets

JEL classification: C52, E58, G21

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1 Introduction

The issue of housing bubbles, banking crises and monetary policy has returned to the fore with the subprime crisis. It is clear that the collapse of house prices in the US was a trigger for the crises, operating domestically via losses on banks' balance sheets and globally via securitised housing loans. This episode has led to a renewed debate on bank regulation, and notably on macroprudential policy. It is widely agreed that capital levels of banks have to rise, and also that it would be appropriate for some countercyclical element to be introduced into bank regulation, in order to offset the natural procyclicality that has been seen in this and many previous boom-bust cycles. However, the Basel proposals are for the most part based on counter cyclical tools with an economy wide effect based on capital or provisioning on the whole of banks' balance sheets. There remains a tradition, which has been continued in some Eastern European and Far Eastern countries, of applying countercyclical tools to the housing or commercial property markets alone, notably via controls on loan-to-value ratios. This raises the question of whether such tools could be appropriate for advanced OECD counties such as Sweden, what their incidence would be and how they would relate to monetary policy.

In order to address this overall issue, we provide an overview of work on the housing market, particularly as it links to monetary policy and financial stability. We also survey existing use of macroprudential policies in the housing market and related empirical work, and undertake estimation of house price equations with a view to seeing what evidence they provide on possible impacts of such policies. Finally we undertake extensive simulations of the NiGEM model for Sweden in order to assess the macroeconomic impact of such policies and their relationship to monetary policies.

Accordingly, the paper is structured as follows. In Section 2 we provide a survey covering the relationship of house prices to financial instability, macroprudential surveillance and monetary policy. In Section 3 we look at macroprudential tools applicable to the housing market, notably loan to value (LTV) ratios but also debt service/income caps, capital weights on housing lending, dynamic provisioning and sectoral exposure limits. We note that current Basel proposals (higher overall capital and procyclical capital weights) do not bear specifically on the housing market. Section 4 completes the survey sections by giving an overview of econometric work on house prices which is essential to evaluating policy proposals.

Section 5 shows estimation of house price equations for Sweden and within a panel of OECD countries, based on the approach of authors such as Muellbauer and Murphy (1997 and later). Variables assessed include demographics, income, the housing stock, interest rates, and lagged house price rises. We consider whether credit enters these models and what other significant variables could be affected

by macroprudential policies. Finally in Section 6 we consider the interaction of macroprudential policies and monetary policy. Apart from surveying the few papers which look explicitly at the impact of macroprudential policies on the economy as a whole, this section is focused on NiGEM simulations comparing macroprudential policies and monetary policy for Sweden with a newly estimated house price equation from the current exercise.

Throughout, we seek to keep in mind the overall aims of the project, for example to describe which macroprudential instruments - new, applied or proposed internationally - may be better suited than the repo rate to counteract excessive risk taking, increased indebtedness among households or extreme deviations of house prices from a long-term trend; to examine which macroprudential tools could be applied in Sweden and under what circumstances such tools should be used, and to assess how monetary policy tools can be coordinated with the macroprudential tools.

2 House prices, banking crises and monetary policy

2.1 INTRODUCTION

The connection between asset prices and banking crises was established in the seminal work of Kaminsky and Reinhart (1999), as well as Borio and Lowe (2002). Since then, specific linkages between house price dynamics and banking crises have been discussed inter alia by Reinhart and Rogoff (2008) and empirically quantified by Barrell et al. (2010a). In the wake of the sub-prime crisis, policy makers such as Turner (2009) have increasingly turned their attention to the role of housing markets.

From an early stage in the development of macroprudential surveillance, there have been recommendations to focus on housing (BIS, 2000). Such recommendations include the monitoring of house prices down to a regional level due to the high concentration of banks' asset portfolios in this market (IMF, 2000) and their exposure to boom and bust cycles.

There is an ongoing debate as to whether house price bubbles should be targeted by monetary policy given, their connection with financial instability. Again this reflects the increasing recognition that house price behaviour is ignored at the policy maker's peril, (although central banks often consider house prices as inappropriate targets except to the extent that they influence consumer prices in the relatively short run).

Meanwhile the subprime crisis has entailed a new focus on the possible use of tools for macroprudential policy to directly affect housing markets. These include loan-to-value ratios, loan to income limits and sectoral exposure limits for banks. These have been applied in countries such as Hong Kong (CGFS 2010) posing the

question whether they might be appropriate for advanced OECD countries as well.

In the light of these developments, a need to be able to explain house price behaviour has become crucial for regulators so as to be able to mitigate the social costs of crises. Moreover given the changing nature of financial intermediation within increasingly competitive banking systems and structural shifts in demographics, migration and building regulations, the modelling of house prices is important in its own right. One important conclusion is that more resources must be devoted to collecting and disseminating data on house prices and related variables such as LTVs since accurate house price modelling and assessment of related risks requires such information.

This section is structured as follows: in section 2.2 we explore the linkages between house prices and financial instability which justifies the recommendations of section 2.3 where the monitoring of house prices as part of macroprudential surveillance is discussed. Section 2.4 summarises the debate on whether central banks should pursue the twin objectives of price stability and financial stability in which case they may be required to respond to house price bubbles. Section 2.5 reviews the linkages between house prices and consumption since these are important channels by which regulatory changes to house prices could impact on aggregate demand. Thereafter in Section 3 we look at experience in using macroprudential policies in the housing market, and in Section 4 we focus on house price estimation both in the long-term and short-term. In this context, the user cost of housing which is central to house price estimation is discussed at length. A selection of alternative estimators in the literature is also briefly reviewed.

2.2 HOUSE PRICES AND FINANCIAL INSTABILITY

Much of the seminal work on banking crisis determination such as Demirguc-Kunt and Detragiache (1998, 2005) simply does not assess the link from banking crises to housing markets owing to a lack of house price data for most emerging market countries. Nevertheless, a connection between asset prices in a broad sense and banking (and currency) crises was established empirically by Kaminsky and Reinhart (1999) although they focused mainly on equity prices. Using a dataset containing 76 currency crises and 26 banking crises between the 1970s and 1995, they identified abnormal behaviour in stock market returns in the run up to banking crises. Their results showed that equity returns prior to banking crises were driven by possible asset price bubbles; returns 9 months prior to banking crises were 40% higher than their "tranquil period" levels.[1] The authors note that these results

1 In contrast, currency crises were preceded (by about 18 months) by returns that were 40% below those observed during non-crisis periods; the authors attributed this to a downturn in the economic cycle. The results suggested that asset returns had already fallen below their cyclical peaks when currency crises materialised.

accord with Gorton (1988) and Calomiris and Gorton (1991) who view the bursting of an asset price bubble as a stylistic occurrence associated with banking crises: depositors who observe increases in firm failures in periods preceding the crisis form conditional expectations of impending recession and change their perceptions of the riskiness of their bank deposits accordingly.

Borio and Lowe (2002) and subsequent work by the BIS has also linked banking crises to asset prices, although their main focus has been on role of credit gaps (i.e. gaps between the credit/GDP ratio and its long-run trend as shown by a Hodrick-Prescott filter). Their asset price variable, which they consider helpful in prediction albeit poorer than the loan variable has tended to be a similar "gap" based on the average of equity, housing and commercial property prices. Their methodology, like that of Kaminsky and Reinhart (1999) has been the "signal extraction" approach.

More recently Reinhart and Reinhart (2008) have examined the link between capital inflows and banking crises by focusing on the behaviour of asset prices in emerging markets. They argue, along the lines Calvo et al. (2003), that to a large extent, capital inflow surges that precede crises are driven by foreign demand for a country's equity and housing as investment vehicles. Like Kaminsky and Reinhart (1999), the results of Reinhart and Reinhart (ibid) suggest that asset market collapses precede crises.

Reinhart and Rogoff (2008) extend the Reinhart and Reinhart (2008) analysis in the context of residential property prices. They examine 16 countries that experienced a banking crisis according to the dating proposed by Reinhart and Reinhart (ibid). Their data also reveals significant increases in property prices in the run-up to the sub-prime episode, with this trend being particularly marked in the US.

The above findings are corroborated by description in the Turner Review (2009) which suggests that in the context of the sub-prime crisis, historically low interest rates fuelled credit expansion and consequent property price booms in the US and UK. In the UK the housing boom was exacerbated by rising demand for housing coupled with inadequate physical supply and between 1997-2007 total mortgage debt relative to GDP rose from 50% to 80%. Lending decisions were driven by the perception that high LTVs were defendable because continued house price appreciation would erode borrowers' debt burdens. In the US, lending patterns were similar but driven also by the need to direct credit to previously excluded social classes.

Against the background of suggestions regarding the predictive power of property prices for banking crisis occurrence as described above, Barrell et al. (2010a), published in the Journal of Banking and Finance have recently tested the usefulness of property prices as a leading indicator of banking crises in a multi-variate context. Using the logit approach common in the Early Warning System

literature (see Demirguc-Kunt and Detragiache, 1998, 2005) they tested the predictive power of previously unused variables such as bank capital adequacy, liquidity and residential property price growth against more commonly utilised determinants in the literature. Based on a sample of 14 OECD economies covering the years 1980-2007, which included 14 systemic and non-systemic banking crises, they concluded that bank capital adequacy, broad liquidity and residential property price growth are the most important determinants of crises in the OECD.

Moreover, Barrell et al. (ibid) were able to quantify the marginal impact of house price fluctuations on the probability of banking crisis materialisation. For a given level of bank balance sheet health, a one percentage point rise in real house price growth was sufficient to raise the probability of a crisis by at least 0.07% (US) and by as much as 0.74% (France).

They note that their results accord with those of Borio and Drehmann (2009) and Borio et al. (2010) who utilised a signal extraction methodology to establish that property prices are leading indicators of banking crises. Whereas the Borio et al. (ibid) did not subject their model to extensive robustness tests, Barrell et al. (ibid) used a series of robustness tests, including out-of-sample crisis prediction, to show that house price dynamics have a major role in the generation of financial instability. The social and public policy implication of this result, in the context of the earlier literature, is that house prices should be subject to monitoring as part of macroprudential surveillance, and possibly to control via macroprudential regulation.

Note however that predictive power over banking crises does not necessarily entail causality, if for example it is commercial property losses, correlated with house prices, that tend to bring down banking sectors. Rising commercial property prices drive credit availability and fixed investment in the upturn (the financial accelerator) and then when prices fall commercial property companies are most likely to default. In contrast, in most OECD countries, housing lending is recourse based, in other words there is a lien of the lender on household income to make up for any shortfall in the case of repossession. This may limit the impact of "negative equity" on defaults except in countries such as the US where lending is non-recourse and handing in the keys to the house covers the borrower's liability. On the other hand, there may be important wealth effects on consumption (Davis 2010) which mean falling house prices drive defaults across the economy more widely.

2.3 MONITORING HOUSE PRICE BUBBLES AS PART OF MACROPRUDENTIAL SURVEILLANCE

Macroprudential surveillance (MPS) can be defined as policy that focuses on the financial system as a whole, and also treats aggregate risk as endogenous with regard to the collective behaviour of institutions. It aims to limit system-wide distress so as to avoid output costs associated with financial instability (Borio 2009;

Davis and Karim, 2009). To this end, variables that are systematically correlated with crises are monitored on a rolling basis by policy makers with the idea that aberrance in their behaviour can trigger policy intervention to mitigate potential financial instability. In other words, there may be transmission of macroprudential surveillance into macroprudential regulation, whereby outcomes of surveillance are institutionalised as part of the regulator's strategy for ensuring financial system soundness.

The definition above allows for a wide variety of surveillance techniques to become part of the arsenal against banking crises; both qualitative and quantitative aspects of the financial system should be monitored so that tools such as early warning systems form one component of the surveillance regime. Surveillance can also be distinguished at a micro bank level or at a systemic level. Regarding the former, Davis (1999) suggests monitoring of variables relating to bank balance sheet health as well as measures of their income and expenditures. In contrast systemic risk should be monitored by tracking aggregate variables such as non-financial and financial sector debt, leverage and asset prices.

Given the discussion in the preceding section it is therefore surprising that the monitoring of house price trends and bubbles has not formed an explicit component of surveillance strategies to date in all countries. On the other hand, it could be argued that regulation is backward looking in that MPS needs are updated in the wake of crises as new information on the causes of crises emerges. This may explain why there is an increasing recognition that house price monitoring should form part of the MPS toolkit.

According to Whyte (2010), the emergence of property price bubbles before the sub-prime crisis occurred in countries such as Spain and the US which had distinct regulatory frameworks. This suggests property price evaluation may be a missing component in the MPS frameworks of many OECD economies. IMF (2000) noted that real estate prices should be monitored at a sectoral level because banks often concentrate their portfolios with loans against properties the prices of which display boom and bust cyclicality. A recent example of this in the UK was lending for "buy-to-let". In this context the authors also recommend monitoring of household indebtedness since a large fraction of this is related to mortgage obligations. However there is recognition that this enhanced monitoring system is subject to data availability which is currently limited and that more resources are required to collect and disseminate data such as residential property prices and loan to value ratios.

One point to note regarding MPS and house prices is the difficulty associated with measuring house price bubbles. As will be discussed in section 4, the estimation of the determinants of house prices has broadly followed two paths: the asset pricing approach and the cointegrating approach. The former methodology

essentially uses a time series of house prices to determine whether prices are over or undervalued but the lack of a structural model implies the degree of price misalignments is a rough guide only. The cointegrating approach assumes house prices are driven by fundamental factors but there is limited consistency in the literature on the exact nature of these determinants; different authors use different specifications based on their theoretical motivations and data availability (see Section 4). This heterogeneity in estimation means the detection of house price bubbles is operationally difficult. On the other hand if standard "bubble" estimation tools are employed such as comparison with long term trends using Hodrick-Prescott filters, the bubble estimate becomes subject to the same criticisms as output gap measures or even measures of credit gaps. Hence although the monitoring of house price bubbles may be an important principle of MPS, in practice policymakers may need to form a consensus on acceptable bubble estimators and use a high degree of judgement.

The lack of adequate historic data on house prices may explain to some extent why new regulatory proposals (e.g. BIS 2010) advocate countercyclical provisioning against credit in aggregate, since authors such as Borio and Drehmann (2009) and Drehmann et al. (2010) contend that credit cycles may cause property price cycles,[2] although they also maintain that credit is a better direct indicator of banking crises than asset prices. The suggestion that credit has a primary role in the transmission mechanism of banking crises may stem from the observation that rapid credit growth precedes banking crises during a phase when collateral values are high and credit risk is improperly processed. It also may relate to developments in both house prices and commercial property prices.

Although empirically many studies appear to find credit growth to be a leading banking crisis indicator (Demirguc-Kunt and Detragiache, 1998, 2005; Borio, Furfine and Lowe, 2001), Barrell et al. (2010b) shows that there is no conclusive empirical evidence that credit Granger causes property prices in OECD countries since 1980. In this sense although credit growth is an important MPS variable in its own right, it cannot be a substitute for property price monitoring.

Furthermore, Barrell et al. (2010b) show that a logit model using house prices, capital adequacy, liquidity and the current account (i.e. slightly extending their earlier work) could have predicted the subprime crisis in the UK, US, Belgium and France using an estimate for up to 1997 only. They contend that the recursive forecasts their model provides should be a key input to macroprudential surveillance as well as giving important evidence for macroprudential regulation.

2 Evidence in Barrell et al (2011) suggests this is not the case in most OECD countries, rather, it is property prices that drive credit. Davis and Zhu (2010) found a similar result for commercial property prices.

There remain some difficulties with using house prices for surveillance. With respect to house price cycles, there is little consensus on definitive estimators that can be used to identify trend levels and deviations from trend (this is discussed in more detail below). However the same estimation problem applies to credit analysis where the cyclical components are often computed with a degree of subjectivity. Given that similar limitations apply to the estimation of credit and house price cycles, there is little reason to exclude house price monitoring from the next generation of MPS frameworks. Moreover if property prices are not subjected to robust monitoring in future, it is possible that signs of financial instability will be missed and that societies will re-incur the costs of banking crises. In recognition of such costs, a debate has formed on the merits of including asset prices, including house prices, in monetary policy rules. We turn to this issue next.

2.4 ASSET PRICE BUBBLES AND MONETARY POLICY

Given the empirical connection between house prices and banking crises and the recognition that housing market developments should feed in to MPS, a natural question arises as to whether house price developments should also be the target of monetary policy, given that interest rates can influence house prices via a number of channels (see discussion of Mishkin (2007) below and Section 4)

Disysatat (2010) highlights the two crucial alternatives available to policy makers in this respect: one in which the central banks only responds to asset price misalignments if they alter the path of central bank targets (inflation and the output gap). The other alternative is that in recognition of the social costs of asset price corrections, central banks should counteract the accumulation of asset price imbalances irrespective of whether they are likely to impact on the short-term paths of inflation and output. This second approach has been used to justify why central banks should "lean against the wind" of asset price bubbles, whereas according the first view, policy makers would deal with the aftermath of such bubbles in the wake of asset price corrections (leaning versus cleaning).

The debate does not question the inflation targeting role of central banks but is concerned with more subtle aspects of stability such as the timing of interventions against asset prices and the relative weights given by policy makers to information contained in asset prices versus their targets. Fawley and Juvenal (2010) summarise the divergent views on this; Bernanke and Gertler (2001) suggest monetary policy should restrict itself to targeting inflation whereas Cecchetti et al. (2002) believe asset price bubbles should be mitigated by central banks. In other words, the latter suggest central banks should be concerned with the "twin objectives" of monetary and financial stability.

Bernanke and Gertler (ibid) cite an earlier contribution (Bernanke and Gertler, 1999) in which they establish that the medium term inflation target announced

by the central bank should be the primary anchor for monetary policy. Inasmuch as the inflation forecast already imbibes the forward looking expectations of asset prices, including house prices, central banks should not respond to asset price developments beyond this.

The empirical simulations of Bernanke and Gertler (1999) appear to validate this stance; they used a Taylor rule in which the change in the interest rate is dictated by a coefficient of 2 on the expected inflation rate. They found that this aggressive reaction function was sufficient for the stabilisation of output and inflation in situations where asset price bubbles emerged and then collapsed. On the premise that such a Taylor rule is adopted, the authors could not establish any additional benefits when central banks responded to asset price deviations. Moreover they argue that if central banks attempt to stabilise asset prices there may be detrimental effects on market expectations which are not always predictable and could modify monetary policy transmission adversely.

In line with the above, Bohl et al. (2004) suggest unpredictability could arise due to problems with estimating house price bubbles. They estimate Taylor rules for Germany, France and Italy and find that the addition of asset prices to the reaction function produces interest rate volatility along the lines of the results for Bernanke and Gertler (1999). However their GMM results which rely on asset prices as instruments generate Taylor rules which fit the actual data well, suggesting that although the central banks in practice did not respond to asset prices directly they did respond implicitly as asset market developments affected expectations of the inflation and output gaps.

Fawley and Juvenal (2010) also note the problems with Taylor rules and house price bubbles. The latter are by definition episodes when house prices respond to irrational exuberance and thus it could be argued are unpredictable. In this case forward-looking rules could not accommodate bubbles effectively and even if a bubble is identified, the impact of an interest rate rise would not be predictable and would most likely generate interest rate volatility. Furthermore if linkages between interest rates and asset prices are weak, central banks would have a limited capacity to deflate housing market bubbles.

On the other hand Mishkin (2007) recognises the economic impact of housing market fluctuations can be severe and thus may warrant interventions by central banks. In other words, a financial crisis is itself a major disinflationary shock, the impact of which is appropriately allowed for. The recent experience of the US housing market where post-2006 contractions in residential investment reduced GDP growth by 1% over the preceding four quarters exemplifies the detrimental impacts of substantial property price corrections. He lists 6 transmission mechanisms whereby interest rate changes impact on house prices and consumption which are discussed further in Section 4: (1) the user cost of capital (2) expectations

of house price movements (3) housing supply (4) wealth effects (5) credit effects on consumption and (6) credit effects on housing demand.

Whilst there is considerable uncertainty on the exact structure of these transmission mechanisms, Mishkin (ibid) indicates the relationships cannot be ignored by those setting monetary policy and that following rules based systems that do not recognise these linkages is inappropriate: if central banks aim to manage aggregate demand to stabilise inflation and unemployment, they cannot ignore housing market developments.

According to the preceding view, a Taylor rule based system where interest rates respond to house price appreciation only once it is realised, may not set the path of interest rates optimally. This is because optimality would require the interest rate to accommodate expected house price changes. Empirical simulations verify this: the model which incorporates future price changes results in more aggressive and rapid interest changes than the Taylor rule model. Moreover there is a considerable lag before changes in house prices feed through to changes in households' consumption which means central banks should have sufficient time to respond to price fluctuations. On the other hand in his 2007 paper Mishkin does not advocate "leaning" per se (although he has tended towards it in more recent work).

Cecchetti et al. (2002) strongly support the view that central banks should explicitly respond to asset price misalignments. They do however make the distinction between reaction and targeting: whilst they argue that central banks could improve macroeconomic stability by responding to misalignments not contained in the inflation forecast, they do not advocate asset prices as actual targets. In line with the argument of Poole (1970) who suggested that by "leaning against the wind" of money market changes central banks could stabilise the macroeconomy, Cecchetti et al. (ibid) believe a similar approach should be used against asset price misalignments, provided that the source of this aberrance can be attributed to supply and demand for the asset itself.

In other words, they do not propose that central banks should respond to all asset price misalignments but only after an analysis of asset price behaviour suggests some corrective action would be prudent. In this sense, the authors' arguments complement the arguments put forward in the preceding sections on macroprudential surveillance and the empirically established connection between financial instability and house prices. Wadhwani (2008) suggests that the Swedish authorities "leaned into the wind" in the 2000s in the manner that Cecchetti et al (2002) recommended, and this may account for lesser difficulties there than elsewhere.

Disyatat (2010) adds to the debate by constructing a model using standard transmission mechanisms with the focus on the operational aspects of central banks' remits. In other words, explicit Taylor rules are not derived since as the

author points out, these reduced form rules prevent flexibility in the central bank's response. Instead, the author uses a non-restrictive approach whereby the central bank is assumed to face an economy characterised by three equations describing the evolution of inflation, output and asset prices. These then give rise to the optimal policy response; the author shows that to the extent that asset prices impact on inputs to the central banker's loss function (output gap and inflation), asset price misalignments require some intervention.

An important issue in this context is that the above choice whether or not to respond to housing market developments is only feasible for countries whose monetary policymakers are able to respond. This rules out those who have a currency board, fixed exchange rate or monetary union. It is particularly in the latter context that interest has arisen in specific macroprudential instruments to control the housing market, as discussed in Section 3 below. First we briefly consider the relation of house prices to consumption in the context of monetary and financial stability.

2.5 HOUSE PRICES, CONSUMPTION AND POLICY CONCERNS

There are divergent views on the extent to which house price changes eventually impact on consumption. These issues are important from the perspective of regulators since depending on the exact transmission mechanisms, house price changes and associated financial crises may have different impacts on aggregate demand via consumption, while falling consumption may itself aggravate crises via bankruptcies of firms involved in producing consumer goods and services, as well as unemployment.

As noted above, Mishkin (2007) lists six transmission channels by which monetary policy decision can impact on house prices: via (1) the user cost of capital (2) expectations of house price movements (3) housing supply (4) wealth effects (5) credit effects on consumption and (6) credit effects on housing demand. While the first three channels reflect the direct impact of interest rate changes, the last three channels are indirect.

The impact of interest rate changes on the user cost of housing is apparent from the user cost functions described below which are also discussed in the context of the role of expectations of house price appreciation and impacts on supply. In Mishkin (ibid), wealth effects according to life-cycle theories of consumption, should arise because households disregard the source of increased wealth (whether from appreciation of financial or real assets) and increase consumption according to their marginal propensity to consume.

However there is the alternative view that wealth changes from different sources will have different impacts on consumption because of the demographic distribution of these assets: financial assets (such as stocks) are more likely to be held by the

rich and old whose marginal consumption propensities are lower and so stock price appreciation will have a smaller impact on consumption than house price appreciation. Also the relatively lower volatility of house prices compared with stock prices could mean that house price appreciation is viewed as being more permanent and therefore leads to larger changes in consumption behaviour.

On the other hand it is possible that house price increases could lead to lower current consumption because the price appreciation is associated with a higher user cost of housing in which case non-residential consumption suffers; those wishing to purchase housing will now have to save more and consume less. Moreover a rise in stock prices is a stronger signal of increased future productivity than house price appreciation because the latter could arise from supply side constraints and not because future economic prospects have improved. In this case, stock price appreciation could lead to higher consumption especially since older generations, according to life cycle theories, have higher propensities to consume and tend to hold more stocks than younger households.

Muellbauer and Murphy (2008) argue there should be no wealth effect per se from house price appreciation based on estimations in Muellbauer and Murphy (1989) and Aron et al. (2007). Instead there is a collateral effect when house prices rise whereby positive equity is translated into higher household borrowing. This, they argue is important in explaining the empirical reality of higher consumption following house price appreciation which is contrary to predictions based on the life cycle hypothesis. In their view the latter suggests that when house prices rise, consumption should fall due to higher downpayment requirements on house purchases.

Thus the credit channel is an important reason as to why increased house prices may lead to higher consumption. In poorly developed credit markets such as Italy, Muellbauer and Murphy (ibid) argue that households cannot translate positive equity into loans and consequently house price appreciation is associated with lower consumption. Conversely in deep mortgage markets such as the UK and US, greater competitiveness in the lending markets means borrowers benefit from higher loan to value ratios and thus need to save less to finance new house purchases. Moreover, existing homeowners can release equity easily due to the depth of credit markets. In combination these effects lead to an increase in consumption when house prices rise.

Buiter (2010) elaborates further on the wealth effect debate. He argues that housing assets are no different from any other durable asset, whereby self-sufficiency means price effects have no impact. In other words, if the owner does not plan to sell or buy a property and has the desired lifetime level of housing services, then they are indifferent to price changes since wealth and the cost of the stream of services change by the same amount. In reality agents are often not self

sufficient and are affected by price changes in different ways; if prices fall, owners are worse off to the extent that the fundamental value of the house is less than the discounted value of the housing services they wish to consume in their lifetime; those who are outside the market at present will in contrast be advantaged by house price declines as they can buy housing services more cheaply.

Buiter (ibid) argues that representative agent models cannot distinguish between the two ownership categories described above and therefore contends that there is no net housing wealth effect. If however, a heterogeneous agent model is used then the differential impacts of house price changes on non-owners, landlords and owner-occupiers can be established; the aggregate consumption change then arises from the redistributive effects between agents who have different marginal propensities to consume (Woodford 2010). The implication of the heterogeneity in housing consumption is important for regulatory purposes. If, in aggregate house price changes do alter consumption, and thus aggregate demand, there may be a case for policy makers to avoid large swings in house prices especially as these may generate financial instability both directly (via mortgage defaults) and indirectly (via the impact of lower consumption on producers' solvency and unemployment).

Finally, Davis (2010) surveys empirical work on consumption and house prices and concludes that the empirical evidence for tangible wealth effects as well as financial wealth is well supported. This underlines the importance for all countries to ensure that there is adequate, accurate and timely data on the complete balance sheet of the household sector. He notes that arguments for different long-run housing wealth effects across countries are arguably stronger than those for net financial wealth, given the wide differences in housing finance systems. On the other hand, there remains some evidence, notably at the micro level, that the housing wealth effect is actually an income-expectations effect.

Note again that this effect on consumption is quite distinct from the possible losses that mortgage lenders may make as a consequence of homeowners defaulting on their loans. It may nevertheless be an indirect cause of financial instability, since falls in consumption may give rise to general recession leading to widespread job losses and business failures. Accordingly, it could justify monetary policy concerns over house prices as well as macroprudential regulation which addresses housing valuation concerns. It is to use of such macroprudential policies that we now turn.

3 International experiences of macroprudential policies related to housing

3.1 OVERVIEW

Whereas macroprudential surveillance focused on house prices as a key indicator is common across many countries, attempts to regulate house purchase lending are less widespread. It is also contrary to the thrust of Basel discussions which is focused on general macroprudential instruments, notably capital or provisions held by institutions (either in time series or cross section) rather than sectors they lend to. Under it, national regulators have scope to set an additional capital buffer of 2.5 percentage points for banks, which rises when times are good and falls when they are bad. And the suggestion in Basel Committee (2010) is that such buffers should be calibrated to credit "gaps"[3]. The Basel approach builds on the historically less interventionist approach of regulators and central banks in OECD countries, who have until recently taken the view that interest rates and individual bank capital regulation are all that is needed for both monetary and financial stability to be maintained.

That said, there has been quite extensive use of housing market related macroprudential regulation by non-OECD countries and some lower income OECD countries. As outlined in this section, methods that have been applied include limits on loan to value (LTV) ratios, debt service/income caps, dynamic provisioning related to housing lending and sectoral exposure limits. And in the light of the sub-prime crisis there is increased interest in what can be called specific macroprudential instruments, see in particular CGFS (2010), also Harding (2010).

3.2 LTV LIMITS

According to CGFS (2010), the most widely used specific instruments have been those limiting credit supply to sectors such as housing or commercial property seen as vulnerable to excessive credit growth. The most common approach is the control of LTV ratios. This has been used in particular in Asian countries such as Hong Kong, Korea, Malaysia, Singapore and India, China, Thailand, Bulgaria, Romania and Croatia have also imposed such limits (Borio and Shim 2007). These limits tend to start from a typical "normal" level in the economy from a microprudential point of view such as 80%. Then they would impose a tightening beyond that of 10 or 20 percentage points.

3 Like the output gap, the credit gap measure is the distance between credit levels at time t and the long-run trend as (usually) measured by a Hodrick-Prescott filter.

Most recently the Swedish Financial Regulatory Authority capped the mortgage LTV at 85%, while Hungary, Finland and Norway have also declared that LTV policies will be introduced. Whilst the motivations for such caps are diverse (in the case of Sweden consumer protection is a large consideration, elsewhere it is often financial stability) it is likely these measures will be beneficial for systemic stability, although it is too early to evaluate the exact effectiveness of these policies.

Such limits have historically tended to be chosen in economies that had a heavy exposure to financial cycles both in terms of the macroeconomy and the financial sector. They would also have housing markets that responded strongly to credit availability, having incipient excess demand. Often fixed or managed exchange rates limit the use of monetary policy for stabilisation purposes in these countries (which makes it a paradox that they have not to date been considered in euro area countries). LTVs might be complemented by other policies which seek to ensure prudent lending such as limits on loan to income and loan concentration, on the grounds that a single policy could not address all the elements of risk in a transaction. The intended use of LTVs was to enhance financial sector resilience and leaning against build-ups of risk both at micro and macro levels, although as noted they can also be motivated by consumer protection. According to central banks and regulators which use them, LTVs are seen to directly influence credit growth and also provide a clear signal of concerns by the authorities to institutions and the public.

The level of the cap needs to take into account expected volatility and overvaluation of house prices as well as political economy considerations (that it is difficult to impose very low caps) and the tolerable level of loss given default. A risk with an LTV cap is to make the maximum level also a minimum and thus raise the LTVs on new lending. Judgement is the main basis for adjustment in LTV caps, although one country does calibrate it to quantitative indicators such as growth in home sales, real estate investment and house prices. Further information needs are for surveys which show the extremes of the distribution, and the riskier products (e.g. subprime) and new distribution channels that may be missed by conventional statistics.

On the other hand, there is a risk that LTV limits are circumvented by strategies such as offshore borrowing, unsecured borrowing, financial engineering, falsification of asset valuation or other borrowing from outside the regulated financial system. Scope for cross border lending is a particular challenge in small open economies. Such problems could however be avoided by simply making the portion of loans above a regulatory limit non-enforceable in the case of default (Weale 2009) – a policy that has not been tried to our knowledge at present. Institutions would then have a strong incentive to hold to the LTV limit, and check consumers against credit registers.

In addition, it should be noted that LTV limits are not strictly countercylical since the ratio depends on an endogenous variable (house prices). Some would argue that limits on debt servicing ratios would more sensitively address the issue of households' burden of debt and hence likelihood of default.

Measuring the success of LTV policies could be done by assessing the growth rate of credit, assuming the objective is mainly to lean against the financial cycle. It is not however easy to distinguish from the effects of monetary policy, confidence and income growth expectations in driving borrowing. There appears to be less evidence that LTVs are effective in promoting lending in a downturn than restraining it in the upturn. If the aim is to increase resilience, then total housing equity (and especially of recent loans) as well as banking sector capital adequacy would be relevant and LTVs may be helpful in providing buffers. CGFS (2010) seems to suggest that the success in this latter aim has been greater than in restraining credit expansion. There is also little evidence at present that LTV limits can restrict house price growth per se.

Hong Kong has no scope for raising interest rates due to the fixed rate vis a vis the US dollar. Accordingly, macroprudential instruments were seen as essential to prevent banking crises following property bubbles when the US interest rate was "too high" for domestic conditions in Hong Kong. There were successive decreases in the maximum loan to value ratio in the 1990-1997 period, from 80-90% to 60%. Although the Asian crisis came after the last tightening, with a marked fall in the price of housing, the banks remained solvent given the low LTVs on their loans. This limit was complemented by a maximum limit of 40% of assets to be held in the form of mortgage loans over 1994-1988.

Wong and Hui (2010) comment that although property prices dropped remarkably by more than 40% right after the Asian financial crisis, the subsequent delinquency ratio for mortgages in Hong Kong never exceeded 1.43%. They also suggest that a policy of mortgage insurance may need to be instituted to prevent excessive liquidity constraints on households and that that an effective operation of loan-to-value policy may require some discretion to adjust the maximum loan-to-value ratio.

Gerlach and Peng (2005) showed that the limits on LTVs had a detectable effect on the impact of house prices on borrowing in Hong Kong, with a 10% rise in house prices having only a 1.5% effect on lending compared to 4% before the measures. In earlier work (Gerlach and Peng 2002) they showed that there is both short-term and long-term causality running from property prices to lending but not the opposite, suggesting that the LTV limits did not restrain property prices per se.

The potential benefit of LTV caps is visible in countries such as the US where by some estimates 25% of loans currently suffer from negative equity, with a strong incentive to default. Meanwhile the structural features of the financial markets

may also limit lending via LTVs, for example in Germany via Pfandbriefe which can only be used to securitise if they have LTVs of less than 80%. Fiscal policy may also impact on the housing market via LTVs.

Wong and Hui (2010) also look more deeply into the effectiveness of LTV limits in a panel of countries. They find that economies with LTV policy are estimated to have a lower sensitivity of mortgage delinquency ratios to property prices than those without LTV policy, taking into account other determinants of default (property prices, GDP growth, mortgage debt/GDP and interest rates). On the other hand, their model can be criticised from a robustness point of view, notably because omitted variation in regulations could underlie the results.

3.3 OTHER SECTOR-SPECIFIC MACROPRUDENTIAL REGULATIONS

LTV limits are not the only form of regulation of the terms of credit that can be applied to the housing market. Debt service/income caps have also been tried in Hong Kong, Malaysia and Korea. For example in 2006 the Korean authorities imposed a debt repayment to income limit of 40% in specific areas where the price of luxury apartments had risen sharply. China imposed a wider limit in 2004 of 50% on loan interest/household income ratios, and Greece a 40% limit in 2005. In Malaysia in 1995 the monthly repayment for credit cards was raised from 10% to 15% of balances. In Thailand in 2005 credit card lines were limited to no more than 5 times monthly income. Such limits require there to be sufficient information exchange between banks and/or the existence of a central credit register.

Dynamic provisioning as applied in Spain since 2000 is applied to overall credit expansion rather than that in the housing market, but would naturally bear on housing credit when this is a large proportion of total credit, as has been the case in Spain in recent years. Banks set aside provisions during times when credit expansion is particularly rapid, which anticipates the losses to be realised when there is a downturn. The provisions are higher on riskier forms of loan. So for example at the end of 2007 the total accumulated provisions (close to 75 percent were general provisions) covered 1.3 percent of the total consolidated assets of Spanish deposit institutions, at a time that capital and reserves represented 5.8 percent of those assets (Saurina 2009).

The experience to date of this policy is that it has been more successful in the protection of the institutions than in limiting credit growth or the asset bubble, although the difficulties of the Cajas or savings banks shows that even this effectiveness is limited. We note that the parameters of dynamic provisioning could be adjusted to penalise certain types of loan since they fall into 6 different risk buckets, but the Spanish have not chosen to do this to date.

Some countries have explicitly varied capital weights to allow for concerns regarding the housing market. This enables banks to choose whether or not to lend

to the sector judged to be growing too rapidly in the light of the amended cost of lending. They could react by absorbing the cost, raising more capital, and raising the cost of lending to the sector. At a macroeconomic level, it could be seen as widening the spread of mortgage loans over the deposit rate in the housing market, as the deposit margin can also be adjusted when capital requirements are raised (see Barrell et al 2009).

As noted by McCauley (2009) varying capital weights was an instrument used by the Indian central bank in late 2004, raising Basel 1 weights on mortgages and other household credit given rapid growth. The capital weight on mortgages was raised from 50% to 75% and that on consumer loans from 100% to 125% while commercial property lending had its weight raised from 100% to 150%. The consequence was a considerable fall in the growth rate of these loans, absolutely and relative to the total. Mortgage loan growth for example fell from around 70% in the year to March 2004 to 50% up to March 2005 and just over 40% in the year ending March 2006. Estonia imposed similar general increases in the risk weights on housing loans to residents in 2006.

Such limits can be conditional on LTVs as cited by McCauley (2009), in that the Reserve Bank of Australia permitted the 50% weight on mortgages to be applied only to loans with an LTV of below 70%, while Borio and Shim (2007) cite a rise in the Irish risk weight for the portion of mortgages over 80% LTV from 50% to 100%; Norway and Portugal imposed similar limits in the 1990s, and Bulgaria in 2004.

Implicit taxation of credit growth was applied widely in the pre-liberalisation policies in countries such as the UK and France, where rapid growth in lending attracted higher reserve requirements on the funding side. In Finland in the late 1980s there was a threshold set on loan growth with lending above that level attracting higher reserve requirements. This was considered successful in restraining lending growth relative to that in Sweden (Berg 1993), although it did not prevent the occurrence of a banking crisis in Finland. Bulgaria imposed similar limits in 2005. Latvia raised general reserve requirements in 2004 to restrain lending growth. The policy of penalising growth of banks balance sheets of over 20% set in Croatia in 2003-2006 was also applied to general credit growth. Such policies could also be applied to the housing market. But banks with access to securities borrowing or foreign bank credit could avoid such restrictions.

Sectoral exposure limits were applied in Ireland in the late 1990s, which meant that only up to 200% of own-funds could be lent to a given industrial sector, while only up to 250% could be lent to two sectors, which shared the economic risks of an asymmetric shock, such as property and construction. But these evidently did not prevent sufficiently large exposures to lead to the current economic and financial difficulties that the country is facing. In Romania in 2005, foreign currency lending was set to be no more than 300% of own-funds.

Borio and Shim (2007) sought to evaluate the impact of macroprudential policies such as those summarised in this section on credit and asset price growth. They found that there was rapid growth in both these variables at the time the measures were introduced. They found that there were reductions in both credit growth (of 4-6 percent) and house price growth (3-5 percent) after the measures, although that is not always easy to divide the impact of such measures from that of monetary policy or economic growth.

Barrell et al. (2010b) looked at how house prices should impact on macro-prudential regulation generally. Against the background of their logit model predicting banking crises cited in Section 2, as well as arguments that credit growth should guide countercyclical provisioning, they suggest that the appropriate adjustment for procyclicality requires the country to calculate the trade-off between house prices, current account balances and regulatory variables over time. Since there is nonlinearity in a logit equation, there is not a simple rule that can be derived. Undertaking a scenario with 5 pp higher house prices, they showed that the regulatory adjustment is greater, as would be expected, with higher lagged house price growth, but the relationship is not one-to-one – it depends also on the other regulatory and non regulatory variables in the model. A given growth rate of house prices is more threatening to financial stability when there is also low capital and liquidity as well as a current account deficit.

Whatever the context, it is clear that the correct modelling of house prices is crucial and is likely to receive increasing attention in the wake of the sub-prime crisis and policy developments; it is this issue we turn to in the next section. The determinants of house prices may either capture directly the impact of policy, or identify key driving variables which would otherwise bias the results of estimation – and which may in any case be indirectly affected by policy in a macroeconomic context.

4 Extant work on estimation of house price equations

House price estimation typically uses a first stage model which links house prices to a set of "fundamental" determinants. These in turn represent the factors that drive the supply of and demand for housing (Gattini and Hiebert (2010), Muellbauer and Murphy (2006, 2008), Capozza et al. (2002)). The justification of this approach is that house prices and fundamentals are cointegrated; this model then determines the long-run price of housing. Such fundamentals may include long run settings of policy variables.

The dynamics estimated in the second stage recognise that actual house prices deviate from their fundamental values in the short-run and attempt to accommodate these deviations through an error correction framework. This allows the examination of a host of factors that drive house price dynamics: bubbles,

spatial and temporal effects and behavioural and informational drivers of house prices as well as short run variations in policy variables.

There has however been criticism of the cointegrating approach. Gallin (2006) notes that while there may be theoretical justification for a cointegrating relationship based on supply and demand, the same model explains why a cointegrating relationship may be absent: there is no reason to assume supply and demand elasticises are stable over time[4]. In other words, a test of cointegration implicitly tests the stability of these elasticities; however given the research time that has been devoted to their temporal and spatial variations, it may be that a cointegrating framework has been accepted too readily in the literature. Nevertheless, this methodology remains the dominant modelling technique[5] in the housing market literature and so we devote the rest of this section to discussing it in more detail.

4.1 THE SUPPLY AND DEMAND FRAMEWORK

According to Gallin (2006), house prices are cointegrated with their fundamental determinants if a long-run relationship exists and if this relationship can be characterised by supply and demand equations according to:

$$Q_d = D\left(Y, N, W, UC, \theta_d\right) \tag{1}$$

where Y = income
N = population
W = wealth
UC = user cost of housing
θ_d = other factors that shift demand

where both income and wealth are potentially influenced by monetary or fiscal policies.

We will discuss the user cost of housing in more detail later, but briefly in this context, the user cost of capital itself depends on the price of housing and other variables according to:

$$UC = P\ \left(1 - T_y\right)\left(m + T_p\right) + \delta - cg \tag{2}$$

4 E.g. due to regulatory changes in planning permission (affecting supply) or demographic changes (affecting demand).

5 Other approaches include the VECM [Gattini and Hiebert (2010)] and spatio-temporal impulse responses to gage the degree to which shocks diffuse over time and space [Holly, Pesaran and Yamagata (2010)].

where P = house price
m = mortgage rate
T_y = income tax rate
T_p = property tax rate
δ = depreciation rate
cg = capital gains

where fiscal policy may affect taxes and also monetary policy may affect the mortgage rate. We note that macroprudential policies may also affect the user cost via mortgage rates, for example if there are higher capital charges on mortgage lending. However, a low LTV limit may not affect the interest rate directly but rather may affect the "shadow price of housing" as demand for housing falls at a given mortgage rate owing to the need for more saving in order to pay a deposit.

The main influences on the supply of housing can be summarised as:

$$Q_s = S(P, C, \theta_s) \tag{3}$$

where P = house price
C = real cost of building
θ_s = other factors which shift supply

where monetary policy can affect the real cost of building via the interest cost of financing construction, while regulations affecting land use may also have an important influence on supply overall. Re-writing equation (2) as

$$\mathrm{UC} = \mathrm{P} \bullet \mathrm{A} \tag{4}$$

means house prices are determined by the following set of "fundamentals":

$$P = f[Y, N, W, C, A, \theta_D, \theta_S] \tag{5}$$

In many studies, an explicit supply equation is not defined, rather, determinants of supply enter indirectly through the demand framework, e.g. Muellbauer and Murphy (2008) where the existing stock of housing impacts on house prices through the income per household variable.

In Cameron et al. (2006), θ_s is partially defined by an explicit equation describing the change in the stock of housing over time. This equation augments the supply and demand equations.

In Hott and Monin (2008), housing supply is modelled in the manner of McCarthy and Peach (2004) where housing supply (S_t) is a function of the

depreciated existing housing stock (δS_{t-1}) and any new builds that occurred over the period (B_{t-1}) as in equation (6). Housing supply is deliberately not related to house prices so that construction costs can be treated as an exogenous variable[6] although the authors recognise that alternative specifications are possible where construction costs positively affect house prices and the level of construction is endogenously determined.

$$S_t = \delta S_{t-1} + B_{t-1} = \delta^t S_0 + \sum_{i=1}^{t} \delta^{i-1} B_{t-1} \qquad (6)$$

In Muellbauer and Murphy (2008) and Cameron et al. (2006) the demand equation is inverted to model house price as a function of its determinants. This is akin to equation (5) and is formally derived from their demand curve specification as follows:

$$\ln \frac{hs}{pop} = \alpha \ln \frac{y}{pop} - \beta \ln r_h + \ln d \qquad (7)$$

where hs = housing stock
pop = population
y = real income
r_h = real rental cost of housing
d = demography

The final inverted demand curve is obtained by replacing the real rental cost (which is unobserved) in equation (7) with the real user cost of housing since the two are equal in equilibrium. The equation is then inverted to yield:

$$\ln(hp) = \frac{\alpha}{\beta} \ln \frac{y}{pop} - \frac{1}{\beta} \ln \frac{hs}{pop} - \ln(UC_h) + \frac{1}{\beta} \ln(d) \qquad (8)$$

where UC_h[7] is the real user cost of housing.

In practice, a restriction[8] is imposed by the authors to obtain the final estimated equation:

$$\ln(hp) = \beta_0 + \theta(\ln(y) - \ln(hs)) - \beta_1 (UC_h) + \beta_2 \ln(d) + u \qquad (9)$$

where $\theta = \frac{\alpha}{\beta}$ and u is the error term.

6 This is so the authors can make use of data on construction costs.
7 Note the term UC_h is explicitly defined in terms of constituent parameters by Cameron et al. (2006) and Muellbauer and Murphy (2008) but because other authors present alternative definitions we discuss the user cost variable later on.
8 $\alpha = 1$.

Moreover equation (9) is modified to accommodate dynamic effects during the modelling process including lagged house price effects, lags of other explanatory variables and an error correction term.

4.2 THE LONG-RUN RELATIONSHIP

Following a log-linear transformation of all the variables, a cointegrating relationship would be identified with whichever fundamentals possess a unit root. The long run relationship is expressed by Capozza et al. (2002) as:

$$P_t^* = p\left(X_t\right) \tag{10}$$

where P^* is the log of real fundamental house price and X_t is the vector of exogenous determinants.

The actual members of the exogenous vector vary according to studies. For example, in Capozza et al. (2002) the set of long-run determinants includes population levels, real median income levels[9], the long-run (5 year) population growth rate[10], real construction costs and the user cost of housing. However in Muellbauer and Murphy (2008) and Cameron et al. (2006) the vector of long-run drivers contains real disposable (non-property) income, the sum of mortgage rates and stamp duty rates, the national credit conditions index and a term which interacts the mortgage rate with the credit conditions index. The latter may be a means of capturing the impact of credit rationing that may be induced by macroprudential policies as well as providing a better understanding of the impact of financial instability on housing markets.

4.3 THEORETICAL BASIS FOR THE EXPLANATORY VARIABLES

Here we briefly outline the theoretical justification for the inclusion of the aforementioned variables in the long-run relationship. Those already aware of the underlying issues could move on to Section 4.4.

Population levels:

Population enters house price models via the housing demand equation where a rising number of households increases the price via excess demand (Meen, 2002; Poterba; 1984). In Cameron et al. (2006) population enters indirectly through the demographic effect in the dynamic equation. Specifically, the change in the proportion of 20-39 year olds in the working age population is expected to be

9 Both the population level and the real median income levels are included together because this also accounts for the size of the region (cross-section).
10 This acts as a proxy for the expected growth premium.

positively correlated with house prices: as this proportion increases, the demand from first time buyers will also increase and with the assumption that supply constraints owing to land use regulation restrict new builds, house prices rise[11].

Capozza et al. (2002), who include this variable, are motivated by the differences in serial correlation and mean reversion that manifest between house price series belonging to different regions (cross-sections). One explanation for such differences arises from buyers' inability to determine the "true" value of a property; products are extremely heterogeneous and so agents typically rely on the informational content of previous transactions in the market to impute their true price. However if transaction volumes are low or if they are spatially and temporally distant, the information embedded in these sales is weak and agents are unable to set their reservation price easily (Quan and Quigley, 1991). In such cases, house price deviations from their fundamental levels are likely to persist for longer (lower mean reversion and higher serial correlation).

Thus Capozza et al. (2002) focus on the informational costs of house purchases and argue that these costs fall on average as the volume of transactions increases. Hence their rationale for the inclusion of population levels: by proxying the number of transactions, the population level captures the demand for housing and correspondingly the informational costs of house purchases.

We note that the impact of population or the size of the young cohort will be dependent on the scope of credit rationing in the mortgage market. To the extent that first time buyers are rationed, this may limit the effect of this variable, at least in the short run. This comment also applies to a number of the other variables discussed below.

Real personal disposable income levels

The relevance of income to house prices is apparent in Poterba (1984) where a simple separation of US states is made on the basis of volatility in house prices (high versus low). The house price to annual per capita income ratios are then computed for both groups. This reveals the effect of income on house prices: the least volatile house price regions have very stable price to income ratios as compared against the volatile regions. In other words, per capita income is likely to explain a substantial amount of long-term house prices but is less involved in generating short-run deviations.

The intuition behind the role of income and house prices is straightforward: it is the income of a household that determines the affordability of a potential

11 This demographic justification is also used by authors relying on alternative estimators such as Tsatsaronis and Zhu (2004), who use a VAR approach on a 17 industrialised country panel, suggest a broader measure of demographic effects: relative size of younger to older generations. However this ratio is excluded from their final model on the basis that its time series dynamics are captured by other variables included in their parsimonious model.

house purchase. This income effect is formalised in Hott and Monnin (2008) who maximise a representative utility function subject to an income constraint both of which underpin the demand equation for housing. In conjunction with supply, the equilibrium (or fundamental house price) is then directly dependant on aggregate income. However, via this framework it is also possible to justify the use of per capita income as in the case of Case and Shiller (2003) or even real GDP as in the case of Collyns and Senhadji (2002) who argue that this captures aggregate income and population trends.

Miles and Pillonca (2008) examine house price behaviour in fourteen OECD economies over 10 years (1996-2006) and attempt to quantify the main drivers of house price changes. On average, approximately 45% of the change in house prices are due to increases in real GDP per capita[12] and for countries such as Ireland and Greece, the income contribution is as high as 108 and 81 percent respectively. The major stimulus from rising real incomes to property prices may also help explain the generation of house price bubbles if, for example, future expected income rises are capitalised early on into house prices.

Real construction costs

Real construction costs are important determinants of house prices in that they underpin the supply function and thus help determine the price elasticity of supply. This in turn is a major determinant of the long-run price level (OECD (2010)). However, as discussed below, there is disagreement on the extent to which housing construction responds to current house price. In addition, non-priced factors such as regulation may explain why house prices deviate in the short-run from their long-run fundamental levels.

Real construction costs contribute to the marginal cost of housing production alongside land costs and normal profits to the builder (OECD 2010). Poterba (1984) assumes the housing construction industry is perfectly competitive and supply responds to the real cost of housing. However, Poterba (ibid) notes, according to Muth (1960) and Foley and Sidrauski (1971), there are divergent views on the stability of supply elasticities: the former assumes that long-run supply is perfectly elastic with respect to price in which case, in the long-run, the only determinant of house prices is real construction costs; the existing level of housing stock does not influence price. However in the Foley and Sidrauski (1971) model, the trade-off between the production of houses and other goods is not constant and so if the availability of individual inputs (such as skilled labour or timber) is restricted, the opportunity cost of building new houses increases and therefore so does the price of new builds.

12 Excludes Italy which has an anomalously low income effect.

Muellbauer and Murphy (2008) also note the divergent views on house price supply responsiveness and in particular discuss arguments by Mayer and Somerville (2000) who believe that house builders do not respond to the current price level but to the appreciation rate. They draw their conclusion for two reasons, firstly, house prices are a composite of their marginal costs of inputs which are mostly reproducible (e.g. bricks and cement). In this case, in the long-run, the price of housing depends on these factors and not on demand (similar to the Muth (1960) argument presented above). Moreover, since land (which is a factor input) is not reproducible, land appreciation will constitute much of the capital gain on dwelling (alongside limited appreciation of other reproducible inputs) so that residential construction predominantly depends on the price acceleration of land. The second reason is empirical: in reality the time series of housing construction is stationary whereas house price levels are not. In this sense the authors argue that there can be no long-run cointegrating relationship whereby new housing construction is explained by existing house price levels.

4.4 THE USER COST OF HOUSING

This variable is fundamental to most house price models in the literature in that it reflects the cost of home ownership. Meen (2002) defines the user cost as being equivalent to the marginal rate of substitution between housing services and an alternative composite bundle of goods. In this sense it can also be interpreted as the downward sloping demand curve for housing (van den Noord, 2005). More generally the OECD (2005) defines user cost as the expected cost of owning a house.

Whatever the interpretation of user cost, it is important to highlight that it is not directly observed; consumers do not explicitly encounter this variable when making allocative decisions. Hence Capozza et al. (2002) note that the user cost is a derived variable although we point out that the actual derivation of the time series uses a set of determinants which varies in the literature due to data availability or motivation of study. However according to Poterba (1984, 1992), McCarthy and Peach (2004) and Himmelberg et al. (2005) there are seven factors that should be included: (i) mortgage rates (ii) depreciation (iii) maintenance and repairs (iv) property taxes (v) risk premia (vi) capital gains and (vii) tax deductibility (on mortgage interest where applicable). We briefly describe the rationale for the inclusion of each of these variables before presenting a selection of user cost equations from the literature (which do not always include all seven factors):

(i) Mortgage rates:

These are included in user costs because they represent the opportunity cost of funds for the buyer. This rationale also partly explains why some authors choose to use the yield on government securities instead of the mortgage rate: in theory the opportunity cost is the interest that could be earned on an alternative investment which could be equally proxied by government yields or mortgage rates provided the spread between them remains constant. In reality, factors such as credit market conditions are associated with changing spreads and so the distinction between mortgage rates and treasury yields may be important. For example, the OECD (2010) points out that increased competition amongst lenders and a change in their risk-assessment behaviour led to a recent decline in spreads in the OECD up to 2007. Moreover in some countries banks have actively cross-subsidised products in order to offer better mortgage rates.

Poterba (1984) notes that as the cost of home financing diverges from the cost of borrowing the opportunity cost of housing equity changes and the user cost equation should be adjusted to include the loan to value ratio. This is because the latter essentially captures the risk borne by the homebuyer who is paying for a property that should be priced according to fundamentals, including the borrowing rate, but paying for the finance at the mortgage rate. The higher the loan to value ratio, the greater the user cost. On the other hand, as pointed out above, limits in loan to value ratios may also impact on the overall cost of owning a house, at least in the short run.

Poterba (ibid) makes a distinction between short term and long-term mortgage rates. When long-term rates increase, the future expected user cost increases and although there is no impact on user costs today, there will be an impact on current house prices since buyers assimilate the signal of higher future borrowing costs and reduce demand thereby reducing house prices. Hence Poterba (ibid) suggests that studies such as Hendershott (1980) which use long-term mortgage rates may have incorrectly measured the user cost. Gallin (2006) who constructs a composite mortgage rate which consists of the 30 year fixed rate and the one year variable rate on 30 year loans, both weighted by the proportion lent out in each category, may mitigate the short-term versus long-term issue to an extent. There are of course important cross country differences in mortgage markets that mean that either long or short rates may predominate.

OECD (2010) also makes a distinction between real and nominal interest rate effects. Whilst most studies use the real interest rate burden, there is a nominal effect that they may be ignoring. This arises because changes to nominal rates affect the repayment profile for the borrower; for most mortgage contracts, a rise in the nominal mortgage rate will mean repayments become front loaded so that

so that debt servicing burdens are greater towards the start of the mortgage term. This means households are less able to borrow during the earlier years whereas if mortgage rates fall in nominal terms, households' budget constraints become more relaxed due to the ability to borrow and so demand for housing increases (Muellbauer and Murphy, 2008; Kearl, 1979). This may explain the divergences in the choice of mortgage rates in the literature: for example, Hendershott (1996) uses the T-Bill rate in real terms whereas Malpezzi (1999) uses the national mortgage rate in nominal terms. The short versus long rate distinction is also important when estimating house prices from the asset price perspective; this will be discussed later in the section on asset models of house prices.

Another important issue regarding interest rates is their role as a monetary instrument for the prevention of financial instability. Box 1 presents a selection of five user cost equations from the literature. In some cases the mortgage rate is used whilst in others the short term interest rate enters the user cost. From the financial stability perspective, monetary policymakers aiming to mitigate housing bubbles can effectively alter the short term rate with the view that this will be transmitted to mortgage rates and affect the user cost of housing accordingly.

However, as described above there will be a divergence in the estimated user costs based on short term rates versus mortgage rates if, for example, banks do not pass on base rate cuts to customers. In such cases the interest rate loses its potency and the user cost will not reflect the regulator's goal as has been observed recently where banks have not fully passed on interest rate cuts to customers. And where long rates determine the cost of mortgages, there is also the term structure relationship to bear in mind, whereby monetary policy changes may not affect the risk free long term rate if future short rate expectations are offsetting.

We noted above that the user cost is also related to the loan to value ratio. It can be argued that the LTV would be a better macroprudential instrument than the mortgage rate or short term rate because it would enable the specific manipulation of house prices without affecting the wider real economy unduly. During boom periods in property markets, regulators could dampen excess demand for housing by requiring mortgage lenders to impose lower loan to value ratios on marginal loans and conversely banks could respond to lower housing demand by raising the loan to value ratio.

(ii) Depreciation and (iii) maintenance and repairs:

OECD (2004) defines this as the recurrent costs associated with owning a home, arising from depreciation, maintenance and repairs. For their estimation on OECD data the authors assume a constant parameter value of 4%.

Although lack of data may necessitate the assumption of time invariant depreciation, Poterba's (1984) analysis shows this may be too much of a generalisation since apart from any other reason, depreciation costs should increase in line with population and real income per capita growth in order to ensure the ratio of housing stock to income remains is maintained across the economy.

(iii) Property related taxes

Van den Noord (2005) focuses on the Euro area to examine the impact of property tax regimes on the cyclical volatility of house prices, since different tax regimes across member states will lead to different house price dynamics. Tax breaks to promote home ownership such as relief on interest payments cause the long-run level of house prices to increase. However tax subsidies are also likely to generate higher house price volatility through indirect means by amplifying housing market shocks such as changes in income, demography and building regulations.

Since income tax acts as an automatic stabiliser, property tax regimes may counteract this stabilisation effect. Van den Noord (ibid) notes that different tax regimes in monetary union members could thus generate different degrees of house price volatility and may explain why different union members display different growth rates and inflation rates.

Poterba (1984) notes that an increase in inflation which generates rises in nominal interest rates will both increase homeowners' mortgage repayment burdens and nominal capital gains. However in real terms, the user cost of homeownership decreases due to tax regimes which allow mortgage interest payments to be tax exempt. Under such frameworks home owners enjoy capital gains fully but only repay a fraction of the higher mortgage repayments and thus gain overall. Such considerations underpin the inclusion of property related taxes in the user cost equation.

This section on taxes is relevant since it shows that monetary or macroprudential policies are not the only way to limit house price bubbles. On the other hand it can be argued that given the long term nature of house purchase decisions, an appropriate fiscal framework may be best set for the long term rather than varied frequently, The role of changing property taxes in the US Savings and Loans crisis and the Swedish banking crisis are relevant in this regard.

(iv) Expected house price appreciation

In theory the expected user cost for potential investors should be influenced by their views on expected house price appreciation which thus influences the demand for housing. The OECD (2010) discusses two reasons as to why anticipated price movements may influence prices today: (1) speculative pressures (2) affordability.

Speculative buyers aim to benefit from expected house price appreciation when expected risk adjusted returns on homeownership exceed returns on other assets. However, agents that are not motivated by investment returns will also increase their demand for housing if they believe that future house price appreciation could price them out of the owner occupier market.

In the UK at least, affordability considerations are substantial for prospective buyers. The BSA (2007) which examined respondents' reasons for house purchases found that 28% of existing first time buyers and 68% of consumers considering purchasing first time viewed being priced out of the market as the main consequence of expected house price appreciation.

On the other hand, Miles and Pillonca (2008) are amongst those who suggest that house price expectations are backward looking; investors use the historic long-term house price growth rate alongside recent movements in house prices to form their expectations of future price movements. According to Shiller (2007) such psychological factors explain why fundamentals such as rents or construction costs alone are unable to explain house price movements. In reality, housing markets are not efficient; prices show momentum between successive periods as a manifestation of a behavioural feedback mechanism where repeated price appreciation serves to reinforce investors' beliefs that such trends will continue into the future.

Empirically, this momentum, which is likely to generate higher serial correlation and slow mean reversion, is modelled by Capozza et al (2002). They cite Case and Shiller (1988, 1989) and Shiller (1990) who suggest serial correlation in house prices arises from backward looking expectations.

Case and Shiller (1988) surveyed buyers in a control market and a "boom" market and found that boom market buyers believed expected house price appreciation would be higher than in the control market where prices had not risen by much in the past. Accordingly, behavioural reasons may explain why serial correlation is stronger in buoyant markets than in situations where the housing market is exposed to lower income growth.

Capozza et al. (ibid) accommodate such effects by augmenting the long-run relationship with dynamic serial correlation and mean reversion terms which are allowed to vary spatially and temporally. This allows differences in behavioural responses to house prices across regions and through the economic cycle to be captured. The mean reversion term accounts for the impact of psychological factors on the long-run price level.

Whether anticipated house price movements are modelled explicitly or as part of the user cost equation, most investigators rely on survey data for house price expectations or proxy this with the current inflation rate. Although the latter approach is common, Capozza et al. (ibid) note that it does not accommodate

regional variation in expected house price appreciation which would impact on user costs accordingly.

The role of serial correlation in house price movements and underlying expectational shifts helps to explain why housing booms are hard to stop once underway. The UK experience of raising interest rates in the late 1980s is relevant in this regard. It is only when a major shock to confidence occurs that the bubble ceases to exist, and at that point a major collapse is likely, threatening financial stability. The underlying lesson may be that monetary or macroprudential polices are best deployed early on in the housing cycle, before there are entrenched speculative elements. Later on such policies risk to be ineffective, although arguably an effective LTV policy may be more effective than interest rates in this regard.

(v) Risk premium

Although Poterba (1984) does not incorporate investors' risk preferences in the derivation of user cost, he does recognise that a complete model of asset market equilibrium would include the impact of risk tolerance on investors' demand for housing as an asset.

In Hott and Monin (2008) investors' risk premia are assumed to be constant and are thus combined with maintenance costs and property taxes as an aggregated user cost input. However Sinai and Souleles (2005) suggest that risk premia can vary and can take both positive and negative values. Risk arises from the decision to own and occupy versus the renting of housing services; whereas capital gains or losses arising from ownership only materialise at the point of sale, changes in rental charges can occur in each period. The differential in risk declines as the time horizon of agents is extended so that if occupation of a given property occurs for long enough the risk premium can become negative.

Having discussed the components of user cost and their theoretical underpinnings, in the box below we present a selection of user cost equations in the literature which vary according to the motivation of the study.

We next turn to describing some short run specifications in brief. These recognise that house prices deviate from their long-run fundamental values and attempt to specify an empirical relationship to track these short-term dynamics.

Box 1. User cost (*UC*) equations in the literature

Poterba (1984):

UC = [after tax depreciation + maintenance + (1 – property tax rate)(mortgage rate + opportunity cost of housing equity) – inflation rate]

Capozza et al. (2002):

UC = (mortgage rate + property tax rate)(1 – income tax rate) – inflation rate

Gallin (2006):

UC = price[(mortgage rate + property tax rate)(1 – income tax) + maintenance and depreciation – expected capital gains]

Meen (2002):

UC = price[(market interest rate + depreciation rate – inflation rate – expected house price appreciation)(1 – income tax rate)]

OECD (2005):

UC = (mortgage rate adjusted for tax relief + property tax rate + maintenance and depreciation and risk premium – expected capital gains)

4.5 SHORT-RUN DYNAMICS:

Cutler et al. (1991) provide a rationale for the inclusion of dynamic terms in house price models. They examine a host of asset types, including real estate, and find that asset price behaviour typically displays 3 characteristics:

1. positive serial correlation in the short-term
2. negative serial correlation in the long-term
3. the deviations of asset prices from their long-run fundamental values contain predictive information

They suggest these characteristics arise due to speculative motives of market participants and in combination they justify the inclusion of dynamic terms alongside fundamental house price determinants; the informational content of such dynamic terms will have predictive value. Cecchetti et al (2002) specifically delve into the properties of serial correlation and mean reversion terms of house prices. Whilst Cutler et al. (ibid) generalised the dynamic terms into descriptors of asset prices in general, Cecchetti et al. (ibid) put forward specific theoretical reasons as to why these terms should manifest in house price series. Informational reasons, transaction costs and supply side factors can all be used to explain serial correlation and mean reversion and since these factors are likely to differ across regions and time, it is also likely that the serial correlation and mean reversion terms will differ across cross sections.

To test the above proposition, Cecchetti et al. (ibid) augment the long-run relationship (equation 10) with dynamic terms according to:

$$P_t = \alpha \quad P_{t-1} + \beta(P_t^* - P_{t-1}) + \gamma \quad P_t^* \qquad (11)$$

where

α is the serial correlation coefficient

β is the mean reversion coefficient and $0 < \beta < 1$

γ is the immediate partial adjustment to the fundamental value

In general as α increases, the amplitude and persistence of the cycle will increase whilst as β increases the frequency and the amplitude of the cycle will increase.

The estimators in the literature do not always take the exact specification highlighted above. For example, Terrones and Otrok (2004) take a dynamic panel approach based on the GMM estimator which also contains the lagged dependant variable. Like Cecchetti et al. (ibid) they point out that if the autocorrelation coefficient (α) exceeds a value of one, house price growth will be explosive.

While authors such as Gallin (2006) focus on the long-run behaviour of house prices, others specify dynamics by using autoregressive distributed lag models in error correction form (Meen, 2002). Several non-structural specifications have also been used in the literature such as the VAR (Hott and Monin, 2008; Sutton, 2002) and the SVAR (Tsatsaronis and Zhu, 2004) since such studies focus on the interdependencies of house prices and their determinants such as term spreads, house price inflation, GDP growth and the growth rate of private sector credit.

4.6 THE ASSET PRICING APPROACH: NO ARBITRAGE EQUILIBRIUM

In this section we briefly outline an alternative house price modelling approach which has been used in the literature. Poterba (1984) proposed the no arbitrage approach to house price valuation which requires that the one period return from owning a house must equate to the return that could be obtained by holding an alternative asset[13].

In an extension to this approach housing service users can be thought of as investors who face a choice between renting and owning a property. In this case they will equate the marginal value of renting a house to the cost of owning a house which is the user cost of housing. Van den Noord (2005) represents this equilibrium as:

$$R(H) = UC \bullet P_H \qquad (12)$$

where $R(H)$ is the marginal value of rental services per period on an owned and occupied property, UC is the user cost of housing[14] and P_H is the price of owner occupied housing.

A similar approach has been used by OECD (2005) where equation 12 is re-expressed in terms of the price to rent ratio in order to determine the degree of overvaluation of OECD house prices:

$$\frac{P_H}{R(H)} = \frac{1}{UC} \qquad (13)$$

Equation 13 translates house price valuation to asset market models where $\frac{P_H}{R(H)}$ is analogous to the price-to-dividend ratio. If the price to rent ratio is high, investors will gain by renting housing services and the subsequent drop in demand for owner occupancy will restore the equilibrium relationship.

However there are problems associated with this interpretation of equation 13. Firstly the OECD (ibid) results suggest the price to rent ratio is non-stationary.

13 Poterba (1984) interprets this as the short-term interest rate. He also assumes risk does not feature in the investor's decision.

14 Van den Noord (2005) defines this explicitly.

Secondly, the user cost of housing is itself not static and may be subject to shifts in institutional factors such as mortgage market innovations which alter the cost of mortgage finance. Moreover, expectations of future house price appreciation are driven to an extent by behavioural factors and thus extremely hard to model (Miles and Pillonca, 2010). As discussed in the sections above, backward looking expectations which give rise to serial correlation in house prices will impact on the user cost accordingly.

Despite the caveats mentioned above, the asset model approach can be used to indicate general under or overvaluation of house prices. In theory, it can also be used to assess housing market efficiency (Meen, 2002) since the no arbitrage condition should ensure that equation 13 holds. However the existence of serial correlation in house prices suggests the market is inefficient since persistent excess returns become possible. One potential explanation for the inefficiency may be the presence of search and transaction costs which restrict buyers to specific geographical regions. This in turn means transaction volumes are lower than they would be in a more efficient market and so buyers have restricted access to information that could be used to compute fair house price valuations (Capozza et al., 2002). Another problem may be the planning regulations which restrict housing supply. Consequently, buyers have limited scope to exploit arbitrage opportunities and in this sense the asset pricing approach may be flawed.

4.7 KEY FACTORS OMITTED FROM MOST EXTANT STUDIES

Institutional factors relating to mortgage markets are typically not taken into account in house price estimates. In fact, many mortgage market innovations that have altered the terms and availability of credit have emerged in OECD financial markets over the past 30 years (OECD, 2005). This financial deregulation has not only increased competition, it has also led to the creation of new products such as buy-to-let mortgages, interest only loans and offset mortgages which allow borrowers to offset their savings against the mortgage balance.

As a result of such innovations, the availability of mortgage credit has risen dramatically in Europe and the US. Miles and Pillonca (2008) note that although the mortgage debt to GDP ratio varies across Europe (exceeding 70% in countries like the UK and Denmark), the stock of mortgage debt has risen in all cases. Consequently house buyers have seen a relaxation in their borrowing constraints and this has fed back positively to house prices.

Nevertheless, as this section has shown, few house price models have taken these fundamental changes into account. One possible way of doing so are to restrict the sample so that it only contains post liberalisation observations. However, this has the problem that there is likely to be a long period of adjustment of balance sheets to liberalisation that may well distort estimates. Furthermore, the period may

be too short to adequately capture long run relationships in the housing market. An alternative is to include a pre liberalisation period in the sample and allow coefficients to vary by use of leveraged dummies. We employ both approaches in our estimation below.

Mortgage spreads (loan less deposit rates) are also typically not included in house price equations, whereas these could be relevant to the impact of capital requirements on interest rates, as in Barrell et al (2009) and have important consequences for household incomes as well as for house price dynamics. We include such a term in our quarterly equation for Sweden below. Equally, despite recognition that housing is part of the asset portfolio of the household sector, most studies do not take the logical step of including household gross financial wealth, as a substitute asset, a rise in whose value would lead naturally to rising demand for housing for portfolio balance reasons.

An additional question raised by financial liberalisation is whether the stock of mortgages is appropriately included in house price equations. This was traditionally the case in pre liberalisation estimates in countries such as the UK (e.g. Hendry 1984) but was judged by authors such as Muellbauer and Murphy (1997) to be inappropriate in a post liberalisation sample, since the stock of lending is endogenous to the determination of house prices (this is consistent with the Granger causality results from Barrell et al (2011) cited above). On the other hand, if there remains a degree of rationing for some participants in the housing market, then the mortgage stock could have a role to play, and all the more if macroprudential policies have an effect of reintroducing forms of credit rationing. And indeed along these lines Miles and Pillonca (2008) do argue that the existing mortgage stock should also be included. We test this also in our work below.

Muellbauer and Murphy (2008) note that deregulation of mortgage markets has implications for monetary policy transmission and business cycles and that these changes are exerted via the interaction of house prices, housing finance and the real economy. Mortgage credit availability drives house prices and thus influences consumption and the supply of new housing stock. Moreover, if the housing wealth effect is negligible then the credit channel becomes crucial for explaining why consumption rises in response to house price appreciation: deregulation of mortgage markets means more homeowners can withdraw equity against a rise in their property values.

In recognition of the above, Muellbauer and Murphy (ibid) include a credit conditions index which they introduce both alone and as an interaction term with the mortgage rate. The credit conditions index is constructed using 10 consumer credit and mortgage market indicators as described in Fernandez-Corugedo and Muellbauer (2006). It is included so as to capture shifts in the credit supply function faced by households in the post-1980s era. The authors note that by omitting this

variable, previous house price models in the literature (which typically utilise pre-1980s data) suffer from omitted variable bias.

Unemployment may impact on house prices via demand and also if it entails widespread defaults and consequent "fire sales" but is typically not included in house price equations. Similar comments apply to banking crises per se, which give rise to uncertainty and credit rationing that other variables may not adequately capture. Certain supply aspects of housing are also typically omitted. Many studies do not even include housing investment or the value of the housing stock as an influence on house prices. But beyond this there is the influence of planning regulations in restricting supply, nationally and/or in local areas subject to high demand. And there is the potential influence of a regulated rental market for housing.

5 Estimation of house price equations for an OECD panel and for Sweden

5.1 SPECIFICATION AND DATA

In the light of the above literature survey and limited experience of macroprudential tool as applied to housing markets, we sought first to estimate panel equations for house prices in OECD countries, with a view to assessing how macroprudential tools could usefully operate, as well as whether suitable international rules could be devised. Given the extensive availability of cross-country data from the NiGEM database,[15] we have scope to investigate the common patterns of property price movements, while at the same time controlling for heterogeneity across countries or at different stages of real estate cycles. This in turn casts light on the relevance of earlier work cited in Section 4. The panel specifications (with details below) are the appropriate tool for this purpose. Moreover, from an econometric perspective, a panel approach gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency (Baltagi, 2005, p. 5).

A first table shows the data sample we are able to use, which for most countries is back to the 1970s. We hence include periods when there has been liberalisation as well as structural regulation in the housing market. This can be justified by the need for cointegration equations to have as long a data period as possible. But it will also be of interest if we can capture the differences in behaviour between liberalised and non-liberalised periods, since the introduction of macroprudential instruments will lead to a reintroduction of some form of credit rationing as was typical of the pre-liberalisation period. Note that we use annual data for the cross country panel

15 Note that the population data in NiGEM are interpolated annual data from the UN Demographic database (in our case we use the original annual data).

work, We contend that annual data ensures that dynamics can be simple and comparable, while it facilitates a focus on the long-run properties of the data.

Table 2 shows the standard panel unit root tests for the main variables. They use the Im-Pesaran-Shin approach to calculation. It can be seen that the bulk of the variables, being trended, are I(1), at least at the 1% level thus justifying an error correction model based approach to estimation. The dependent variable hence must be changes in real residential property prices. Accordingly, changes in real house prices were regressed on contemporaneous changes in explanatory variables, and lagged dependent and explanatory variables (both in levels) as well. This error-correction specification is able to deal with non-stationarity in the data (as mentioned above), and at the same time offers further tests of the theory by distinguishing short- and long-run influences on residential property prices. The significance of the coefficients for lagged non-stationary variables (in levels) and their magnitude reveal the long-term relationship among those variables.

Our modelling started from the work cited above with a basic equation where we include real house prices, real personal disposable income and the long term real interest rate (proxying the user cost). We use this as a foundation for applying further tests of extra variables that could be added.

As a first step, we start with the pooled regression that treats all countries as equally important, while the country fixed effects take account of heterogeneity. This regression is able to give us a preliminary view of whether the theoretical hypotheses set out above are validated by the data. Meantime, the result also serves as a benchmark for the follow-up discussion on distincative characteristics of real estate cycles for different markets of interest. We then proceed with a number of sub-sample panel regressions, in which each panel only consists of a particular group of countries (with similar market arrangements).

Hence, we first estimate for all 18 OECD countries but also for two divisions of that group. The first is between the large and small countries, with the large countries being the G-7 and the small countries the remainder. Then we have the division between the Anglo Saxon and bank-dominated countries, where the former are the UK, US, Ireland, Australia and Canada and the latter are the remainder. These breakdown analyses offer deeper insights by allowing for richer heterogeneity, e.g. distinctive economic determinants in each sub-sample (compared to the pooled regression). The combination of the pooled regression and the sub-sample panel regressions reveal elements of both commonality and uniqueness in residential property cycles in those 17 countries.

To confirm the existence of the long-term relationship, we also implement the panel cointegration test proposed by Kao (1999) among those variables with significant lagged level terms in a simple levels equation (i.e. the first step of an Engle and Granger (1987) two-step estimation).

5.2 RESULTS FOR THE FULL PANEL SAMPLE

Table 3 shows the basic results for the full sample from 1970-2009, with real long rates and real personal disposable income entering the equation. It can be seen from the Kao tests that the long run of all the equations cointegrate except for the G-7. This may link to the group being relatively small and non-homogeneous given the inclusion of both bank and market dominated countries. As regards the results, in the short run we find a strong income effect with an elasticity of 0.8 for all countries, larger in the G-7 and Anglo Saxon countries and lower in the small and bank dominated ones. The short run real rate effect is negative as expected, and significant for all countries, small countries and the Anglo Saxon ones, with a similar coefficient magnitude. A 1 percentage point rise in long real rates leads to a 0.5% fall in house prices in the short run.

A very consistent effect is the short run serial correlation term, which is highly significant, and around 0.5 in each case. In other words, a rise of 10% in house prices one year gives rise to a 5% rise next year independent of the other coefficients in the equation.

Turning to the long run results, we have a highly significant error correction term in each case of around 0.08, which means a slow adjustment to the long run fundamentals, around 12 years in fact. Their significance is supportive of cointegration (see Pesaran and Shin, 1995) as is confirmed by the Kao tests for most of the equations. Then the long run income elasticity is somewhat below the theoretical level of one, around 0.7-0.8 in most cases. The long run interest rate effect is significant except for the G-7, with a long run elasticity of around 4, i.e. the long run impact of a one percentage point rise in long real rates is to reduce the level of real house prices by 4%. These contrast to some degree with the results of Terrones and Otrok (2004) with a similar panel, who found an income elasticity of 1.1 and an interest rate elasticity of –1.0. Country studies cited in OECD (2005) are much closer to ours, however.

We undertook F-tests on the pooling assumptions in the groupings and found that for both categories, the divisions were preferred to the "all" sample. This was more the case for the G7/small breakdown than for the Anglo-Saxon/banking split. (In the former pooling was rejected at 99% whereas for the latter it was only rejected at 95%). Accordingly, we consider closely the G7 and small country results, with particular focus on the latter as being relevant for Sweden.

Table 4 shows the variants on these basic results, which we consider highly satisfactory in general terms. We first sought to include a cubes lag in house price growth. This was suggested originally by Hendry (1984) as a proxy for "frenzy" when a large rise in house prices gives rise to a further boost, suggestive of bubble formation. The expected coefficient is positive. In fact we find only a significant negative coefficient for all countries, the G7 and for the bank dominated ones. This

implies rather a form of mean reversion in growth. It may be that using annual data gives rise to periods too long for "frenzies" to be detectable, whereas a shorter quarterly frequency might have captured it.

The second variant has the log stock of real mortgage debt included. We note in this context that there is a theoretical argument, which has been borne out by much empirical work, that mortgage debt should not be causal for house prices in a liberalised financial system. This is because it accommodates to house prices, when it is freely available. Such a surmise was partly confirmed, for example, by Granger causality tests in Barrell et al (2010b) between personal debt and house prices, which showed causality from credit to property prices only in Belgium, Canada and Finland from a group of 14 OECD countries, although some causality was also found for Sweden in the pre-1995 period. At least, we considered it essential to instrument the difference of credit, so that results were not affected by simultaneity with house prices. The instruments were the lagged difference of house prices, income and interest rates.

The results were that there was indeed a significant impact of credit on house prices in a number of subgroups, albeit generally only in the short term, with a quite consistent elasticity of around 0.15. Comparison with Davis and Zhu (2010)'s estimates for commercial property prices with similar panels showed a much higher coefficient of around 0.8. In commercial property the incidence of rationing is likely to be much greater. There is only a long run effect in the small countries, with a long run elasticity of around 0.4.

An objection to such results is that the sample, typically from 1970-2009, includes periods of both financial repression and financial liberalisation. We used dates from OECD (2000) to fix the time of financial liberalisation, As in Barrell and Davis (2007), we then defined dummies distributed from 1.0 prior to liberalisation to 0.0 five years after, with the transition being in the form of an ogive imposed to conserve degrees of freedom. The coefficients on the differences in debt and lagged debt were then leveraged by these dummies to give scope for the parameter to change gradually with liberalisation. Our result for the G7 we consider unsatisfactory due to outliers and should be disregarded. However, the result for the small countries is of interest, suggesting as it does that the short run elasticity for debt changed from 0.44 before liberalisation to 0.09 thereafter. This is in line with the hypothesis of a fall in the impact of mortgage lending with liberalisation, while leaving an ongoing small positive effect. The small countries of course include Sweden. The results for all countries, the Anglo Saxon and bank dominated are unchanged by the dummy, however.

The implication of this result for the mortgage stock is that a macroprudential policy that affects the mortgage stock will have an additional effect on house prices over and above the interest rate/user cost change that may underlie it. Hence the

effect of macroprudential policy will be greater than if the mortgage stock variable had been absent.

The third variant was using a demographic variable, namely the proportion of 20-39s in the population. In Cameron et al (2004), as cited on Section 4, this is considered to be the prime age group for property purchase. However, it is acknowledged that this may not hold in countries such as Germany where renting is more common at this age, and house purchase may be delayed till later in the life cycle. Possibly consistent with this, we only obtain a significant result for the "Anglo Saxon" countries where owner occupation is high and also mortgages are freely available for most of the sample. There is a short run elasticity of 1 between the size of this age group and the house price, and in the long run the effect is around 1 also.

We then sought in two ways to allow for supply in the equation, firstly by including a flow variable which is the ratio of housing investment to GDP, then by adding a stock variable, the ratio of the estimated housing stock to GDP. The latter is estimated on the basis of a perpetual inventory model with a deprecation rate based on a life of 75 years, and the initial year's investment/GDP ratio. Hence it may well be inaccurate. That said, there is evidence of supply effects for the small countries, and to some extent in the Anglo Saxon ones, but not elsewhere. The effect in the small countries is as would be expected, with a rise in the supply leading to lower house prices. On the other hand, the Anglo Saxon result is a positive one, suggesting that housing investment tends to accompany booms in house prices.

We tried two dummy variables directly in the equations. First we assessed whether financial liberalisation has had a direct effect on house price growth, with systematically lower growth before liberalisation. Then, we tested whether banking crises had a marked effect, over and above any effect from the changes in income and interest rates. As can be seen in Table 4, the liberalisation dummy (as defined above) had no significant impact, while banking crises (with periods defined as in Caprio and Klingebiel (2003)) were highly significant and negative in all cases. We can hypothesise that crises impact via uncertainty and credit rationing effects that the existing variables are unable to capture. For the most part, the crisis variable complements but does not supersede the other variables in the equation. Crisis impacts are worse in small countries than the G-7, and in bank dominated countries than in market based. In the latter, there are in most cases alternative sources of finance to banks (e.g. securitisation – except in the latest episode) which may mitigate the impact of bank failures on the housing market. There have tended to be a greater proportion of systemic crises in the smaller than the larger countries also.

Does unemployment impact on house prices, via greater uncertainty and incidence of default? Table 4 shows that this is the case in most of the country groups for the difference of unemployment, but not the levels. A 1% rise in the rate

of unemployment reduces house prices by around 1% in the first year. It is notable that the largest effect is in the Anglo Saxon countries where unemployment is typically more volatile and protections against default less.

Finally in this section we tested for an effect of gross financial wealth on house prices. The idea is a portfolio balance one, whereby high financial wealth might lead to shifts in allocation to real assets, thus boosting house prices. The empirical results suggest that this is an effect worth considering, with significant results for the difference in all countries, the small and bank dominated ones. A 1% rise in real financial wealth boosts house prices by around 0.1-0.15%. There is also a significant long run effect in the G7 countries only, where the elasticity is around 0.7. A counter argument to including wealth is that the relevant information should be captured by income and interest rates.

5.3 RESULTS FOR THE POST LIBERALISATION PERIOD

A feature of the above results is that we have included both periods of financial liberalisation as well as non liberalisation. Accordingly, we may be vulnerable to shifts in coefficients within the sample. On the other hand, we do benefit from a long data period which includes several cycles and hence should well capture the long run properties of the data. Accordingly, we retain the above as our main set of results, but test in two ways for possible biases. First, we shortened the sample for each country to begin with financial liberalisation. Second, we sought in the manner of Barrell and Davis (2007) to do generalised leveraging of coefficients, to see whether the partial results for debt cited above generalise to some of the other terms. We comment on these results relatively briefly, to mainly highlight contrasts with the main results in Tables 3 and 4.

For the liberalisation period, the methodology was to multiply the dependent variable by a dummy which is 1 for all periods after liberalisation. This reduces the sample from 618 to 413 in the all countries case, for example. The most noteworthy feature is that we "lose" the long run income effect in this shorter period, and it becomes insignificant. This may be due to the protracted adjustment period after financial liberalisation, although a further experiment with an even shorter period 5 years after liberalisation also produces counter intuitive results (a negative income effect for "all countries" for example). We consider this result to mean this is an unsatisfactory result overall. Nevertheless, some differences with the full panel remain noteworthy. As shown in Table 5, the short run income effect is lower and the interest rate effect is consistently higher. There is more serial correlation in house prices when the later period is considered alone. And the adjustment to the long run equilibrium is generally slower. This suggests a more volatile period when house prices can deviate further from equilibrium and fundamentals, albeit strongly driven by real long term interest rates.

As regards the variants (Table 6), we do not find a significant cubic term in the later period. On the other hand, the debt effect remains in the short run in all cases, with a comparable coefficient to the full period, and a negative long run effect in the Anglo Saxon countries, perhaps caused by the recent falls in prices in 2007-2009. Demography continues to be significant for the Anglo Saxon countries too. We find long run effects for the housing stock in the G7 and Anglo Saxon countries which are negative in line with theory, but no investment effects. Crises remain powerful determinants of house prices. Most of these of course occurred after liberalisation in any case. We now find a long run as well as a short run effect of unemployment in all countries and the bank dominated ones. And wealth is a consistent determinant of house prices in the short run across the country groups.

5.4 APPLYING LEVERAGED COEFFICIENTS FOR THE PRE LIBERALISATION PERIOD

Although the above-cited results from Tables 5 and 6 add to knowledge, they remain unsatisfactory due to the long run income effect being zero. We accordingly go on to comment on the full sample regressions with the pre-liberalisation dummies (i.e. set at unity for unliberalised phasing to zero five years after liberalisation). So for example in Table 7, the variables labelled X*Lib show the absolute difference in the coefficient before liberalisation compared with after it. If all of these coefficients are insignificant, the equation is stable between the two regimes. If on the other hand there are some significant coefficients, it is indicative of structural change.

A first point to note from Table 7 is that the unleveraged coefficients are comparable to the basic estimates in Table 3 over the same time period, which is a favourable sign. As in Table 3, all of the coefficients are significant except for the long run effect of the long rate for the G7. As regards the leveraged coefficients, we can see that the short run is much more affected than the long run. We have evidence of a much lesser response to income growth since liberalisation for example (positive leveraged dummies are significant for all groups except the small and bank dominated). The short run interest rate effect was absent before liberalisation for the Anglo Saxon and G7 groups. And the serial correlation "bubble building" effect is much greater in the G7, Anglo Saxon and All countries groups since liberalisation (and also at 90% for the bank dominated countries). Equally, the adjustment coefficient suggests that there was slower adjustment to the long run before liberalisation, apparently in contrast to the differences between Tables 3 and 5. There are in contrast no significant coefficients for the long run, except that prior to liberalisation the small countries have a smaller long run interest rate coefficient. The income term is totally unchanged.

Looking at Table 8 where we leverage the variants, there are no significant effects or differences for the cube term. Results for debt are comparable to those

in Table 4, except that of course we are also permitting other terms to vary as well. The key result is again that for the small countries, where the debt effect in the short run was much greater before than after liberalisation. There is some evidence for a demographic effect in the G7 as well as the Anglo Saxon countries in the post liberalisation period, while supply effects only appear now in the G7. There is a positive crisis effect in the Anglo Saxon countries, which we attribute to a single observation – virtually all OECD crises were after liberalisation. As regards unemployment, it appears to have impacted on house prices mainly before liberalisation in the G7 and Anglo Saxon countries, whereas for the smaller countries (and all countries) it is consistent across the sample. Finally, the financial wealth effect is apparent across the whole sample in first difference form only. Noteworthy patterns from Table 8 are again that there are virtually no changes to the long run specifications, only some amendments to the short run results.

Reflecting on the impact of macroprudential instruments, it seems likely that LTV limits could be incorporated as feeding through the discount factor, as they require further saving to take on the mortgage (the interest rate term) also affecting the volume of credit (the stock of mortgages would decelerate). Capital ratio increases could similarly be an interest rate effect although perhaps a better index would be the spread between deposit and loan rates – a form of risk premium.

5.5 QUARTERLY ESTIMATES FOR SWEDEN

Against the background of the panel estimation, we estimated an equation for Sweden using quarterly data from 1970-2009 as a basis for the model simulations.[16] We include the key variables which are significant in the small countries panel, but also can include the spread between the deposit and lending rate, unlike in the cross country panel data where this variable is not available for most countries over a sufficiently long sample period. As noted, this variable can capture the impact of higher capital requirements for mortgage lending, affecting as it does the deposit rate and also the lending rate.

Four versions are shown in Table 9. The first has long run income homogeneity not imposed, the second has that restriction and the third includes estimates for the additional variable bank spreads between household loan and household deposit rates. The fourth imposes the same coefficient on spreads and long rates, as is required in the NiGEM model as discussed below.

As can be seen in Table 9, the equations are all well behaved statistically, with no autocorrelation or non-normality despite the differing regimes during estimation. There is however some evidence of heteroskedasticity, which may relate to the greater volatility of house prices in the more recent period. The only

16 Source: BIS; quarterly data before 1986 were annual data interpolated.

difference between pre and post liberalisation coefficients that was significant was the difference of income term, which is much larger prior to liberalisation. Other significant short run terms are on wealth and liabilities, there is also a large serial correlation term (lagged difference of house prices) of around 0.5. There is no short run interest rate effect. The freely estimated long run income elasticity is around 1.6, while there is also a significant long run interest rate and spread effect. The freely estimated spread effect is larger than the interest rate effect.

It is the final column equation that is incorporated in our NiGEM simulations. It allows macroprudential policy to operate in three ways, via the long term real interest rate, via the spread (which affects household incomes as well as the cost of credit) and via the mortgage stock. On the other hand we note that this specification is not very "dynamic" in the sense that although there is a major serial correlation coefficient, the shocks feed through slowly given the low income-difference term as well as the slow adjustment to the long run.

6 Interactions of macroprudential policies with monetary policy, and simulations with the NiGEM model

In a final section of our work, we first review overall comments and the limited amount of technical work on macroprudential and monetary policies. We then go on to carry out simulations on the Swedish component of the NiGEM model using the final equation in Table 9, comparing the effect of housing market related macroprudential policy with that of monetary policy and more general macroprudential instruments. We consider the impacts on house prices, real activity and also credit formation of the various shocks that can be imposed.

6.1 OVERALL COMMENTS

Looking first at the interaction of macroprudential with monetary policy, Barrell et al (2010a and b) cited above have shown that the overall country adjustment in prudential policy to reduce crisis probabilities depends partly on macroeconomic volatility. So one argument one can make is that if monetary policy can reduce house price bubbles and imbalances in the current account, it impacts on macroprudential adjustment.

On the other hand, extant comments suggest it is more doubtful that macroprudential regulation will significantly affect the macro economy and hence the demands on monetary policy. This is based not only on NIESR calculations but also the Basel calculations that were made in FSB (2010). According to simulations with macroeconomic models in various countries, 1% more capital and liquidity seems to take around 0.1% off GDP which is not huge and only 0.03% if all countries moved together. So in other words, the effect of regulatory tightening on

the macro economy are small so long as the tightening is gradual, which is a point relevant to monetary policy.

As the BIS point out in their recent Annual Report (2010), there are some benefits to monetary policy of a more active macroprudential policy. Less financial crises imply less economic fluctuation. If crisis risk can be reduced, interest rates are less likely to become ineffective due to financial distress, and also there will be less need to cut interest rates for financial stability in the downturn with possible inflation risks. Conflict between monetary and macroprudential policy is possible mainly well in advance of a crisis, since inflation may be subdued but there may be pressures on asset markets. Then one might wish to pursue a tight macroprudential policy and an easy monetary policy. Once inflationary pressures also emerge both macroprudential and monetary policies should be tightened, but this may be too late to prevent a crisis. After a crisis, both policies should be loosened, although as noted there may be inflation risk from holding monetary policy too loose for too long.

6.2 EXTANT TECHNICAL WORK

We note there are rather few papers that have sought to look at monetary and macroprudential policy together. These are typically in stylised calibrated models rather than estimated ones. And a comment from one such paper is relevant "within a standard macroeconomic framework, it is very difficult to derive a satisfactory way of modelling macroprudential objectives" (Angelini et al 2010).

For example in Kannan et al (2009) they use the standard New Keynesian model as for example in Gali (2009) and add, first, a choice on the part of households how much to invest in housing as well as how much to consume, second, a distinction between borrowers and lenders, and third, the lending rate is modelled as a mark-up over the policy rate dependent on LTV ratios, the mark-up over funding rates, and in some simulations a macroprudential instrument. So for example a rise in house prices leads to a fall in LTVs and hence in mortgage rates even if the policy rate does not change. Market competition can also affect the mark-up. Hence, there can be endogenous house price and investment booms.

The general results are that strong monetary reactions to such financial accelerator effects that drive credit and asset price growth can improve macroeconomic stability compared with a simple Taylor rule, while a macroprudential tool against credit cycles, applied in a discretionary manner, could also stabilise the economy. Such rules would entail additional capital or provisioning when credit grows in excess of a certain rate. They note however that because it is not always straightforward to identify the cause of house price movements, a rigid rule could increase macroeconomic instability. In particular, whereas a relaxation in lending standards (financial shock) can be well catered for by rules, this is not the case for

an increase in productivity (real shock). In the latter case resisting rises in credit would be inappropriate and cause undershooting of inflation targets.

Angelini et al (2010), use a similar dynamic general equilibrium model of the Euro Area to address the issue of appropriate macroprudential tools and rules and their interaction with monetary policy. Their extensions of the DSGE model are for a banking sector with capital, loans to households and firms and deposits from households. Interest rates are sticky owing to banks' market power. There are risk sensitive capital requirements generating procyclicality and heterogeneous creditworthiness of agents. The macroprudential policies are capital requirements and loan to value ratios, where the latter gives rise to credit rationing for households given the value of the housing stock. The former affects both firms and households, by contrast.

They find that macroeconomic volatility can be reduced by active management of macroprudential instruments in cooperation with monetary policy but the benefits are not large. When there is a technology shock, macroprudential policy should focus on output and not loans or equity prices, for the capital based rule, but loans is preferred in the case of the LTV. When there is a credit crunch shock, that destroys bank capital, both policies should focus on loan growth. Overall, the capital policy is more effective at reducing volatility of output growth, and LTV at reducing variance of the loan/GDP ratio, suggesting there is in their model a trade-off of stabilising economic activity and financial stability.

As regards the coordination issue, both policies operate partly by affecting the interest rate on loans. In a cooperative game between policymakers output variability is reduced. But if there is a non-cooperative Nash equilibrium, then substantial coordination problems emerge. In other words, there is a risk of coordination failure if suitable coordinating mechanisms are not devised.

Finally Angeloni and Faia (2009), give a DSGE model with a competitive banking sector and the possibility of bank runs, where the monetary policy is allowed to react to asset prices and leverage as well as inflation and output, and capital requirements can be pro or anti cyclical. There is a need for mildly counter cyclical capital requirements and a monetary policy that reacts to asset prices or leverage as well as inflation.

As noted by Angelini et al (2010) a difficulty of all these is that systemic risk cannot readily be modelled, although stabilising the loans/GDP ratio and GDP growth around their steady state values could be justified by definitions of macroprudential aims such as those of the Bank of England "the stable provision of financial intermediation services to the wider economy, avoiding the boom and bust cycle in the provision of credit". Of course, systemic risk will heighten economic volatility, and the loans/GDP ratio may be one factor underlying systemic risk (although we argue in Section 2 that it is not the most important one).

6.3 NIGEM SIMULATIONS

We turn now to simulations using the NiGEM sub-model for Sweden. The NiGEM model is presented in Appendix 1. In sum, it contains elements of demand, including consumption, and a supply side with a production function that is driven by technology and the user cost of capital which is the main determinant of the development of the economy in the longer term. Financial markets are forward looking, as are factor markets. i.e. incorporating rational expectations. All of these may be affected by financial regulation. When banks increase the spread between borrowing and lending rates for individuals it changes their incomes, and can also change their decision making on the timing of consumption, with the possibility of inducing sharp short term reductions. The volumes of deposits and lending that result are demand determined. Changing the spread between borrowing and lending rates for firms may change the user cost of capital and hence the equilibrium level of output and capital in the economy in a sustained way.

We contend that NiGEM offers the advantage of being a description of the economy and not a theoretical abstract as is true of DSGE models, which may not well describe the economy. The latter is a weakness of models such as Meh and Moran (2008) which seek to identify some potential influence of banks on the economy. The rational expectations features of NiGEM increase realism further and reduce the impact of the Lucas critique. As regards the modelling of banking sectors' influence in terms of spreads between borrowing and lending rates, in a global macromodel this was pioneered by NIESR in its work on the impact of capital adequacy regulation (Barrell et al 2009), where other influences on spreads besides capital include measures of borrower risk. Goodhart (2010) has argued that determining spreads is precisely the way that banks should be incorporated in macro models, and not either ignored or set out in terms of the "money multiplier", see also Woodford (2010). Operating via spreads' impact on investment, the stock of capital and hence, via the production function, output, NiGEM offers a highly realistic and plausible view of the economy and banks' role therein.[17]

We undertook a number of modifications of the existing Swedish NIGEM model, with first an inclusion of housing wealth in the consumption function. Second, we allowed the increase in household liabilities to be driven by housing wealth (previously it had been driven by income). And third, we included the house price equation set out in column 4 of Table 9, which incorporates an income, wealth and mortgage stock effect as well as an effect of long real rates and the household sector lending spread (the previous equation had included only the interest rate terms). Hence the effect of banks on the economy via lending spreads is broadened

17 We note that the Meh and Moran (2008) paper cited above, bank lending does not operate via spreads explicitly but rather in a form of quantity rationing of credit, where it is only after the investment that returns to banks are made explicit.

from fixed investment, the stock of capital and consumption to also include house prices. The new equations are shown in Appendix 2.

As regards the simulations, we describe seven differing ones. First there is a 0.5 percentage point rise in technical progress, which boosts long term growth. There is a fiscal tightening, which is equivalent to 1% of GDP off government consumption, with the target for the government deficit raised by 1% so tax adjustment is mitigated. There is a fiscal easing which is 1% of GDP on government consumption There is a 3 percentage point rise in the intervention rate for 2 years, showing the impact of tighter monetary policy. We then have three macroprudential simulations. One is for a 3 percentage point rise in the bank spread for mortgages only (LENDW) (showing the effect of higher countercyclical capital requirements on mortgages), for 2 years. We then do this for all bank lending so it also affects the spread for the corporate sector (IPREM). And finally we seek to proxy a fall in regulated LTVs by simply shocking the implicit user cost of housing by 3 percentage points for 2 years. The main difference between LENDW and user cost is simply the effects of LENDW on personal income which is absent for the user cost shock. Then we present the results in a series of tables. Our main focus is on the monetary and macroprudential simulations, the others are there mainly for comparison purposes and to validate the properties of the model.

Table 10 shows the impact of the simulations on GDP. It can be seen that all sectors capital adequacy has a similar effect to monetary policy. This is largely due to the impact of the IPREM variable on investment, because the corresponding fall in GDP where only the spread for the housing market is widened is much less, around 0.2% off GDP after 2 years compared to 1.1% for monetary policy and 1.4% for economy wide capital adequacy. Even more subdued is the response of output to the LTV proxy, which by construction does not affect personal income and hence consumption directly, but only affects consumption via the value of housing wealth. Note that we do not build in a possible response of saving to a lower LTV, as people save more to buy a house.

As regards inflation, (Table 11) monetary policy is more effective than macroprudential policies, although there is some effect of the latter also on inflation from the all sectors capital adequacy simulation. We show house prices as a deviation in terms of levels from base in Table 12 . The macroprudential policies are more effective at reducing house prices than monetary policy of the same magnitude (3 pcp for two years). This no doubt relates partly to the term structure effect of the short intervention rate being less than one to one on the long real rate that enters house price determination. The greatest effect is from the all sectors capital adequacy simulation which affects house prices via personal disposable income as well as directly. The other macroprudential policies are quite comparable however.

Table 13 looks at changes in the stock of personal debt. This is driven largely by housing wealth, as shown in Appendix 2 so falls in line with house prices. Again the impact is much greater for macroprudential than monetary policies, calibrated in the manner we have chosen. Table 14 shows housing wealth moving in line with house prices. This variable enters the determination of consumption as does personal disposable income (Table 15) which falls considerably more in the monetary policy than in the macroprudential simulations, although "other personal income" declines in the case of widening spreads in the lending market from LENDW. Note that there is by construction virtually no change to PDI for the case of LTV limits, and we consider this to be realistic.

We finally construct two key macroprudential indicators, namely debt/housing and debt/personal disposable income and consider how many percentage points the ratios change. In the case of housing market gearing (Table 16) monetary policy raises gearing in each case since it affects housing wealth proportionately more than it does debt. In contrast, the macroprudential policies start to reduce the ratio, in the case of an LTV policy in the third year and for the two capital adequacy policies slightly later on. The debt/income ratio (Table 17) is also raised by monetary policy for the first three years, before declining thereafter. The LTV policy, which reduces debt while leaving income unchanged, unambiguously reduces the ratio. For the capital adequacy simulations the effect is again delayed till after the policy is taken off, although there are marked reductions in years 3 to 5 in each case.

Summarising briefly, we need to caution the reader that model simulations can only be imperfectly calibrated. It would be hard to devise a policy that makes an exact change in the spread via capital adequacy equivalent to 3 percentage points, for example. Nevertheless, we contend that the results are of interest in showing that monetary policy is superior in addressing inflation and for the most part output. That said, a rise in capital requirements which gives rise to 3 pcp wider spreads for households and corporations has a major effect on GDP, indeed greater than a 3 pcp rise in intervention rates for the same period. It appears to generate more volatility in GDP for a given macroprudential effect than do the housing market related tools.

In terms of housing market variables, the macroprudential policies seem to be more effective, although monetary tightening also has a major effect on house prices and correspondingly on housing wealth. The restraint of debt by the macroprudential policies is much more effective, operating as it does largely via house prices and housing wealth. We see that an LTV policy can restrain house prices while not impacting on personal income in the same way as capital adequacy based policies. It is correspondingly better at reducing debt/wealth and debt/income ratios, at least in the first two years of the simulation. We should note that

the model excludes confidence effects that could differ between these policies, as well as any adjustment to the saving/consumption balance due to LTV restrictions.

Against the background of these results, as well as the theoretical work summarised in Section 6.2, we suggest that the housing market linked macroprudential tools could be a useful complement for monetary policy even in a country like Sweden where there is no constraint on use of monetary policy for domestic stabilisation – and all the more for countries such as those in the Euro zone with a fixed exchange rate.

Conclusion

Against the background of the subprime crisis, where housing was implicated in the financial crisis in countries such as the US, as well as the ongoing discussions regarding Basel III, there has been renewed interest in both macroprudential regulation in general and countercyclical and macroprudential regulation focused on the housing sector in particular. However, although a number of "building blocks" exist, the literature on macroprudential policy in respect of housing is quite thin. There are some descriptions of national experience and some tentative econometrics on the success of such policies, as well as theoretical papers but little beyond that.

We have sought to contribute to reflection in this area by taking a wide point of view and surveying the literature on housing market dynamics with a view to finding possible links to financial instability as well as potential macroprudential tools for dampening disruptive tendencies. We then went on to estimate house price equations and evaluate NiGEM model simulations for Sweden with the same aim.

Summarising our work, we note a number of empirical papers which suggest a link from house prices to banking crises. Notably, we highlight Barrell et al (2010a and b) which show that house prices are a key indicator of banking crises. On the other hand, we also note that housing losses have not tended historically to lead to bank collapses, except in the US where housing loans are non-recourse. It is rather commercial property which is the biggest risk to banks, and the predictive power of house prices might be seen as partly linked to the close relation of the various real estate prices. However, house prices may also influence banking crises via the wealth effect of housing on consumption, falls in which may drive defaults for producers of consumer goods and services, and for the unemployed.

Such results underpin the growing consensus that housing markets in general and house prices in particular need to be monitored in macroprudential surveillance. Monetary policy can influence house prices via a number of channels, including the user cost of capital, expectations of house price movements, housing supply, wealth effects (although the size of the housing wealth effect is disputed), credit effects on consumption and credit effects on housing demand. Hence, there is an ongoing debate as to whether monetary policy should respond to house prices directly,

particularly if there is evidence of deviations from their fundamental determinants. The debate can be summarised by two points of view, whether policy should "lean" against house prices generating potential risk independently of forecasts of inflation and the output gap, or whether it should concentrate on the latter and "clean up" if there is a crisis following a house price collapse.

Notably in countries where monetary policy is taken up with other objectives (e.g. with a fixed exchange rate) there has been ongoing development of policies to influence housing markets via banking regulations, notably limits of allowable loan to value ratios, and variable capital requirements on bank lending for house purchase. These complement the Basel rules which focus on capital regulations across the whole of banks' balance sheets. However, the effectiveness of housing market specific macroprudential regulations is not fully empirically proven beyond their impact on lending, perhaps partly due to the short periods over which they have been introduced in most countries. There are nevertheless some tentative results suggesting that default rates and house prices are affected by such policies.

Policy can only operate effectively on housing in a context where the determinants of house prices are well understood. In the literature, house prices are typically estimated in a cointegrating framework where long and short run influence arise from personal income and a user cost variable (where the latter may incorporate not only interest rates but also taxes and expected house price appreciation). Population and construction costs may also enter. Serial correlation in the short run is a feature of many house price equations. On the other hand, most empirical studies omit some influences that might be expected to impact on house prices. These include financial liberalisation, banking crises, the mortgage stock (especially before liberalisation), unemployment, regulations on housing supply, the housing stock or the flow of investment , financial wealth as a portfolio balance effect, and interest rate spreads on mortgage lending.

In our empirical work, we capture not only the conventional effects but also a number of those typically omitted from existing work, such as banking crises, unemployment, gross financial wealth and the mortgage stock. We find that there are regime shift changes between pre and post liberalisation periods, with a lesser impact of the mortgage stock and a smaller short term income effect after liberalisation. However, long run determinants of house prices are consistent between the two periods, for the most part. Some variables that could be helpful in estimation of the effect of macroprudential policies are absent for most countries, notably a marginal LTV ratio and data on spreads between lending and borrowing rates. The latter was helpfully available for Sweden however. Indeed, estimation of an equation for Sweden includes a significant mortgage spread.

In our estimation we have shown that a number of potential macroprudential effects can be captured in freely estimated house price equations. Notably, we can

have effects arising via the user cost, which can proxy LTV limits, spreads, which can proxy for changing capital ratios, as well as a mortgage stock effect.

As noted the mortgage stock effects were stronger in the period before financial liberalisation, which raises the issue of what "regime" tough macroprudential policy will bring the housing market to. Will it lead to renewed rationing and a return to the past, or will it rather be consistent with a free market in house prices and housing finance? In our view the types of policy under consideration are unlikely to be so draconian as to return the housing market to a 1970s style rationing.

Finally, there is evidence from our NiGEM simulations that macroprudential policies can have a distinctive impact on the economy, focused on the housing market, which could helpfully complement monetary policy at most points in the cycle. These results are in turn broadly consistent with the small volume of work assessing theoretically how macroprudential policies may affect the economy. A generalised rise in capital adequacy is shown to have a quite marked impact in GDP, mainly via investment rather than consumption, however. A more focused capital adequacy rise for mortgage lending only or an LTV policy appear to have scope to reduce house prices with less effect on the rest of the economy than other options, although it may of course be more subject than capital adequacy based policies to disintermediation. Capital adequacy for mortgage lending affects GDP more than the LTV policy since it impacts more on personal income and hence consumption. Monetary policy does of course also affect housing market variables but also has a greater effect on the wider economy, as do generalised rises in capital ratios affecting all lending.

Overall, we suggest that the housing market specific macroprudential tools could be a useful complement for monetary policy even in a country like Sweden where there is no constraint on use of monetary policy for domestic stabilisation – and they could be particularly helpful for countries such as those in the Euro zone with a fixed exchange rate.

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Table 1. Data sample

	AU	BG	CN	DK	FN	FR	GE	GR	IR
House prices (PH)	1970-2009	1970-2009	1970-2009	1970-2009	1970-2009	1970-2009	1970-2009	1994-2009	1970-2009
Intervention rate (INT)	1968-2009	1961-2009	1961-2009	1976-2009	1970-2009	1965-2009	1961-2009	1961-2009	1971-2009
Consumers expenditure deflator (CED)	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009
Real personal disposable income (RPDI)	1961-2009	1970-2009	1961-2009	1971-2009	1963-2009	1961-2009	1961-2009	1977-2009	1961-2009
Real long term interest rate (LRR)	1970-2009	1962-2009	1962-2009	1962-2009	1972-2009	1966-2009	1962-2009	1962-2009	1971-2009
Personal debt (LIABS)	1977-2009	1961-2009	1961-2008	1961-2009	1979-2009	1971-2009	1971-2009	1984-2009	1961-2008
Personal net financial wealth (NW)	1970-2009	1961-2009	1961-2008	1961-2009	1979-2009	1970-2009	1971-2009	1964-2009	1975-2008
Unemployment rate (U)	1970-2009	1965-2009	1965-2009	1970-2009	1970-2009	1968-2009	1965-2009	1961-2009	1961-2009
Housing investment (IH)	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1970-2009	1970-2009	1970-2009
Gross domestic product (GDP)	1961-2009	1961-2009	1970-2009	1970-2009	1970-2009	1970-2009	1970-2009	1970-2009	1970-2009
Housing stock estimate (RHS)	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1970-2009	1970-2007	1970-2008
Total population (POP)	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009
20-39 age group (2039)	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010

Note. Country codes are Australia AU, Belgium BG, Canada CN, Denmark DK, Finland FN, France FR, Germany GE, Greece GR, Ireland IR, Italy IT, Japan JP, Netherlands NL, Austria OE, Portugal PT, Sweden SD, Spain SP, the United Kingdom UK and the United States US.

Table 1. Data sample continued

	IT	JP	NL	OE	PT	SD	SP	UK	US
House prices (PH)	1970-2006	1961-2009	1970-2009	1970-2009	1988-2009	1970-2009	1971-2009	1964-2009	1970-2009
Intervention rate (INT)	1961-2009	1961-2009	1962-2009	1961-2009	1972-2009	1963-2009	1977-2009	1961-2009	1971-2009
Consumers expenditure deflator (CED)	1961-2009	1965-2009	1961-2009	1970-2009	1970-2009	1961-2009	1961-2009	1961-2009	1961-2009
Real personal disposable income (RPDI)	1965-2009	1970-2009	1970-2009	1970-2009	1970-2009	1961-2009	1964-2009	1961-2009	1961-2009
Real long term interest rate (LRR)	1962-2009	1967-2009	1962-2009	1971-2009	1971-2009	1962-2009	1980-2009	1962-2009	1962-2009
Personal debt (LIABS)	1972-2009	1971-2009	1961-2008	1970-2009	1961-2008	1961-2009	1961-2009	1963-2009	1961-2009
Personal net financial wealth (NW)	1972-2009	1971-2008	1961-2009	1970-2009	1980-2008	1961-2009	1970-2009	1963-2009	1961-2009
Unemployment rate (U)	1978-2009	1961-2009	1965-2009	1961-2009	1961-2009	1975-2009	1965-2009	1971-2009	1961-2009
Housing investment (IH)	1981-2009	1965-2009	1961-2009	1970-2009	n/a	1961-2009	1961-2009	1986-2009	1961-2009
Gross domestic product (GDP)	1970-2009	1965-2009	1970-2009	1970-2009	1961-2009	1961-2009	1964-2009	1961-2009	1961-2009
Housing stock estimate (RHS)	1981-2009	1965-2009	1961-2009	1970-2009	n/a	1961-2009	1961-2009	1986-2009	1961-2009
Total population (POP)	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1961-2009	1971-2009	1961-2009
20-39 age group (2039)	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010	1961-2010

Note. Country codes are Australia AU, Belgium BG, Canada CN, Denmark DK, Finland FN, France FR, Germany GE, Greece GR, Ireland IR, Italy IT, Japan JP, Netherlands NL, Austria OE, Portugal PT, Sweden SD, Spain SP, the United Kingdom UK and the United States US.

Table 2. Panel unit root tests

	LEVEL	DIFFERENCE
Log real house prices	-2.1 (0.02)	-10.3 (0.00)
Log RPDI	-1.6 (0.06)	-13.6 (0.00)
Real long rate	-2.2 (0.01)	-16.9 (0.00)
Log real liabilities	6.6 (1.0)	-11.7 (0.00)
Log real gross financial wealth	0.5 (0.67)	-15.0 (0.00)
Unemployment rate	-2.3 (0.01)	-10.7 (0.00)
Log housing investment/GDP	-0.8 (0.21)	-15.7 (0.00)
Log real housing stock	-1.7 (0.04)	-3.1 (0.00)
Log 20-39 as a share of population	-5.8 (0.00)	-6.4 (0.00)

Table 3. Panel results – all observations – basic equation

	ALL	G7	SMALL COUNTRIES	ANGLO SAXON	BANK DOMINATED
C	**-0.423**	**-0.42**	**-0.67**	**-0.414**	**-0.559**
	(4.8)	**(3.5)**	**(4.4)**	**(3.2)**	**(4.1)**
DLRPDI	**0.81**	**1.0**	**0.644**	**1.16**	**0.683**
	(8.5)	**(6.1)**	**(5.2)**	**(6.8)**	**(5.2)**
DLRR	**-0.0047**	-0.0035	**-0.0058**	**-0.0046**	-0.0044
	(2.3)	(1.4)	**(1.9)**	**(2.2)**	(1.4)
DLRPH (-1)	**0.534**	**0.511**	**0.547**	**0.432**	**0.577**
	(13.5)	**(7.4)**	**(11.5)**	**(6.6)**	**(12.0)**
LRPH (-1)	**-0.07**	**-0.07**	**-0.088**	**-0.074**	**-0.075**
	(7.1)	**(4.3)**	**(6.4)**	**(4.0)**	**(6.8)**
LRPDI (-1)	**0.048**	**0.048**	**0.079**	**0.04**	**0.068**
	(4.8)	**(3.5)**	**(4.4)**	**(3.0)**	**(4.1)**
LRR (-1)	**-0.0025**	-0.0016	**-0.0036**	**-0.0026**	**-0.0027**
	(3.5)	(1.5)	**(3.5)**	**(2.5)**	**(2.8)**
Countries	18	7	11	5	13
Obs	618	268	350	185	433
Adjusted R2	0.53	0.53	0.528	0.555	0.523
SE of regression	0.05	0.048	0.051	0.043	0.053
Durbin Watson	1.79	1.71	1.84	1.82	1.82
Kao	-4.6	0.17	-4.3	-1.3	-3.94
	(0.00)***	(0.43)	(0.00)***	(0.09)*	(0.00)***

Note. Countries included in "All" are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Austria, Portugal, Sweden, Spain, the UK and US; "G7" are the UK, US, Germany, Japan, Canada, Italy and France; "Small countries" are Australia, Belgium, Denmark, Finland, Greece, Ireland, Netherlands, Austria, Portugal, Sweden, Spain; "Anglo Saxon" are the UK, US, Ireland, Australia and Canada; Bank-dominated are Belgium, Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, Austria, Portugal, Sweden, Spain. In table 3-9, figures in bold are statistically significant.

Table 4. Panel results – all observations – variants

	ALL	G7	SMALL COUNTRIES	ANGLO SAXON	BANK DOMINATED
Cubic (-1)	**-4.9**	**-9.88**	-1.05	-6.44	**-4.9**
	(2.9)	**(4.4)**	(0.6)	(1.3)	**(3.9)**
Debt (diff)	**0.122**	0.15	**0.15**	**0.14**	**0.13**
	(6.0)	(0.9)	**(4.0)**	**(3.8)**	**(5.2)**
Debt (-1)	-0.001	0.025	**-0.047**	-0.025	-0.0028
	(0.1)	(1.3)	**(3.5)**	(1,1)	(0.2)
Debt (diff)	**0.152**	**3.9**	**0.086**	**0.16**	**0.144**
	(5.1)	**(3.1)**	**(2.5)**	**(2.8)**	**(4.6)**
Debt (diff*unlib)	-0.066	**-3.8**	**0.35**	-0.08	-0.034
	(1.3)	**(2.9)**	**(4.4)**	(0.8)	(4.6)
Debt (-1)	-0.0043	0.02	**-0,047**	-0.023	-0.004
	(0.3)	(0.6)	**(3.5)**	(0.9)	(0.3)
Debt (-1) *unlib	0.0005	0.0009	0.0002	-0.0022	0.0017
	(0.6)	(0.6)	(0.2)	(1.1)	(1.5)
Demog (diff)	0.064	0.16	-0.07	**1.0**	-0.317
	(0.3)	(0.5)	(0.2)	**(2.6)**	(1.0)
Demog (-1)	0.028	0.012	0.011	**0.127**	0.011
	(0.9)	(0.2)	(0.3)	**(2.4)**	(0.3)
Investment/GDP (-1)	-0.019	-0.014	**-0.029**	**0.049**	-0.017
	(1.7)	(0.9)	**(2.0)**	**(2.0)**	(1.2)
Housing stock (-1)	0.0009	0.008	**-0.065**	-0.024	-0.0018
	(0.1)	(0.2)	**(1.9)**	(0.8)	(0.1)
Finlib	-0.005	0.0016	0.007	-0.004	0.007
	(0.1)	(0.2)	(0.6)	(0.3)	(0.9)
Crises	**-0.027**	**-0.021**	**-0.033**	**-0.019**	**-0.4**
	(4.5)	**(3.1)**	**(2.8)**	**(2.4)**	**(5.1)**
Unempl (diff)	**-0.0093**	**-0.0096**	**-0.0097**	**-0.015**	-0.0057
	(3.8)	**(2.6)**	**(2.8)**	**(4.3)**	(1.6)
Unempl (-1)	0.00085	0.001	0.0005	-0.0024	0.0008
	(0.9)	(0.6)	(0.4)	(1.3)	(0.6)
Finwealth (diff)	**0.11**	0.079	**0.138**	0.064	**0.153**
	(2.9)	(1.6)	**(3.6)**	(1.4)	**(4.1)**
Finwealth (-1)	0.015	**0.043**	-0.0011	0.031	0.004
	(1.3)	**(2.1)**	(0.1)	(1.2)	(0.3)

Note. (1) Debt growth is instrumented by a constant and lagged growth in RPDI. House prices and real long rates.
(2) For country groupings see footnote to Table 3.

Table 5. Panel results – liberalised – basic equation

	ALL	G7	SMALL COUNTRIES	ANGLO SAXON	BANK DOMINATED
C	0.029 (0.15)	0.025 (0.1)	-0.135 (0.4)	-0.088 (0.3)	0.097 (0.3)
DLRPDI	**0.567** **(5.0)**	**0.799** **(4.3)**	**0.408** **(2.8)**	**0.883** **(4.8)**	**0.386** **(2.7)**
DLRR	**-0.009** **(4.1)**	**-0.008** **(2.2)**	**-0.012** **(3.5)**	**-0.0089** **(3.3)**	**-0.0088** **(2.4)**
DLRPH (-1)	**0.617** **(13.4)**	**0.646** **(9.9)**	**0.593** **(8.9)**	**0.537** **(7.6)**	**0.642** **(10.7)**
LRPH (-1)	**-0.06** **(5.7)**	**-0.059** **(3.4)**	**-0.069** **(4.3)**	**-0.067** **(3.0)**	**-0.059** **(4.7)**
LRPDI (-1)	-0.002 (0.1)	-0.002 (0.1)	0.018 (0.5)	0.0086 (0.3)	-0.01 (0.2)
LRR (-1)	**-0.006** **(4.0)**	**-0.0058** **(2.2)**	**-0.007** **(3.4)**	**-0.0056** **(2.0)**	**-0.0069** **(3.3)**
Countries	18	7	11	5	13
Obs	413	188	225	133	280
Adjusted R2	0.599	0.625	0.554	0.571	0.605
SE of regression	0.043	0.038	0.047	0.041	0.0448
Durbin Watson	1.76	1.63	1.89	1,83	1.72
Kao	-4.03 (0.00)	-1.97 (0.02)	-2.83 (0.00)	-2.72 (0.00)	-.2.55 (0.00)

Note. For country groupings see footnote to Table 3.

Table 6. Panel results – liberalised – variants

	ALL	G7	SMALL COUNTRIES	ANGLO SAXON	BANK DOMINATED
Cubic (-1)	-3.27 (1.4)	-4.4 (1.5)	-0.85 (0.3)	-7.1 (1.4)	-3.43 (1.2)
Debt (diff)	**0.19** **(7.9)**	**0.22** **(5.0)**	**0.18** **(4.6)**	**0.19** **(4.3)**	**0.19** **(6.0)**
Debt (-1)	-0.023 (1.7)	-0.053 (1.8)	-0.003 (0.2)	**-0.075** **(2.4)**	-0.017 (1.0)
Demog (diff)	0.07 (0.2)	0.45 (1.1)	-0.506 (1.0)	1.0 (1.8)	0.117 (0.3)
Demog (-1)	0.005 (0.1)	0.044 (0.7)	0.001 (0.1)	**0.21** **(2.4)**	-0.056 (1.0)
Investment/GDP (-1)	0.0007 (0.1)	0.019 (1.0)	-0.014 (0.8)	0.023 (0.8)	0.002 (0.1)
Housing stock (-1)	-0.047 (1.5)	**-0.16** **(3.4)**	0.033 (0.6)	**-0.107** **(2.3)**	-0.005 (0.1)
Crises	**-0.024** **(3.8)**	**-0.019** **(2.7)**	**-0.032** **(2.6)**	**-0.017** **(2.2)**	**-0.036** **(3.9)**
Unempl (diff)	**-0.012** **(4.3)**	**-0.0099** **(2.2)**	**-0.015** **(3.7)**	**-0.014** **(3.2)**	**-0.01** **(2.9)**
Unempl (-1)	**-0.003** **(2.0)**	-0.002 (0.9)	-0.003 (1.6)	-0.0025 (0.9)	**-0.003** **(2.0)**
Finwealth (diff)	**0.114** **(2.9)**	**0.166** **(2.3)**	**0.165** **(2.8)**	0.122 (1.8)	**0.094** **(1.9)**
Finwealth (-1)	-0.019 (0.9)	-0.034 (1.0)	0.062 (1.7)	0.007 (0.2)	-0.057 (1.8)

Note. For country groupings see footnote to Table 3.

Table 7. Panel results – all observations – with liberalisation dummies

	ALL	G7	SMALL COUNTRIES	ANGLO SAXON	BANK DOMINATED
C	**-0.529**	**-0.559**	**-0.868**	**-0.541**	**-0.692**
	(4.1)	**(2.6)**	**(4.3)**	**(2.4)**	**(3.4)**
DLRPDI	**0.572**	**0.646**	**0.457**	**0.659**	**0.464**
	(4.6)	**(3.3)**	**(2.5)**	**(3.6)**	**(2.7)**
DLRR	**-0.0089**	**-0.008**	**-0.012**	**-0.0089**	**-0.0095**
	(3.7)	**(2.5)**	**(3.0)**	**(3.3)**	**(2.4)**
DLRPH(-1)	**0.67**	**0.758**	**0.54**	**0.63**	**0.695**
	(12.1)	**(9.6)**	**(6.2)**	**(8.2)**	**(8.3)**
LRPH(-1)	**-0.105**	**-0.106**	**-0.132**	**-0.119**	**-0.101**
	(8.8)	**(5.2)**	**(7.8)**	**(5.1)**	**(7.6)**
LRPDI(-1)	**0.061**	**0.062**	**0.104**	**0.055**	**0.085**
	(4.2)	**(2.6)**	**(4.4)**	**(2.4)**	**(3.5)**
LRR(-1)	**-0.0044**	-0.002	**-0.009**	**-0.0037**	**-0.0058**
	(3.2)	(0.8)	**(4.6)**	**(2.0)**	**(2.7)**
DLRPDI*LIB	**0.483**	**0.738**	0.422	**1.0**	0.444
	(2.2)	**(2.0)**	(1.5)	**(3.3)**	(1.6)
DLRR*LIB	0.006	**0.009**	0.007	**0.011**	0.0063
	(1.6)	**(1.9)**	(1.3)	**(2.3)**	(1.1)
DLRPH(-1) *LIB(-1)	**-0.238**	**-0.462**	-0.026	**-0.395**	-0.2
	(2.9)	**(3.4)**	(0.2)	**(3.0)**	(1.8)
LRPH(-1) *LIB(-1)	0.043	0.026	**0.059**	**0.036**	**0.034**
	(3.9)	(1.6)	**(3.5)**	**(2.2)**	**(2.1)**
LRPDI(-1) *LIB(-1)	0.00006	-0.0004	-0.0002	-0.0025	0.0006
	(0.1)	(0.3)	(0.2)	(1.4)	(0.6)
LRR(-1) *LIB(-1)	0.002	0.00037	**0.006**	-0.0012	0.0032
	(1.5)	(0.1)	**(3.0)**	(0.5)	(1.5)
Countries	18	7	11	5	13
Obs	618	268	350	185	433
Adjusted R2	0.55	0.57	0.543	0.612	0.536
SE of regression	0.05	0.046	0.05	0.041	0.053
Durbin Watson	1.79	1.69	1.83	1.88	1.82
Kao					

Note. For country groupings see footnote to Table 3.

Table 8. Panel results – all observations – variants with liberalisation dummies

	ALL	G7	SMALL COUNTRIES	ANGLO SAXON	BANK DOMINATED
Cubic (-1)	-6.87	-4.76	-6.8	-9.6	-8.13
	(1.8)	(1.0)	(1.4)	(1.7)	(1.6)
Cubic(-1)*LIB	3.48	-3.78	6.4	8.2	4.2
	(0.8)	(0.7)	(1.2)	(1.0)	(0.7)
Debt (diff)	**0.19**	**3.68**	**0.107**	**0.197**	**0.171**
	(5.9)	**(3.2)**	**(2.9)**	**(3.1)**	**(5.1)**
Debt (-1)	0.001	0.02	-0.034	-0.034	0.005
	(0.1)	(0.7)	(1.8)	(1.3)	(0.3)
Debt (diff)*LIB	**-0.111**	**-3.61**	**0.327**	-0.137	-0.072
	(2.3)	**(3.1)**	**(3.4)**	(1.5)	(1.3)
Debt (-1)*LIB	0.0045	0.007	0.001	-0.003	0.005
	(1.2)	(1.2)	(0.1)	(0.6)	(0.9)
Demog (diff)	0.41	**0.91**	0.17	**0.987**	0.61
	(1.4)	**(2.0)**	(0.3)	**(2.1)**	(1.6)
Demog (-1))	0.023	0.033	0.0037	**0.156**	-0.004
	(0.7)	(0.5)	(0.1)	**(2.1)**	(0.1)
Demog (diff)*LIB	**-1.11**	**-1.69**	-0.54	0.856	-1.95
	(1.8)	**(2.0)**	(0.5)	(0.9)	(2.6)
Demog (-1))*LIB	-0.0083	-0.014	-0.007	-0.006	-0.008
	(1.6)	(1.6)	(0.9)	(0.6)	(1.3)
Investment/GDP (-1)	-0.013	**-0.049**	-0.017	0.038	-0.013
	(1.0)	**(2.2)**	(0.9)	(1.4)	(1.0)
Investment/GDP (-1)*LIB	0.0037	0.01	0.007	-0.0058	0.0037
	(0.6)	(0.9)	(0.8)	(0.5)	(0.6)
Housing stock (-1)	0.02	0.088	-0.008	-0.059	0.024
	(1.1)	(1.8)	(0.2)	(1.2)	(1.1)
Housing stock (-1)*LIB	-0.037	-0.04	-0.024	0.077	-0.037
	(2.4)	(1.7)	(1.2)	(1.2)	(2.4)
Crises	**-0.021**	-0.0128	-0.025	**-0.018**	**-0.034**
	(3.1)	(1.6)	(1.5)	**(2.0)**	**(3.8)**
Crises*LIB	-0.006	0.0016	-0.007	**0.203**	-0.001
	(0.4)	(0.1)	(0.2)	**(2.2)**	(0.1)
Unempl (diff)	**-0.0076**	-0.003	**-0.015**	-0.0088	-0.0062
	(2.5)	(0.7)	**(3.5)**	(1.7)	(1.5)
Unempl(-1)	0.001	0.0026	-0.0003	0.0002	0.001
	(0.9)	(1.5)	(0.2)	(0.1)	(0.8)
Unempl (diff)*LIB	-0.0063	**-0.021**	0.0076	**-0.0148**	0.0019
	(1.1)	**(2.5)**	(1.0)	**(2.2)**	(0.2)
Unempl(-1)*LIB	-0.0009	0.0001	-0.0004	**-0.006**	0.0007
	(0.7)	(0.1)	(0.2)	**(2.2)**	(0.4)
Finwealth (diff)	**0.164**	**0.135**	**0.193**	**0.141**	**0.157**
	(3.8)	**(2.0)**	**(3.6)**	**(1.9)**	**(3.0)**
Finwealth (-1)	0.008	0.032	0.02	0.004	-0.007
	(0.6)	(1.6)	(0.7)	(0.2)	(0.4)
Finwealth (diff)*LIB	-0.092	-0.068	-0.069	-0.138	-0.0132
	(1.6)	(0.9)	(0.9)	(1.6)	(0.2)
Finwealth (-1)*LIB	0.004	0.013	-0.0059	-0.009	0.015
	(0.7)	(1.4)	(0.5)	(1.1)	(1.4)

Note. For country groupings see footnote to Table 3.

Table 9. Results for Sweden quarterly data 1970Q3-2009Q4

	NO RPDI HOMOGENEITY	RPDI HOMOGENEITY	RPDI HOMOGENEITY AND LENDW	RPDI AND LENDW HOMOGENEITY
C	**-0.404** **(3.3)**	**-0.233** **(2.6)**	**0.084** **(0.9)**	**-0.31** **(2.3)**
DLRPDI	**0.695** **(5.0)**	**0.653** **(4.7)**	**0.657** **(4.8)**	**0.609** **(4.3)**
DLRR				
DLRPH(-1)	**0.489** **(8.3)**	**0.521** **(9.1)**	**0.489** **(8.5)**	**0.56** **(10.2)**
LRPH(-1)	**-0.024** **(2.5)**	**-0.026** **(2.7)**	**-0.024** **(2.6)**	**-0.0224** **(2.3)**
LRPDI(-1)	**0.039** **(3.4)**	**0.026** **(fixed)**	**0.024** **(fixed)**	**-0.0224** **(fixed)**
LRR(-1)	-0.098 (1.8)	-0.101 (1,8)	**-0.11** **(2.1)**	**-0.00635** **(1.9)**
DLRPDI*LIB	**-0.667** **(4.2)**	**-0.618** **(3.9)**	**-0.629** **(4.0)**	**-0.572** **(3.5)**
DLRGW	**0.061** **(1.9)**	0.059 (1.8)	0.061 (1.9)	0.062 (2.0)
CRISES	**-0.011** **(2.2)**	**-0.0098** **(2.0)**		
DLRLIABS	**0.063** **(2.1)**	**0.072** **(2.4)**	**0.07** **(2.4)**	**0.0828** **(2.8)**
SPREAD (-1)			**-0.268** **(3.1)**	**-0.00635** **(Fixed)**
R2	0.61	0.61	0.62	0.594
SE	0.014	0.014	0.014	0.014
DW	1.96	1,99	1.97	2.0
LM (4)	4.1	4.6	4.2	3.3
NORM (2)	3.0	1.0	4.6	2.5
HET (1)	4.4*	6.9*	5.2*	5.9*

Note. In last column the real rate and spread are defined as log (real rate/100 + spread/100).

Table 10. Change in GDP

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	0.34	0.66	0.93	1.15	1.34
Government consumption	-0.22	-0.15	-0.12	-0.11	-0.11
Government consumption	0.24	0.17	0.13	0.10	0.07
Monetary policy tightening	-0.9	-1.14	-0.79	-0.53	-0.33
Housing sector LTV proxy	-0.01	-0.04	-0.05	-0.04	-0.02
Housing sector capital adequacy	-0.05	-0.16	-0.15	-0.12	-0.10
All sectors capital adequacy	-0.72	-1.35	-1.13	-0.90	-0.75

Note. Tables 10-17 depict differences from simulation base in percentage points.

Table 11. Change in inflation

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	0.28	0.14	0.20	0.18	0.13
Government consumption	0.15	-0.05	0.02	0.04	0.03
Government consumption	-0.10	0.12	0.07	0.04	0.03
Monetary policy tightening	-0.71	-0.06	-0.22	-0.11	-0.01
Housing sector LTV proxy	-0.02	0.00	-0.01	-0.01	-0.01
Housing sector capital adequacy	0.06	-0.01	-0.06	-0.05	-0.04
All sectors capital adequacy	0.06	-0.06	-0.14	-0.07	-0.13

Table 12. Change in house prices

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	0.41	0.63	0.95	1.32	1.71
Government consumption	0.36	0.39	0.43	0.50	0.59
Government consumption	-0.31	-0.42	-0.63	-0.92	-1.23
Monetary policy tightening	-1.30	-1.79	-2.36	-2.81	-3.01
Housing sector LTV proxy	-0.83	-2.36	-3.03	-2.73	-2.18
Housing sector capital adequacy	-0.89	-2.75	-3.76	-3.66	-3.13
All sectors capital adequacy	-0.86	-2.74	-3.94	-4.11	-3.91

Table 13. Change in stock of personal debt

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	0.22	0.37	0.56	0.83	1.15
Government consumption	0.39	0.51	0.51	0.52	0.56
Government consumption	-0.25	-0.16	-0.15	-0.33	-0.63
Monetary policy tightening	-0.43	-0.55	-1.11	-1.91	-2.58
Housing sector LTV proxy	-0.24	-1.54	-3.05	-3.56	-3.29
Housing sector capital adequacy	0.17	-0.94	-3.01	-4.13	-4.21
All sectors capital adequacy	0.19	-0.76	-2.76	-4.05	-4.49

Table 14. Change in housing wealth

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	0.41	0.63	0.95	1.31	1.69
Government consumption	0.36	0.39	0.44	0.50	0.59
Government consumption	-0.31	-0.42	-0.63	-0.92	-1.23
Monetary policy tightening	-1.30	-1.78	-2.35	-2.80	-3.0
Housing sector LTV proxy	-0.83	-2.36	-3.03	-2.73	-2.18
Housing sector capital adequacy	-0.89	-2.75	-3.76	-3.66	-3.13
All sectors capital adequacy	-0.86	-2.74	-3.93	-4.10	-3.89

Table 15. Change in nominal personal disposable income

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	0.31	0.18	0.18	0.20	0.24
Government consumption	-0.18	0.00	0.02	0.05	0.11
Government consumption	0.31	0.18	0.18	0.20	0.24
Monetary policy tightening	-2.49	-3.32	-2.13	-1.86	-1.58
Housing sector LTV proxy	0.04	0.07	0.12	0.17	0.18
Housing sector capital adequacy	-1.74	-2.05	-0.20	0.15	0.26
All sectors capital adequacy	-1.96	-2.81	-1.34	-1.02	-0.79

Table 16. Change in debt/housing wealth ratio

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	-0.19	-0.26	-0.39	-0.49	-0.54
Government consumption	0.03	0.12	0.07	0.02	-0.02
Government consumption	0.05	0.25	0.48	0.59	0.59
Monetary policy tightening	0.87	1.23	1.24	0.89	0.42
Housing sector LTV proxy	0.59	0.82	-0.02	-0.83	-1.12
Housing sector capital adequacy	1.06	1.81	0.75	-0.47	-1.09
All sectors capital adequacy	1.04	1.97	1.17	0.05	-0.60

Table 17. Change in debt/income ratio

SIMULATION	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
Productivity shock	-0.09	0.19	0.37	0.62	0.91
Government consumption	0.57	0.51	0.49	0.47	0.45
Government consumption	-0.57	-0.34	-0.34	-0.53	-0.88
Monetary policy tightening	2.06	2.77	1.02	-0.05	-1.00
Housing sector LTV proxy	-0.27	-1.60	-3.17	-3.73	-3.48
Housing sector capital adequacy	1.91	1.11	-2.81	-4.28	-4.47
All sectors capital adequacy	2.15	2.04	-1.42	-3.03	-3.70

Appendix 1. The structure and use of the NiGEM model

For a macroeconometric model to be useful for policy analyses, particular attention must be paid to its long-term equilibrium properties. At the same time, we need to ensure that short-term dynamic properties and underlying estimated properties are consistent with data and well-determined. As far as possible, the same long run theoretical structure of NiGEM has been adopted for each of the major industrial countries, except where clear institutional or other factors prevent this. As a result, variations in the properties of each country model reflect genuine differences in data ratios and estimated parameters, rather than different theoretical approaches. The model has been in use at the National Institute since 1987, but it has developed and changed over that time. Some of its development was initially financed by the ESRC, but since 1995 it has been funded by its user community of public sector policy institutions. These currently include the Bank of England, the ECB, the IMF, the Bank of France, the Bank of Italy and the Bundesbank as well as most other central banks in Europe along with research institutes and finance ministries throughout Europe and elsewhere.

Each quarter since 1987 the model group has produced a forecast baseline that has been published in the Institute *Review* and used by the subscribers as a starting point for their own forecasts. The forecast is currently constructed and used out to beyond 2031 each quarter, although the projection beyond 2015 is a stylized use of the long run properties of the model. Since 1998, the model has also been used by the EFN Euroframe group to produce forecasts for the European Commission. Forecasts are produced based on assumptions and they do not always use forward looking behaviour. In policy analyses the model can be switched between forward looking, rational expectations mode and adaptive learning for consumers, firms, labour and financial markets. Policy environments are very flexible, allowing a number of monetary and fiscal policy responses. The model has been extensively used in projects for the European Commission, UK government departments and government bodies throughout the world. It has also contributed to a number of Institute ESRC projects.

Production and price setting

The major country models rely on an underlying constant-returns-to-scale CES production function with labour-augmenting technical progress.

$$Q = \gamma \; s\left(K\right)^{-\rho} + (1-s)(Le^{\lambda t})^{-\rho} \;^{-1/\rho} \qquad \text{(A1)}$$

where is Q is real output, K is the total capital stock, L is total hours worked and t is an index of labour-augmenting technical progress. This constitutes the theoretical

background for the specifications of the factor demand equations, forms the basis for unit total costs and provides a measure of capacity utilization, which then feed into the price system. Barrell and Pain (1997) show that the elasticity of substitution is estimated from the labour demand equation, and in general it is around 0.5. Demand for labour and capital are determined by profit maximisation of firms, implying that the long-run labour-output ratio depends on real wage costs and technical progress, while the long-run capital output ratio depends on the real user cost of capital

$$Ln(L) = \sigma \ln\{\beta(1-s)\} - (1-\sigma)\ln(\gamma) + \ln(Q) - (1-\sigma)\lambda t - \sigma \ln(w/p) \qquad \text{(A2)}$$

$$Ln(K) = [\sigma \ln(\beta s) - (1-\sigma)\ln(\gamma)] + \ln(Q) - \sigma \ln(c/p) \qquad \text{(A3)}$$

where w/p is the real wage and c/p is the real user cost of capital. The user cost of capital is influenced by corporate taxes and depreciation and is a weighted average of the cost of equity finance and the margin adjusted long real rate, with weights that vary with the size of equity markets as compared to the private sector capital stock. Business investment is determined by the error correction based relationship between actual and equilibrium capital stocks. Government investment depends upon trend output and the real interest rate in the long run. Prices are determined as a constant mark-up over marginal costs in the long term.

Labour market

NiGEM assumes that employers have a right to manage, and hence the bargain in the labour market is over the real wage. Real wages, therefore, depend on the level of trend labour productivity as well as the rate of unemployment. Labour markets embody rational expectations and wage bargainers use model consistent expectations. The dynamics of the wage market depend upon the error correction term in the equation and on the split between lagged inflation and forward inflation as well as on the impact of unemployment on the wage bargain (Anderton and Barrell 1995). There is no explicit equation for sustainable employment in the model, but as the wage and price system is complete, the model delivers equilibrium levels of employment and unemployment. An estimate of the NAIRU can be obtained by substituting the mark-up adjusted unit total cost equation into the wage equation and solving for the unemployment rate. Labour supply is determined by demographics, migration and the participation rate.

Consumption, personal income and wealth

Consumption decisions are presumed to depend on real disposable income and real wealth in the long run, and follow the pattern discussed in Barrell and Davis (2007). Total wealth is composed of both financial wealth and tangible (housing) wealth where the latter data is available.

$$\ln(C) = \alpha + \beta \ln(RPDI) + (1-\beta)\ln(RFN + RTW) \qquad \text{(A4)}$$

where C is real consumption, $RPDI$ is real personal disposable income, RFN is real net financial wealth and RTW is real tangible wealth. The dynamics of adjustment to the long run are largely data based, and differ between countries to take account of differences in the relative importance of types of wealth and of liquidity constraints. As Barrell and Davis (2007) show, changes in financial (dlnNW) and especially housing wealth (dlnHW) will affect consumption, with the impact of changes in housing wealth having five times the impact of changes in financial wealth in the short run. They also show that adjustment to the long run equilibrium shows some inertia as well.

$$\mathrm{dlnC_t} = \lambda(\mathrm{lnC_{t-1}} - \mathrm{lnPI_{t-1}}) + \mathrm{b_1 dlnRPDI_t} + \mathrm{b_2 dlnNW_t} + \mathrm{b_3 dlnHW_t} \qquad \text{(A5)}$$

Al Eyd and Barrell (2005) discuss borrowing constraints, and investigate the role of changes in the number of borrowing constrained households. It is common to associate the severity of borrowing constraints with the coefficient on changes in current income (dlnRPDI) in the equilibrium correction equation for consumption, where d is the change operator and ln is natural log,

Financial markets

We generally assume that exchange rates are forward looking, and 'jump' when there is news. The size of the jump depends on the expected future path of interest rates and risk premia, solving an uncovered interest parity condition, and these, in turn, are determined by policy rules adopted by monetary authorities as discussed in Barrell, Hall and Hurst (2006):

$$RX(t) = RX(t+1)[(1+rh)/(1+ra)](1+rprx) \qquad \text{(A6)}$$

where RX is the exchange rate, rh is the home interest rate set in line with a policy rule, ra is the interest rate abroad and $rprx$ is the risk premium. Nominal short term interest rates are set in relation to a standard forward looking feedback rule. Forward looking long rates are related to expected future short term rates

$$(1+LR_t) = \Pi^{T}_{j=1},\ (1+SR_{t+j})^{1/T} \qquad \text{(A7)}$$

We assume that bond and equity markets are also forward looking, and long-term interest rates are a forward convolution of expected short-term interest rates. Forward looking equity prices are determined by the discounted present value of expected profits

Public sector

We model corporate (CTAX) and personal (TAX) direct taxes and indirect taxes (ITAX) on spending, along with government spending on investment and on current consumption, and separately identify transfers and government interest payments. Each source of taxes has an equation applying a tax rate (TAXR) to a tax base (profits, personal incomes or consumption). As a default we have government spending on investment (GI) and consumption (GC) rising in line with trend output in the long run, with delayed adjustment to changes in the trend. They are re-valued in line with the consumers' expenditure deflator (CED). Government interest payments (GIP) are driven by a perpetual inventory of accumulated debts. Transfers (TRAN) to individual are composed of three elements, with those for the inactive of working age and the retired depending upon observed replacement rates. Spending minus receipts give us the budget deficit (BUD), and this flows onto the debt stock.

$$BUD = CED*(GC+GI)+TRAN+GIP-TAX-CTAX-MTAX \qquad \text{(A8)}$$

We have to consider how the government deficit (BUD) is financed. We allow either money (M) or bond finance (DEBT).

$$BUD = \Delta M + \Delta DEBT \qquad \text{(A9)}$$

rearranging gives:

$$DEBT = DEBTt\text{-}1 - BUD - \Delta M \qquad \text{(A10)}$$

In all policy analyses we use a tax rule to ensure that Governments remain solvent in the long run (Barrell and Sefton 1997),. This ensures that the deficit and debt stock return to sustainable levels after any shock. A debt stock target can also be implemented. The tax rate equation is of the form:

$$TAXR = f(\text{target deficit ratio - actual deficit ratio}) \qquad \text{(A11)}$$

If the Government budget deficit is greater than the target, (e.g. -3% of GDP and target is -1% of GDP) then the income tax rate is increased.

External trade

International linkages come from patterns of trade, the influence of trade prices on domestic price, the impacts of exchange rates and patterns of asset holding and associated income flows. The volumes of exports and imports of goods and services are determined by foreign or domestic demand, respectively, and by competitiveness as measured by relative prices or relative costs. The estimated relationships also include measures to capture globalization and European integration and sector-specific developments. It is assumed that exporters compete against others who export to the same market as well as domestic producers via relative prices; and demand is given by a share of imports in the markets to which the country has previously exported. Imports depend upon import prices relative to domestic prices and on domestic total final expenditure. As exports depend on imports, they will rise together in the model. The overall current balance depends upon the trade balance and net property income form abroad which comprised flows of income on gross foreign assets and outgoings on gross foreign liabilities. Gross National Product (GNP) is gross Domestic Product (GDP) plus net factor income from foreigners.

Appendix 2. New equations for Swedish NiGEM

Addition to credit rate (SDCR)

This allows an extra wedge to be incorporated in the interest rate relevant for house prices to proxy an LTV cap.

```
# sdcr = sdcr(-1)
```

House prices (SDPH)

As described in the text, real house prices are in an error correction relationship with real personal disposable income, and the long real rate, adjusted for the credit rate as above (sdcr) and the bank spread (sdlendw). There is also a link in the short run to real gross financial wealth and to real household debt.

```
log(sdph)= log(sdced) + log(sdph(-1)/sdced(-1)) -0.3104
+ 0.03*(log(sdrpdi)-log(sdrpdi(-1)))+ 0.5598*(log(sdph(-1)/sdced(-1))
- log(sdph(-2)/sdced(-2))) - 0.0224*(log(sdph(-1)/sdced(-1))-log(sdrpdi(-1)))
- 0.0063*log((sdlrr(-1)/100)+(sdlendw(-1)/100)+sdcr(-1)) +
0.0663*(log((sdnw+sdliabs)/sdced)
- log((sdnw(-1)+sdliabs(-1))/sdced(-1))) + 0.0828*(log(sdliabs/sdced)
- log(sdliabs(-1)/sdced(-1)))
```

Value of personal sector housing stock (SDHW)

This is a technical equation that ensures that housing wealth is adjusted in line with housing investment and house prices.

```
sdhw  = sdhw(-1)*(sdph/sdph(-1))*(1.-.01*0.25)
  + .01*sdph*0.6*(sdih-0.0059*sdy)
```

Private consumption, Mn SEK, 2000 prices (SDC)

The Swedish consumption function in NiGEM is an error correction relationship including real personal disposable income, total wealth (financial plus housing) and the retired share pf the adult population.

```
dsdcrr = dwdcrr*((1.- 0.22145)*(1.-0.037433)*0.00125*sdrr(-1)
            -(1.- 0.22145)*0.00125*sdrr)
log(sdc) = log(sdc(-1)) + 0.0402 + dsdcrr  -  0.074257*(  log(sdc(-1))
 +0.5*sdpopr/(sdpopr+sdpopwa)
 - 0.92266* log(sdrpdi(-1))
- (1.-0.92266)* log((sdnw(-1)+sdhw(-1))/sdced(-1)))
```

```
 +0.03866*log((sdnw/sdced)/(sdnw(-1)/sdced(-1)))
+ 0.10885*log(((sdhw/(0.01*sdced))*100.)/((sdhw(-1)/(0.01*sdced(-1))) *100.))
+sdcliq*log(sdrpdi/sdrpdi(-1))
```

Gross liabilities personal sector, Mn SEK (SDLIABS)

Personal gross liabilities rise in line with personal disposable income and housing wealth.

```
log(sdliabs) = log(sdliabs(-1))
      + 0.1232 - 0.2576*((log(sdliabs(-1))-log((sdpi(-1)-sdtax(-1))))
      - 0.1691*(sdhw(-1)/(sdpi(-1)-sdtax(-1))))
```

Other variable definitions

SDRPDI	Real personal disposable income
SDPI	Personal disposable income
SDTAX	Income tax rate
SDNW	Personal net financial wealth
SDCED	Consumers expenditure deflator
SDY	Real GDP
SDIH	Real housing investment
SDLRR	Real long term interest rate
SDLENDW	Spread between household borrowing and deposit rate
SDPOPR	Retired population
SDPOPWA	Working age population
SDCLIQ	Proportion of population facing liquidity constraints
SDSCRR	Technical variable permitting the effect of indirect taxes on inflation to be removed

Tools and institutions for influencing house prices and household debt

Tom Andersson, Carl Andreas Claussen, Björn Lagerwall and Pär Torstensson*

This chapter discusses alternative tools to the monetary policy rate to prevent developments in house prices and household debt from being a source of macroeconomic shocks. The chapter starts by discussing a number of general considerations relating to the design of the tools. In the light of this a number of tools are then evaluated. For each of them an assessment is made as to how they can counteract shocks and how effective they may be in this respect. We also assess the consequences the tools may have in other relevant respects and the questions that may arise on implementation and application of the tools. Further, we consider how these tools can be coordinated with the monetary policy instruments and their effect on monetary policy and the transmission mechanism. In conclusion, issues concerning the institutional arrangements associated with the tools are discussed.

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Introduction

The ability of households to borrow money for house purchases or for other purposes is a basic prerequisite for a well-functioning economy. At the same time credit provision can entail risks to the economy if it breeds a dynamic in which house prices and debt mutually drive each other up to levels that are unsustainable in the long term. In a situation where the economy is slowing down, house prices can quickly take a downward turn. Falling prices combined with a high level of household debt may in such a situation reinforce the contraction of the economy. One reason for this could be that households are unwilling or unable to sustain the same level of consumption, with a consequent fall in demand in the economy. Another reason is that stability in the financial system may be threatened if the development leads to large losses or funding difficulties for banks and other financial institutions. In both these cases there is a risk that problems will be bigger the more inflated credit volumes and house prices become.

To prevent imbalances in the housing market from resulting in this type of shock there may be reason for authorities to intervene using various types of tools, i.e. regulations, supervision or other policy measures. The monetary policy rate is one such a tool, but as discussed in Chapters III.1 and III.2, its use may be problematic in several respects.

Consequently, this chapter discusses what other tools, apart from the monetary policy rate, can be used to prevent the housing market from being a source of macroeconomic shocks. We also consider how these tools can be coordinated with the monetary policy instruments and their effect on monetary policy and the transmission mechanism. In conclusion, issues concerning the institutional arrangements associated with the tools are discussed.

1. General considerations concerning the design of alternative tools

As a point of departure for the evaluation of individual alternative tools that follows in the next section we first discuss a number of general considerations concerning the design of the tools and the advantages and disadvantages of these considerations. The aim is to produce alternatives to the interest rate weapon that are better suited to the purpose of preventing the housing market from becoming a source of macroeconomic shocks.

1.1 TWO POSSIBLE STRATEGIES FOR COUNTERACTING SHOCKS

There are two strategies that authorities can use to prevent imbalances in the housing market from giving rise to macroeconomic shocks. One is preventive work using tools directed at preventing or moderating excessive hikes in house prices

and debt, i.e. trying to prevent imbalances from arising at all. Another strategy is working with tools that are directed at minimising the shocks that may arise as a consequence of unsustainable price and debt movements, i.e. trying to ensure that the macroeconomic consequences do not become very serious if the economy slows down and imbalances are corrected.[1]

The first case concerns tools to ensure long-term sustainability of credit and price cycles. This can be done either by trying on isolated occasions to dampen excessive rises in prices or credit volumes, or by continuously trying to keep the price and credit cycle stable.

The advantage of this strategy is that imbalances never need to arise or need not be very serious. One condition for the authorities' success is, however, that the tools are really able to counteract imbalances and that this is done without too great a cost to the economy in other respects.

In the second case, the task of the tools is instead to manage the consequences of an unsustainable price and credit cycle. One way may be to ensure *ex ante* that the financial system has sufficient resilience in the form of economic buffers to be able to absorb the losses that may arise as a consequence of mortgage lending. In that way no shocks need ever arise in the economy as a consequence of deterioration in the functioning of the financial system. Correspondingly, the tools can be directed towards strengthening households' resilience, so that they can retain a certain level of consumption even if their income or wealth decrease. Another way can be to use stimulus measures *ex post*, which restore house prices and credit volumes to the trend that is sustainable in the long-term or to take fiscal and monetary policy measures to stimulate general demand in the economy.

The main advantage of this strategy is that it does not require to the same extent that the authorities are able to identify if and when imbalances are being built up. The disadvantage is, however, that it is not directed at dealing with the actual source of the problem, but only its consequences. Remaining passive towards the build-up of an imbalance may be problematical, partly because it can be costly for the Government to take measures afterwards, partly because it is not certain that these measures will have the desired effect. For example, it is conceivable that measures to stimulate household borrowing or consumption will be ineffective in a situation where households, as a reaction to housing market developments, decide to consolidate their own finances by saving and paying off loans.[2]

Making a clear-cut distinction between tools that counteract imbalances and tools that manage their consequences is not, however, very easy. The tools may have both these qualities. A good example of this is the capital requirements

1 See CGFS (2010) for a discussion on the application of these strategies in the framework of financial regulation and supervision.

2 See for example Nyberg (2010) for a discussion that monetary policy in these situations may have considerably less effect than it normally does.

imposed on credit institutions, which partly strengthen banks' resilience to shocks and partly influence household borrowing costs and hence also the development of price and credit cycles. But even if a tool can contribute to fulfilling both strategies, its effectiveness in doing so may vary. An actual example that illustrates this is the dynamic provisioning rules applied in Spain, which functions in a similar way to capital requirements. These rules contributed to strengthening the Spanish banks' resilience in the global financial crisis. On the other hand, the rules do not seem to have had any perceptible dampening effect on the substantial credit expansion that preceded the crisis.[3] This example shows that the risk of excessive increases in price and credit cycles is not automatically eliminated just because it has been ensured that the participants in the financial system have sufficient economic buffers.

1.2 HOW TARGETED SHOULD THE TOOL BE?

The repo rate is a monetary policy tool that affects the entire economy, even if it were to be used to manage development on the housing market. The generality of this tool is one of its greatest drawbacks, so alternative tools should be more targeted towards the market to be corrected in order to prevent or manage imbalances. An open question is, however, the tool's degree of precision.

It may seem obvious that tools should be as precise as possible if the problems are isolated to individual markets, but a tool that is too precisely targeted may have disadvantages. For example, targeted tools can sometimes be circumvented or give rise to the build-up of imbalances in other markets. Such a case would be if the tool limits banks' lending to households and this leads to the banks increasing their lending to other more risky sectors instead. Another risk is that the banks will find alternative ways of lending to households, which in the worst case makes the tool ineffective.[4] However, given that these problems can be avoided, targeted tools are preferable to general tools.

Another consideration is whether the tool should be restricted to trying to influence the market for buying and selling homes or if it should also target those who already own their homes. The repo rate is a tool that reaches everyone who has a mortgage, new as well as existing borrowers. But it is not certain that alternative tools are suitable or even possible to apply to the entire mortgage stock.

1.3 SHOULD THE TOOL BE STATIC OR DYNAMIC?

We noted above that one strategy for the authorities to counteract shocks is to try to ensure that credit and price cycles develop in a sustainable way. To be able to *actively* manage these cycles the authorities must use tools that are **dynamic**,

3 CGFS (2010).
4 See for example Borio (2010) for a more detailed discussion.

i.e. tools that can be varied over time. This is done either to tighten or to stimulate the market, for example by making it more expensive in an expansionary phase for households to borrow money for housing and vice versa in a contractionary phase. The Riksbank's steering of the interest rate is a tool that works dynamically, but its purpose is broader than just influencing conditions in an individual market.

The main advantage of dynamic tools is that they are sensitive to how markets and other factors develop over time and in that way make it possible to actively offset a development that is seen as harmful to the economy. The effectiveness of the tools is, however, dependent on their being based on the "right" indicators, i.e. those that give rise to imbalances, and on it being possible to apply them at the right time.

Static tools, i.e. those that do not change over time, can also to some extent contribute to stabilising price and credit cycles. For example, fixed restrictions on household borrowing may have a price-stabilising effect on the housing market. In the same way stricter capital adequacy rules for banks can help to reduce variations in credit growth. But since the tool is static it cannot actively contribute to eliminating a certain cycle, but only prevent further cyclical effects that would have arisen if it had not been used. The dampening effect also always remains in place, which entails a cost to the economy.

Regarding the second possible strategy the tools can fulfil – minimising the consequences if a price correction in the housing market actually occurs – both dynamic and static tools can be effective. For example, rules that set limits for credit institutions' or households' borrowing contribute to strengthening the resilience of those agents to substantial price corrections. In that way the risk of a price fall leading to financial instability or substantial changes in household consumption also decreases. However, here dynamic tools also have the advantage that they can be changed in response to how the markets and the economy develop, for example by raising requirements for buffers in the banks in good times and reducing them in bad times.

1.4 SHOULD THE USE OF A DYNAMIC TOOL BE AUTOMATIC OR DISCRETIONARY?

Tools that are applied dynamically can either be *discretionary* or *automatic*. Tools are **discretionary** if it is up to a responsible authority to make continuous assessments and on the basis of these assessments decide if measures need to be taken to steer a certain development in a desired direction. The Riksbank's inflation steering using the repo rate is an example of a tool that is based on discretionary assessments. **Automatic** tools are instead based on measures being taken in accordance with one or more pre-determined parameters that do not leave any scope for discretionary decisions by the authorities. A conceivable example of an

automatic tool is a rule that determines how the level of banks' capital requirements is to be adjusted in relation to credit growth in the economy.

Accordingly, automatic tools have the advantage of being predictable. Another advantage is that the automatic functioning removes some of the burden of proof and anguish over the need to make uncomfortable decisions. A disadvantage is, however, that automatic tools reduce precision and can be more indiscriminate than "discretionary" interventions based on assessments of the prevailing situation. Nor is it certain that automatic tools "hit the target", since all types of risks or imbalances are not necessarily seen in the indicators on which the tool is based.

Discretionary tools entail a higher degree of flexibility, since they leave room for authorities to make situation-adapted assessments. A potential problem is, however, that an unsustainable development will not be corrected in time. There is a risk that authorities decide to refrain from acting if the necessity for action is difficult to prove. The fact that discretionary tools are less predictable than automatic tools can also create increased uncertainty on the part of market participants. Such uncertainty can, on the one hand, lead to the tools being unnecessarily restrictive, which may be the case if credit institutions (or households) choose to handle uncertainty about the future regulatory environment by being excessively prudent. On the other hand, uncertainty can reduce the effectiveness of a tool if the market participants have the "wrong" expectations of how the authorities will apply the tool.

One way of dealing with the problems of a fully discretionary application is to make the tool "semi-automatic". The tool can be linked to some type of decision rule, such as the quantified inflation target that currently exists for monetary policy. Also, a formalised decision-making process can be introduced, in which authorities are forced to regularly take a stand on whether measures are necessary and report the reasons for their decision in official publications. In that way the predictability can increase at the same time as the risk of authorities refraining from making uncomfortable decisions is reduced.[5]

1.5 SHOULD THE TOOL BE QUANTITATIVE (ABSOLUTE) OR PRICE-ADJUSTING (INCENTIVE-BASED)?

Further, tools can be quantitative or price-adjusting. Quantitative tools set absolute limits for households or banks and force them to act in a certain way. For example, it may be a matter of introducing rules that set an absolute limit on the percentage of the value of a house that may be mortgaged. Price-adjusting or incentive-based tools instead encourage the agents to restrict their risk taking or otherwise act

5 See for example Bank of England (2009) for a more detailed discussion of considerations of the pros and cons of automatic or discretionary tools ("rules versus discretion").

in a desired way. Instead of setting an absolute limit on households' borrowing, it is conceivable that the authorities would decide to introduce a tax or fee on mortgages.

The repo rate is in this respect price-adjusting, since it raises or lowers households' interest expense. In the academic literature price-adjusting tools are generally preferred to quantitative tools. The main reason is that these tools give the market participants a choice, which also means that the objectives for which the tool is created can be achieved in a more cost-effective way. One problem with price-adjusting tools, however, is that authorities can only influence the outcome but not fully control it. Another problem with price-adjusting tools is that the households that react to price signals are not always the same as those that run the greatest risk of taking on too much debt. A quantitative tool reaches everyone, for better or worse.

2. Alternative tools

Building on these general considerations, in this part we discuss a number of specific tools that could potentially be used to discourage developments in the housing market from being a source of macroeconomic shocks. As has been mentioned earlier, such shocks can be reflected in stability problems in the financial system or through a decline in household demand. For each of the tools we also make an overall assessment of the consequences the tools may have in other relevant respects and issues that may arise when implementing and applying the tools.

There are, of course, several other conceivable tools than those discussed here. The selection is based on the most commonly existing tools internationally and those we have assessed to be most relevant from a Swedish perspective. We have decided to divide these tools into the following categories; tools targeting household debt, tools targeting lending institutions and fiscal tools.

To be able to clearly illustrate the effects of the various tools each section contains a calculation for how the tool affects a stylised household. A comparison is made using the following basic example, which is intended to give a representative picture of a borrowing situation for a normal Swedish household buying a home today. (However, the basic example disregards the maximum loan-to-value ratio that was introduced on 1 October 2010).

BASIC EXAMPLE

A household meeting the following conditions intends to buy a house for SEK 2 million:

- Total disposable annual income of SEK 350 000
- SEK 100 000 available for down-payment
- No existing loans

The household may take out a mortgage of 95 per cent of the house value, 85 per cent of which is a first mortgage loan and 10 per cent a second mortgage loan. The total loan amount is SEK 1 900 000, broken down into a first mortgage of SEK 1 700 000 and a second mortgage of SEK 200 000. They borrow at a variable (3-month) interest rate and for the first year have the following interest and repayment costs (straight amortisation term of 90 and 10 years respectively):

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	2.6	3 683	1 574
Second mortgage	200 000	10	4.6	767	1 667
Down payment	100 000	5			

The initial monthly expense is about SEK 6 356 per month, after tax relief, of which about SEK 3 115 is interest costs and about SEK 3 241 is amortisations.

2.1 TOOLS TARGETING HOUSEHOLD DEBT

2.1.1 Loan restrictions based on the house value

Internationally the most common method for regulating household debt is to set a limit on the percentage of the house value that may be mortgaged. Such limits exist for example in Canada[6] and Hong-Kong[7]. In Sweden the Financial Supervisory Authority (Finansinspektionen) recently issued a general guideline stating that credit institutions providing credit against residential property as collateral should restrict the loan so that the loan-to-value ratio does not exceed 85 per cent of the market value of the property at the time of granting credit.[8] Lending beyond this limit is not prohibited, but must be granted without using the residential property as collateral. In Norway and Finland the supervisory authorities have recently issued similar guidelines for the banks' lending. In both cases it is stipulated that the loan-to-value ratios may not normally exceed 90 per cent of the market value.

6 Under Canadian law all federally regulated credit institutions must buy loss insurance for mortgages where the loan-to-value ratio exceeds 80 per cent. The borrower may mortgage a maximum of 95 per cent of the property value, i.e. at the time of purchase the borrower must make a down-payment of 5 per cent. You can read more about how the housing market functions in Canada in the Canadian housing observer 2010, Canada Mortgage and Housing Corporation, Ottawa, Ontario, Canada (http://www.cmhc-schl.gc.ca/en/index.cfm).

7 In Hong Kong the limit is between 50 and 60 per cent of the property value. 50 per cent applies to residential property with a value of HK$ 12 million and residential property where the owner does not live in the property personally. You can read more about how the housing market in Hong-Kong functions on the website of The Hong Kong Mortgage Corporation Limited, (http://www.hkmc.com.hk/eng/index.html).

8 Finansinspektionen, FFFS 2010:2.

EXAMPLE: Loan restriction based on the value of the residential property
A rule is introduced that limits the household's loan-to-value ratio to 85 per cent. In other respects the same conditions apply as in the basic example.

A binding limit, i.e. where no borrowing beyond the limit is allowed, means that the household cannot buy a home for SEK 2 million. Instead, they can buy a home for a maximum of SEK 667 000. (The rule requires a 15 per cent down payment, which with the household's SEK 100 000 of own funding enables the purchase of a home worth SEK 667 000. SEK 567 000, or 85 per cent of SEK 667 000, is the maximum loan amount).

A non-binding limit , i.e. where borrowing above the limit is allowed if it does not use the residential property as collateral, makes it possible to buy the desired home. The household's costs will then be as follows:

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	2.6	3 683	1 574
Unsecured loan	200 000	10	6.5	1 083	1 667
Down payment	100 000	5			

CONSEQUENCES: A binding limit of 85 per cent has a drastic effect on the ability of the household to buy a home. In this example there is a shortfall of just over SEK 1.3 million in financing for the purchase of the desired home. With a non-binding limit the household can buy a home for SEK 2 million. The initial monthly expense, after tax relief, is SEK 6 577. This is an increase of just over SEK 200, compared with the basic example. To the extent the lender requires a faster rate of amortisation of the unsecured loan than 10 years, the differences compared with the basic example will be greater.

Achievement of objectives

A loan-to-value limit may help to reduce the risk of households' over-indebtedness and thereby also to reduce their vulnerability to price falls in the property market. This consumer protection motive underlies the limit recently decided by Finansinspektionen. In other countries the introduction of similar rules was motivated by more macroeconomically related objectives. The limit has been regarded either as a way to promote stability in the financial system or as a complementary tool to monetary policy.

Regardless of the reason for which a limit is applied, it can contribute both to strengthening financial stability and to stabilising the macro economy as a whole.

Firstly, from the financial stability perspective, credit risk in the banks' credit portfolios can decrease if the limits helps to reduce households' financial vulnerability. In that the risks in the financial system decrease, the risk of future macroeconomic shocks arising from stability problems is also reduced.

Secondly, limits on household debt can contribute to more stable price formation in the housing market. Since the rules restrict the capital gearing of households and thereby also the amount of money they can use to purchase homes, price variations on housing may decrease. The lower the loan-to-value limit is set, the greater the price stabilising effect of the limit can be assumed to be. If in addition the limit is applied dynamically, i.e. the limit varies over time, price variations in the housing market can be assumed to stabilise further.

Through the price-stabilising effect of the limit, the risk decreases of house prices becoming a breeding ground for unsustainable credit expansion in which households use the rising values of their homes to take out further mortgages, either for consumption or to buy more or costlier property. If a limit can counteract both excessive price variations in the housing market and an unsustainable build-up of household debt, it will also in this respect contribute to reducing the risk of credit losses in the banking system. With its potentially price-stabilising effect it also helps to stabilise household balance sheets, which from a macroeconomic perspective can be regarded as favourable, since the risk of drastic variations in household consumption can thereby be restricted.

The possibility of dampening excessive credit expansion or hefty swings in house prices using regulation that relates the size of the loan to the underlying asset value should not, however, be exaggerated. Since the limit is set in relation to the value of the property, price developments in the housing market will influence the amounts that households may borrow. If house prices rise, households' credit limits will rise, and vice-versa. The binding restriction will in this case be the value of the asset being mortgaged and not the household payment capacity. Consequently, the credit limit set by the rule will also be affected as prices in the housing market change. For example, a household that is mortgaged up to the limit at the time of purchase can increase its mortgage if the property has subsequently increased in value. (If the limit is 90% then an increase in value of the property of SEK 100 000 will increase the credit limit by SEK 90 000. Alternatively, the same household can sell its home and use the profit as a down-payment when buying a new home. Further capital of SEK 100 000 would make it possible to buy a house that is SEK 1 million more expensive than the household could buy before.) This may fan the flames of a credit expansion and push house prices up further.

Compared with a situation where there are no explicit rules to limit household debt, a loan-to-value limit – as pointed out earlier – could of course help to dampen this type of cyclical variation in credit growth and house prices. The effectiveness of the limit in this respect depends on the level of the limits and if they are allowed to vary over time. Besides this, the method of determining the value of the property is significant. A limit based on the full market value of the house is probably less effective in offsetting cyclical patterns in house prices and credit growth than a limit that is for example based on model-based valuations (on the basis of what is regarded as a long-term sustainable level of house prices.)

But regardless of how the limit is designed as regards levels, valuation etc., it is probable that a static limit is not the most effective instrument to prevent imbalances or drastic price variations in the housing market. This is quite simply because the limit is based on house prices, which in itself may constitute a driving force in building up a debt and price spiral. If the aim of the limit is to manage

price and credit cycles it is important that it can be applied dynamically or is supplemented by other types of tool, such as restrictions on how much households may borrow in relation to their income (see next section).

It can be added here, however, that if the limit is applied dynamically it can in itself give rise to certain inflationary price and credit effects. This could be the case for example if households expect the authorities to tighten limits. Major demand for credit could then temporarily arise when people try to avoid being affected by the expected squeeze. The lending institutions on their part can whip up such a situation by playing on expected credit restraint in their marketing.

Other consequences

A loan-to-value limit puts households that have little capital of their own, such as first-time buyers, at a disadvantage. It should be noted here, however, that this effect can be mitigated if the regulation itself entails a cooling off of housing market prices so that the capital input required is not as great (in kronor) to meet the limit for getting a mortgage.

Implementation issues

If the limit is not binding, in the sense that it entails an absolute ban on borrowing over a given limit, there is a risk that the regulation will not have the effect intended. This is because the effect of the regulation on household debt, house prices and credit growth can be assumed to be small if a large proportion of households decide to take out mortgages in excess of the limit. If such additional borrowing is also at a higher borrowing cost (for example through unsecured loans) a limit may even be counterproductive, because if the credit cost for a given level of debt increases, it also entails greater vulnerability of households to shocks. However, here it must be added that the increased costs entailed by borrowing over the limit give households an incentive not to take on too much debt. It cannot, however, be taken for granted that households will act in accordance with these incentives – either because the price signal is not sufficiently strong or because households simply do not react to the incentives. For these reasons it cannot be assumed that a non-binding limit will have the same effect as a binding limit. Seen in that light, a binding limit may therefore be preferable. Against this it can be said, however, that a binding limit implies a quantitative regulation, which in general is a more costly method of achieving the desired objective. In addition it is doubtful if it is possible to introduce a binding limit that is not easily circumvented. This would in principle require that all lending without collateral is prohibited so as to prevent households from taking out unsecured loans to cover any financing needs beyond the limit.

Even a non-binding limit may be ineffective if households or banks find ways

of circumventing it. For example, a conceivable risk is that household lending moves abroad, either because the borrowers choose to borrow from foreign credit institutions or because the credit institutions themselves start to offer loans from foreign subsidiaries.

Reasonably, a loan-to-value limit can only be applied to new lending. An obvious reason for this is that from a legal point of view it is doubtful, or even impossible, to introduce provisions that retroactively change the terms and conditions of loans already agreed. But even disregarding the legal aspects, it would for several reasons seem to be inappropriate to allow the rule to include existing loans. For example, it would mean that new agreements between the bank and the borrower would have to be signed in cases where the loan-to-value ratio is higher than allowed. In best case this would mean slightly higher borrowing costs for the borrower, since parts of first or second mortgages would have to be replaced by unsecured loans. But it could also mean that a few people would not be allowed to borrow the same amount. If the borrowers have insufficient funds to make up the funding shortfall they would quite simply be forced to sell their homes.

2.1.2 Loan restrictions based on income

A related method for regulating household debt is to set a limit on the debt or borrowing expenses in relation to income. Such limits are applied in several countries, including South Korea, the Netherlands and Hong Kong. In all these cases the limit is formulated so that the household's borrowing expenses (interest and amortisations) do not exceed a certain percentage of the (disposable) income. It is, however, conceivable to design the rules in other ways, for example by stipulating that households' total loan amounts may not exceed a certain percentage of the household's annual (disposable) income.

In Sweden there are no explicit limits to the amount a household may borrow in relation to its income. However, the Swedish regulations stipulate that the lender must carry out a review to establish whether the borrower has the capacity to fulfil his or her obligations under the credit agreement. This includes the lender ensuring that private individuals do not take on too much debt in relation to their income and other economic conditions (payment capacity).

EXAMPLE: Loan restriction based on the value of the residential property
A rule is introduced that limits households' total loans to a maximum of 500 per cent of the household's total annual disposable income. The example assumes that the household has no income from capital or that this may not be included in disposable income. In other respects the same conditions apply as in the basic example.

A binding limit, i.e. in which all loans are included, means that the household can buy a home for a maximum of SEK 1 850 000 (as they have SEK 100 000 in capital and may borrow a maximum of 500 per cent of the disposable income of SEK 350 000, which is SEK 1 750 000).

A non-binding limit, in which only borrowing with the house as collateral is counted in the loan amount, would mean that the household can buy a home for SEK 2 million by taking out an unsecured loan for the borrowing needs in excess of 85 per cent of the house value.

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	2.6	3 683	1 574
Unsecured loan	200 000	10	6.5	1 083	1 667
Down payment	100 000	5			

CONSEQUENCES: With a binding limit the household cannot buy the desired home costing SEK 2 000 000. The limit implies that the household can buy a home for a maximum of SEK 1 850 000. A non-binding limit would give an initial monthly expense after tax relief of SEK 6 577 instead, i.e. just over SEK 200 more expensive than in the basic example.

Achievement of objectives

A limit based on income has by and large the same qualities as a corresponding limit based on the property value. The limit can help to reduce households' financial vulnerability and thereby also reduce the risks in banks' lending. Potentially it can also help to influence price and credit development, both by having a cooling effect in an expansionary phase and by stabilising development over time.

In the latter respect an income-related limit is probably a more effective instrument than a loan-to-value limit. This is because the parameter that governs household borrowing – income – is more stable over time and varies less than the parameter – price of the property – on which a loan-to-value limit is based. And if the debts are not linked to house prices the problem of price-rises and indebtedness mutually driving each other up in a rising spiral is avoided. In this way the need to apply the limit dynamically is also reduced.

It should, however, be noted that the limit gives different effects depending on whether it is designed as a limit on the *loan amount* or *borrowing expenses* (interest and amortisation). In the former case it is only income that affects the maximum amount a household can borrow. In the latter case interest rate movements and households' amortisation preferences/banks' amortisation requirements are also of significance for the size of the loan.

If the limit is to be used to steer price and credit development it would seem most appropriate to design a limit that is neutral in relation to the interest level in

the economy. Hence, in this respect an amount-based limit is preferable. Such a regulation would mean that changes in the interest rate would not have a direct effect on households' credit limits, which would be the case with a expense-based limit. Another circumstance that favours an amount-based limit is that the loan amount would also be independent of the size of the amortisations. In that way no incentive is created for households to refrain from making amortisations, which must be seen as positive from the financial stability perspective.

Other consequences

An advantage of an income-based limit is that it does not discriminate against households with little capital, such as first-time buyers. On the other hand, the limit may mean that households with low incomes who were previously able to obtain loans no longer can. However, it is difficult to see how this would be a problem, since a basic condition for being able to borrow money at all is that the borrower has sufficient capacity to service the loans. It could possibly be seen as a problem that the limit does not take into account that households with low incomes may have considerable wealth which secures their ability to bear a greater debt than their income justifies. For those households the rule implies that they are forced to invest their wealth in their home against their will.

Implementation issues

An important question that must be decided when introducing an income-based rule is the level at which the limit should be set. There are few examples of countries that apply or have applied a limit that relates the size of households' loans to their disposable incomes. In Sweden this ratio is currently about 170 per cent[9]. Looking only at new lending, however, the ratio is considerably higher. There, over half the households have a debt ratio of over 500 per cent and the ten per cent of households most in debt have a debt ratio of more than 1 000 per cent[10]. A limit of the order of 500 per cent would thus mean a relatively severe constraint on lending and in that way could also help reduce the pressure on house prices.

Another central issue is how the income measurement on which the limit is based should be designed. Households have three types of income – earned income (wages, salaries and other remuneration), transfers (child allowance etc.) and income from capital. Income from capital consists partly of direct return on financial assets, i.e. interest and dividends, and partly of capital gains (realised value changes). A reasonable point of departure is that the limit should be based on the income sources that are stable and provide a reliable flow of income over

9 Sveriges Riksbank, Financial Stability Report 2010:2.
10 Finansinspektionen, "The Swedish Mortgage Market and Bank Lending", February 2010.

time. With the exception of capital gains this can be assumed to apply to all the income types mentioned above. It therefore appears reasonable to formulate an income measurement which includes all types of income except capital gains. Doing this also avoids the problem of borrowers deciding to realise their capital gains to achieve a temporary income effect making it possible to borrow more.

As with a limit based on the value of the property, there is a risk that the desired effects will not materialise if the limit is not binding, i.e. if it allows borrowing above the limit, or if it can be circumvented by households or institutions. A binding rule would in this case mean that no loans over a certain percentage of income would be allowed. Compared with a limit based on the value of the property, a binding rule would be less harmful, since it would not require the same far-reaching restrictions on the type of loan households could obtain. As long as the loans are below the limit, borrowers and banks can themselves decide how the loan terms and conditions should be formulated and the collateral against which the loans can be granted.

For the same reasons as the case of a limit based on the property value, an income-based rule could only reasonably be introduced for new lending.

2.1.3 Amortisation requirements

An alternative to (direct) regulation of the size of household mortgages is to impose amortisation requirements. An amortisation requirement means that households will be forced to pay off all or part of their mortgages within a certain pre-determined period of time.

An amortisation requirement can be formulated in slightly different ways. In its very simplest form it can mean that a maximum period is established for how long the entire loan may run and that amortisations during this period must be made periodically (for example monthly) and of the same amount. Such a straight amortisation requirement over 30 years would mean monthly repayments of just under SEK 2 800 on a loan of SEK 1 million. Provided that the households do not raise further loans the debt stock will decrease successively during the life of the loan.

A conceivable alternative is for the requirements to only cover a certain part of the loan. It may, for example, be a matter of making the amortisations for as long as the borrower's loan-to-value ratio exceeds a certain level. Another alternative is to only establish that the loan must be repaid within a certain period, without stipulating the periodicity of the amortisations. Such a requirement could, however, be circumvented by repaying the entire loan in a lump sum on the end-date of the loan.

There are amortisation requirements in several countries, including Canada and Hong Kong. In Canada all federally regulated credit institutions must take out credit insurance with the Government for mortgages with a higher loan-to-value

ratio than 80 per cent. A requirement for granting such mortgages is that they must be amortised within a maximum of 35 years. This requirement also applies to mortgages that credit institutions voluntarily insure (i.e. loans with a loan-to-value ratio of less than 80 per cent). In Hong Kong the maximum amortisation period is 30 years. Linked to this requirement is also a ban on interest-only periods during the life of the mortgage.

EXAMPLE: Amortisations requirements
An amortisation requirement is introduced stipulating that the first mortgage must be repaid over 30 years (straight repayment). In other respects the same conditions apply as in the basic example.

The household's costs will be:

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	2.6	3 683	4 722
Second mortgage	200 000	10	4.6	767h	1 667
Down payment	100 000	5			

CONSEQUENCE: The initial monthly expense, after tax relief, is SEK 9 504, which is mainly because the repayment expense increases by just over SEK 3 100 per month compared with the basic example. The substantial increase in the rate of repayment (from 90 years to 30 years) means, however, that the interest costs decrease faster. After the first year the interest cost after tax (given the same interest rate) is down to SEK 2 976 per month (compared with SEK 3 115 initially).

Achievement of objectives

An amortisation requirement gives households reason to restrict their borrowing. The requirement means that the households' immediate mortgage expense will rise, which leaves less room for other expenditure. The limit for how much a household can and may borrow against collateral in the form of residential property is also adjusted downwards, since the households' 'left to live on' estimates are affected negatively by the amortisation expense. In that way an amortisation requirement may be seen as an indirect loan restriction in relation to income (see previous section). An effect of households borrowing less as well as paying off their mortgages is that they reduce their debt and loan-to-value ratios. As the mortgage is paid off, household sensitivity to interest rates also decreases. Taken together, these effects mean that the lending institutions' credit risk decreases, which also reduces vulnerability in the financial system.

In that the requirements affect both borrowing expense and credit limits for households this is also a useful tool to counteract imbalances in price and credit developments, which also benefits financial stability, but potentially also to avoid drastic variations in household consumption. As in the case of the loan restriction based on income, the need for dynamic application of repayment requirements is not as great as with a restriction based on the value of the property. Nevertheless,

there may be reason to adjust the requirements at times of strong fluctuations in the credit cycle, so as to try to prevent shocks in the economy from arising.

Other consequences

Like a loan restriction based on income, an advantage of an amortisation requirement is that it does not affect households with little capital as severely as a restriction related to the value of the home. This is because income, rather than wealth, becomes the crucial factor for the amount that can be borrowed. The group that would "suffer" most from the regulation would be households with relatively low incomes and little capital for a down-payment.

A amortisation requirement means that households can set aside less money for saving in other assets than their home. This means that households' ability to build up an asset portfolio with a balanced composition of different types of real and financial assets is impaired. If all available income after deduction for living and interest costs goes to repay the mortgage the household's assets will consist entirely of the home. This makes them more vulnerable to a fall in house prices than they would have been if they could have saved the funds used for repayment in other types of asset.

Implementation issues[11]

A amortisation requirement that is designed without regard for the borrower's financial position, or the value of the collateral pledged for the loan, risks being unnecessarily restrictive. For example, it is difficult to see any reason for forcing households with low loan-to-value ratios to amortise. Therefore it seems more practical to design a amortisation requirement that targets households with high loan-to-value ratios or high borrowing costs relative to their income. A conceivable alternative is, for example, to prescribe amortisation requirements for loans with a loan-to-value ratio of more than 80 per cent.

While the requirements should not be unnecessarily restrictive, they must be formulated so that they cannot be easily circumvented. If households can, for example, raise new loans to compensate for the amortisations they are forced to make then the requirement is at risk of being ineffective. In the same way the requirement will not fulfil its purpose if it only regulates a final date for when the loan must be repaid. If that were to be the case the requirement could be simply avoided by paying back the entire loan on the maturity date, which can easily be replaced by a new loan. To avoid both these problems the requirements must

11 Finansinspektionen raises the difficulties of implementing a amortisation requirement in its memorandum "Allmänna råd om begränsning av lån mot säkerhet i bostad" (General Guidelines on restricting loans with residential property as collateral).

be designed to require amortisations over the entire life of the loan and that in addition cover all household credit. In practice such a regulation would need to be designed so that no new credit can be granted during the amortisation period, with or without the residential property as collateral. And to introduce a rule that forbids the household to raise any loans at all during the period of repayment seems to be rather a drastic measure. Apart from the fact that curtailment of households' ability to adapt their credit needs over time would probably lead to negative welfare effects, the risk is also great that a black lending market would arise outside the regulated banking sector. In addition, it would also be very difficult, and not least extremely resource-intensive, to monitor compliance with the rule.

Another problem of amortisation requirements is that they can be counterproductive in an economic downturn or crisis. In a situation where households' payment capacity has deteriorated, the amortisation requirement in itself could become a reason for borrowers defaulting on their loans and the loan losses thereby being higher than they would have been if no requirement had existed. In these situations there may be reason to allow exceptions from the amortisation requirement. Regulating when such exceptions may be made is, however, not easy and would also be resource-intensive for the supervisory authority to monitor.

Like previous tools, an amortisation requirement can reasonably only be introduced for new lending. It may, however, be worth pointing out that the economic consequences of an amortisation requirement introduced on existing loans would probably be more severely felt than in the two previous cases. Since a amortisation requirement would entail a relatively large increase in the monthly borrowing expenses it would probably imply a substantial restriction on household consumption. Particularly as this is a cost that households could not have anticipated when they took out their mortgage. If the amortisation requirement is applied dynamically there may, however, be reason to allow any relief on the requirement to also include the existing borrowers on whom the requirement was imposed when they took out a mortgage. This is because in a situation where household finances are strained in an economic downturn, reduced amortisation requirements can contribute to reducing the risk of default among households. By reducing household borrowing expenses, relaxation of the requirements can also provide some stimulus to household consumption.

2.1.4 Risk insurance

One way of handling some of the risks existing in the housing market is to introduce risk-reducing insurance. In several countries there are different insurance solutions that protect the borrower, the lender, or both against price falls or payment difficulties on the part of the borrower. This is often a matter of some form of

arrangement that is over and above the risk management achieved through other solutions, such as for example a loan restriction based on property value.

Various underlying objectives can be differentiated for these insurance schemes:[12]

- *Insurance for social purposes.* These insurance schemes are often arranged by a government agency and generally target certain types of household. For example, these government insurance schemes can target households wishing to buy a home but which for one reason or another find it difficult to obtain a normal mortgage. This may be due to low income, new employment, low equity or a poor credit history. Variants of such insurance schemes can be found for example in Finland, Greece and Hungary, as well as Sweden.[13]
- *Insurance for stability purposes.* These insurance schemes are arranged by both government and private actors internationally and often as a complement to other existing regulation, such as a loan-to-value limit. Most of these insurance schemes aim to transfer part of the credit risk taken on by the lender. In that way these insurance schemes can function as a type of safety valve to enable households that do not fully meet the requirements of the general regulations or the bank's lending practice to obtain mortgages. In Canada such insurance is compulsory if the loan-to-value ratio exceeds a certain limit. In the United Kingdom a lender may require for high loan-to-value ratios that borrowers take out insurance to protect the lender against any losses in connection with forced sales/foreclosure.
- *Insurance for security purposes.* These insurance schemes are often arranged by private actors and aim to allow households the possibility of managing their risks in connection with home ownership. It is often an insurance against price falls, which can for example be a way of eliminating a potential loss if the buyer knows he or she will only be active in the housing market for a certain period.

Loan insurance schemes for stability purposes are of greatest interest as an alternative tool to prevent the housing market from being a source of macroeconomic shocks. Even if these insurance schemes can be designed in different ways, we will only study price-fall insurance in the following.

12 An examination of different international trends in risk insurance has been made by Scanlon and Whitehead (2004).

13 The National Housing Credit Guarantee Board can grant a home purchase guarantee, which is a government guarantee covering interest payments for first-time buyers' home purchases. This guarantee can be seen as insurance for the borrower, who by signing a guarantee with the National Housing Credit Guarantee Board is insured against the risk of losing interest income for a mortgage. This is often also the case internationally. The insurance is mainly for the purpose of protecting the lender against default or suspension of payments by the borrower. In some cases the government guarantees protect the borrower, for example in Belgium (against loss of income) and the Netherlands (against fall in price).

EXAMPLE: Loan insurance against price falls
A rule is introduced stipulating that all loans with a loan-to-value ratios over 80 per cent must be insured against price falls. We look at two cases. In other respects the same conditions apply as in the basic example (the maximum loan-to-value ratio allowed is 95%).

CASE 1. The insurance premium is paid as a lump sum and is 2 per cent of the insured amount (= the entire mortgage).[14] The premium affects how much the household has left for a down-payment. At the same time the insurance means that the entire mortgage amount can be granted as a first mortgage, so the second mortgage loan of the basic example disappears.

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 357 142	95	2.6	2 940	1 257
Down-payment	71 428	5			

The insurance cost is SEK 28 571 for 5 years, which is paid as a lump sum directly from the SEK 100 000 the household has for the down-payment.

CASE 2. The insurance premium is paid monthly and covers only SEK 300 000, i.e. down to a loan-to-value ratio of 80 per cent. The cost is assumed to be 2 per cent of the insurance amount. Also in this case the insurance makes it possible to lend the entire loan amount as a first mortgage.

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 900 000	95	2.6	4 117	1 759
Down-payment	100 000	5			

The insurance cost is about SEK 500/month.

CONSEQUENCES: The consequences are relatively great in Case 1, while they are relatively small in Case 2. In Case 1 the household can only buy a home for SEK 1 428 571, since part of their savings must also cover the insurance cost. This means that they only have just over SEK 70 000 left to use as a down-payment (given that they cannot take out a loan for the premium).[15] In Case 2 the household can buy the same property as in the basic example. The initial monthly expense will be about SEK 5 141 per month after tax relief, given that no stricter amortisation requirements are imposed by the insurance company. Amortising the loan with the insured amount (SEK 300 000) over the insurance period (5 years) would cost SEK 5 000 per month, but a more reasonable assumption is something between this amount and SEK 1 759, i.e. SEK 3 380 per month. The initial monthly expense will then be SEK 6 262 per month, which is about the same expense as in the basic example.

Achievement of objectives

A price-fall insurance requirement for higher loan-to-value ratios contributes to reducing the vulnerability of households and credit institutions to price falls in the property market. If households had such insurance most households forced to sell their homes would be able to pay back their mortgages even if the price fell short of the mortgage amount. This in turn reduces the credit institutions' credit risk.

An insurance requirement may also have an indirect stability-enhancing effect. Insurance companies selling loan insurance will function as a controlling third party to maintain the quality of loan reviews. The issuers of the insurance have

14 We assume in somewhat simplified terms, that the insurance company takes the same premium as the risk premium on the second mortgage compared with the first mortgage, i.e. 2 per cent.
15 If the household can borrow to pay the premium (unsecured loan) the monthly cost will be a couple of hundred kronor more expensive than in Case 2, i.e. almost exactly the same as the basic example.

an incentive to ensure that the loan review is adequate, since they must pay any residual debt if the property is sold at a loss. To insure a borrower the insurer may also impose further requirements that go beyond ordinary regulations and lending practice, for example as regards amortisation or the ability of the borrower to cope with high interest rates. These further requirements in turn strengthen the resilience of both households and credit institutions. If, on the other hand, the insurer does not carry out this controlling function the insurance may have the directly opposite effect. If borrowers do not risk having a residual debt after selling property to the same extent they may take on more risk when borrowing. If the credit institutions do not risk credit losses to the same extent they may be less prudent in their credit reviews.[16]

The strength of the stability enhancing effect also depends on which actors will offer this insurance. A lesson from the crisis is that it is important that the risk that is insured against is really also removed from the credit institutions' balance sheets and is not either too concentrated on one or a few actors that are intimately linked with the credit institutions. If the credit institutions for example have exposures to the actor or actors who insure mortgages not much has been achieved from a stability perspective. It is, therefore, important to have an adequate framework for monitoring systemic risks when there is an insurance solution, not least if the insurers are private actors. One way of reducing such network risks is for the Government to create one such actor, which is common internationally. In that case, however, it is important that the Government is charging premiums that reflect the risk it takes, so that mortgage lending is not subsidised.

If mortgage insurance requirements would have an effect on household debt, and more generally on the price and credit cycle in the housing market, is more difficult to assess. The outcome depends to a great extent on how these insurance schemes are designed and priced, as well as on what further demands the insurance company may impose to insure borrowers.[17] Purely theoretically, however, the effect on price and credit developments should be relatively small as long as the insurance is priced on commercial terms. It is true that the cost of the mortgage itself (the interest), all else being equal, will be lower for an insured borrower than an uninsured borrower. This is because all or part of the lender's credit risk disappears with a price-fall insurance policy. At the same time the risk is transferred to the insurer, who will demand a premium corresponding to what the lender would have taken if the loan had been uninsured. This insurance premium will ultimately

16 For example the insurance schemes can reduce the incentive of credit institutions to obtain and use more qualitative information about the borrower when carrying out a credit review, such as structural use of overdraft facilities and a high percentage of late payments, if the borrower is an existing or former customer.

17 In principle the insurance company could apply its own terms for how much a household may borrow in relation to its income in order to insure the loan.

be paid for by the borrower. Provided that the insurance policy is priced on market terms and paid regularly during the life of the policy the monthly costs of borrowing with or without insurance should be equally great. Thus the effect on credit demand and household debt will also be small. On the other hand, if the insurance cost is taken as a lump sum directly at the time of the mortgage, the household will have a relatively large initial cost, which affects how much the household can spend on a down-payment. If the down-payment amount decreases, the maximum mortgage amount also decreases.[18] There will be an even greater effect if the insurer also imposes stricter amortisation requirements and 'left-to-live-on' estimates to insure the mortgage than the lender would have done.

Other consequences

Regardless of how mortgage insurance schemes will affect the price and credit cycle in the housing market, one consequence of them will be improved consumer protection. But only to the extent that insurance can help households that for one or other reason must sell their home for a lower price than the mortgage amount, for example after a divorce or during a recession. How price-fall insurance will affect households that become insolvent more generally is, on the other hand, an open question. In normal cases credit institutions try to help their customers if they have temporary payment problems, for example by granting a period of grace for amortisation of the mortgage. At present it is in both the borrower's and the credit institutions' interest to have this possibility. But with loan insurance the credit institutions' incentive to use this possibility may potentially decrease when loan losses on forced sales have been substantially reduced. To a certain extent the insurer can require that such solutions must be tried first before a claim on the policy is made, but it is not clear exactly how this would work.

Implementation issues

Introduction of mandatory price-fall insurance is a fairly extensive change in relation to how credit is granted today. Among other things it includes another party in the credit review and the insurance policies may also affect credit institutions' funding. Besides, the supply of these insurance policies is limited in Sweden, at least at present. It will be a political question whether the Government should create such an actor, or if it should rely on private actors being created when regulation is introduced.

A price-fall insurance requirement is also easier to justify if the regulation is introduced together with a loan restriction bases on property value or other similar

18 Given that the loan-to-value ratio of 100 per cent is not allowed (see example). This also assumes that the household cannot borrow to cover the premium.

requirement. This is since it is difficult to justify why households with very low loan-to-value ratios would need to take out insurance. One consequence of only requiring insurance for loan-to-value ratios over a certain level is that it in practice would be equal to having an actual loan-to-value restriction, but where higher loan-to-value ratios are allowed if you take out insurance. In other words, to some extent a loan restriction based on property value will follow automatically if price-fall insurance is required for high loan-to-value ratios.

2.1.5 Fixed rate requirement

The last tool targeting households that we will discuss is a fixed rate requirement. A fixed-rate requirement means that the borrower must borrow at a fixed interest rate for all or part of the mortgage for a predetermined period.

In some countries, such as Denmark and the USA, mortgages are characterised by interest rates being fixed for very long periods. For example, 95 per cent of American borrowers choose to fix their interest rates for 30 years or more. In Sweden, on the other hand, a very large proportion of households have mortgages at variable interest rates or very short fixed interest periods. This is a change that has taken place in a little more than 10 years, from having made up about half of all new mortgages, those with fixed-interest rates of 5 years or more are now just a few per cent. Those who had variable interest rates during this period were able to benefit from the falling trend in interest rates and there is much to indicate that households today attach greater importance to the difference between variable and fixed rates than to other variables, such as income, future interest rates or inflation.[19]

There are two potential problems with this; firstly that households take on an increasing interest rate risk and become more sensitive to interest rate changes, secondly that households tend to borrow heavily when the interest rate is low (see Figure 1).

19 National Housing Credit Guarantee Board (2010).

Figure 1. Credit growth at different interest rates

Source: The Riksbank.

A fixed rate requirement could be designed in various ways as regards the duration of the period rates must be fixed and the share of the loan that must be at a fixed rate. The requirement could be formulated, for example, so that households that mortgage their property over a certain limit (for example 75 per cent) must have fixed rate of the entire mortgage for a period of 10 years.

EXAMPLE: Fixed rate requirement
A fixed rate requirement is introduced stipulating that first mortgages must be at a fixed rate for 10 years. The household's costs will then be:

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	4.5	6 375	1 574
Second mortgage	200 000	15	4.6	767	1 667
Down payment	100 000	5			

CONSEQUENCES: The initial monthly expense, after tax relief, is about SEK 8 240. The household will thus have a higher interest rate cost of about SEK 1 884 per month compared with the basic example. The difference is because a 10-year loan is assumed to have a higher interest rate than a variable interest loan (3 month fixed interest period). If the variable interest rate rises (falls) during the fixed interest period the differences decrease (increase) compared with the basic example.

Achievement of objectives

With fixed interest mortgages households have full control of their borrowing costs and are less sensitive to interest rate changes. A fixed rate requirement would, thus, entail a lower collective interest rate risk for the household sector. It would strengthen households' resilience at interest rate peaks, and mean that fewer would fail to meet their borrowing costs when interest rates are increasing. In that the

short-term interest rate is more volatile than the long-term rates, credit demand can to some extent be levelled out over time.

A fixed rate requirement could also have a certain dampening effect on price and credit development, particularly in periods with historically low interest rate levels and a favourable housing market with a strong price trend. If interest costs are higher, the borrower is given an incentive to avoid high borrowing levels and thus avoid getting into a vulnerable position if something unexpected should happen. A fixed rate requirement could in that way capture some of the borrowers who do not react to housing cost estimates with assumptions of higher interest rates in the future.

Since a fixed rate requirement does not restrict how much households may borrow, nor does it entail the same perceptible effects on household borrowing costs as an amortisation requirement, it is, however, doubtful if the requirement can have any great impact on house prices and credit growth. A fixed rate requirement is therefore primarily to be regarded as a tool to reduce households' vulnerability to interest rate shocks. And as such it is difficult to see any need to apply the requirement dynamically.

Other consequences

For households with large economic margins (high income/large wealth) a fixed rate requirement is not such a good measure, as they will be forced to insure themselves against a risk that they most probably can afford to bear. Another category of borrower who may be negatively affected is people who will borrow or rearrange loans at a relatively high interest rate level. The problem of high interest rates when rearranging a loan could, however, be dealt with by requiring that the interest must be fixed at the same rate for the entire life of the loan. Such a solution assumes, however, that the loan has a fixed amortisation period. For borrowers affected by the requirement, this entails in effect an indirect amortisation requirement.

Another consequence for households is that their borrowing costs will be insensitive to inflation. In periods when inflation and – as a consequence – variable interest rates have risen more than expected, households who fixed their loans earlier will benefit. If, on the other hand, inflation and the variable interest rates are lower than expected, it will instead be a disadvantage to have a fixed rate. In that way households' real borrowing costs may vary much more with fixed rates than with variable rates.

For the banks, a fixed rate requirement would mean a changed interest rate risk. When fixed interest periods on the assets (mortgages) increase, funding must be adapted to retain the same risk level. This can be achieved through longer-term funding or by swapping short-term interest rates to long-term. In both cases the requirement entails a cost to the banks.

Implementation issues

A fixed rate requirement should reasonably be restricted to households that are vulnerable to interest rate shocks. It may therefore be appropriate to link the requirement to the borrower's indebtedness, either in relation to the value of the property or in relation to income.

2.2 TOOLS TARGETING CREDIT INSTITUTIONS' OPERATIONS

An alternative to tools targeting household borrowing is to use tools that instead target the credit institutions' operations. By regulating the economic conditions in these institutions, it is possible to both steer the risk of disruptions in the financial system and to influence the price and supply of credit in the economy and hence also development in the housing market.

2.2.1 Capital requirements

The capital requirements imposed on the credit institutions form a central part of the regulation of the financial system. In Sweden and many other countries these rules are based on internationally agreed standards that stipulate the composition and the minimum level of capital. The amount of capital required is related to the risk in the assets held by the institution, including mortgages. The capital functions as a buffer against losses and by means of the requirements the authorities can regulate the risk of disruptions arising in the financial system. The higher the requirements, the lower the risk of disruptions. In that the capital requirements also affect the institutions' funding costs, adjustments of the requirements can also potentially be used to steer the price and supply of credit in the economy, which in turn has an impact on developments in the housing market. Even if this is not their explicit purpose, the capital requirements can thereby also contribute to steering the price and credit cycle.

Since capital requirements already exist as a tool, the regulatory framework will require amendment to strengthen the ability of the requirements to offset the macroeconomic risks that developments in the housing market may cause. In the light of the lessons learned from the latest financial crisis the international capital requirement standards will be reformed in several important respects. More specifically, the reforms consist of two main parts; a general tightening of existing requirements, where both quality and amount of capital is raised, and the introduction of contracyclical elements into the regulation, for example in the form of obliging banks to hold more capital in periods of strong credit expansion, and vice versa. These reforms do not, however, aim to manage risks arising from the housing market specifically, but are directed at the institutions' operations in general. Nor

are they designed for the direct purpose of counteracting an unsustainable rise in the price and credit cycle, but rather for ensuring stability in the financial system.

To achieve isolated effects in relation to the housing market it is necessary to specifically focus on adjusting capital requirements for mortgages. Since the capital requirements can be calculated in accordance with two different methods, different procedures may be needed for achieving this. For the method in which the institutions calculate the requirements using pre-determined risk weightings (the standardised approach), one alternative is to increase the degree of differentiation in the risk weightings on the basis of how risky the loans are, for example as regards the loan-to-value ratio[20]. Since in this way the borrowing costs increase in proportion to the loan-to-value ratio, households are given the incentive to refrain from excessive indebtedness. For the method in which the institutions calculate the requirements using their own risk models (the internal ratings-based approach) this is not an alternative, since extensive risk differentiation already takes place within the banks' internal models. Here an alternative could instead be to set a floor for how low the risk weightings may be allowed to go. In this way a certain minimum level is ensured for the institutions' capital buffers for mortgage lending. In addition, it may have a certain price effect on housing credit that helps to dampen credit demand. An alternative that is applicable to both models is to raise the capital requirements for mortgages in general. This can lead to higher borrowing costs for housing credit in general, which in that case would probably have a dampening effect on the credit cycle.

EXAMPLE: Tighter capital requirements for mortgage lending
Provided that the stricter capital requirements lead to banks increasing their capital, they will entail increased costs for banks' provision of mortgage lending. Given that these costs will be passed on to customers the lending rates will increase. The extent to which interest rates increase depends on a number of different circumstances, above all the size of the increase in capital requirements and the extent to which costs are passed on to customers. In this example we assume that the lending rate for first mortgages will increase by 0.3 % and that the interest rate for second mortgages will remain unchanged. The same conditions apply as in the basic example.

In this case the household's costs will be:

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	2.9	4 108	1 574
Second mortgage	200 000	15	4.6	767	1 667
Down payment	100 000	5			

CONSEQUENCES: The household's initial monthly expense, after tax relief, will be SEK 6 654, of which SEK 3 413 in interest costs. Compared with the basic example the household will have a higher interest cost after tax of about SEK 300 per month.

20 This is done to a certain extent already in existing capital adequacy rules.

Achievement of objectives

The credit institutions as a rule hold more capital than the legal requirement. A tightening of capital requirements, generally or specifically for mortgages, would not automatically mean an improvement in the financial system's resilience to shocks. For this to happen the tightening would have to make the institutions increase their capital, either through compulsion or their own choice. In brief, to achieve an actual effect, the formal capital requirement would have to exceed the capital requirements that the institutions (via their financiers) impose on themselves.

As regards the effect on the price and credit cycle, tighter capital requirements for mortgages mean that this category of lending will be more expensive for the banks to provide (assuming they do not have internal capital requirements that exceed the legal requirements). If the banks decide to pass on the increased cost to mortgage customers, interest rates will rise and demand for mortgages will decrease. Tighter requirements can thus be expected to have a dampening effect on the credit cycle and thus also the housing market. The banks could also decide to meet the tighter requirements by reducing their mortgage lending. In that case the credit supply will be negatively affected, which also has a dampening effect.

It should be noted here that the main objective of capital adequacy rules is to strengthen the resilience of the financial system. Even if the requirements can impact price and credit cycles this is not a purpose for which the regulatory framework can be used for. But even if the requirements could also be used for this purpose, there may be circumstances that mean that the effect of tightened requirements on price and credit cycles may not be the one desired. In an expansionary phase characterised by great optimism, household demand for credit may be so strong that the increased borrowing costs (price incentives) entailed by the extended requirements do not have any material effect on lending. It may also be the case that the banks' costs for acquiring capital may be low in an expansionary phase, which may mean that the tightened capital requirements do not lead to any major effect on lending rates.

Changes in capital requirements that only target certain types of lending, in this case mortgage lending, mean that this type of lending will be relatively more expensive for the institutions. A possible consequence of this is that the banks will decide to redistribute their lending to other loan categories, such as unsecured consumer credit or corporate lending. If flows move toward riskier lending, the stability preserving effect an increase in the requirements intends to achieve will be counteracted.

Some alternatives for tightening capital requirements specifically for mortgages have been mentioned above, though a general increase in the requirements, extended differentiation of risk weightings or a floor for risk weightings.

A differentiation on the basis of loan-to-value ratio would make high indebtedness more expensive, which in itself can help to reduce indebtedness and dampen credit and price cycles. However, the fact that capital requirements are dependent on the market value of the properties means that there is a counteracting cyclical effect. If the institutions value their collateral at fair value, rising prices will mean a fall in borrowers' loan to value ratios, which also entails falling capital requirements. In that way capital will be freed up, which the institutions can use to increase their lending. The reverse applies when prices fall. In that way capital requirements help to strengthen rather than dampen credit and price cycles. This effect can be assumed to be greater the more risk differentiated the requirements are.

Introducing a floor for risk weightings in the internal ratings-based approach contributes to ensuring that the banks' capital buffers for mortgage lending are always at a certain minimum level. At the same time, such a floor means a deviation from the principle that capital requirements should be calculated on the basis of historical losses.

Other consequences

Calculation of capital requirements on the basis of historical loss data is a manifestation of one of the most basic principles of capital adequacy rules, which is that capital requirements should reflect as closely as possible the actual risks taken by the institutions. An important reason for this is that the regulatory framework as such should not be a factor for how institutions decide to conduct their lending. Another central reason is that the banks must not be forced to hold more capital than the risks in their operations merit.

If a decision is made to deviate from this principle by introducing capital requirements for mortgages that exceed those indicated by existing risk calculation methods, mortgage lending may decrease (and other types of lending increase). Allowing the regulatory framework to influence credit allocation in this way may, however, be motivated if there is reason to believe that the calculation methods for capital requirements underestimate the actual risks. Another motive could be if the banks' lending creates a negative externality, i.e. that mortgage lending creates risks for the economy that are greater than the risks it entails for the individual bank. Through the capital requirements, but also through other tools discussed, the authorities can try to "price" these externalities so that mortgage lending arrives at a acceptable risk level from an macroeconomic point of view.

An increased differentiation of capital requirements means that households with high loan-to-value ratios will have higher borrowing costs relative to households with lower loan-to-value ratios. In the same way as in the case of a loan restriction related to the value of the property, this can lead to households with insufficient

capital, for example first-time buyers, finding it more difficult to enter the housing market.

Implementation issues

Unlike the previously discussed tools, which reasonably can only be applied to new lending or loans that are rearranged, changed capital requirements will affect the existing mortgage stock. One effect of this difference is that existing owners of residential property are affected in a more immediate way. To the extent the requirements lead to higher lending rates, existing home owners' scope for consumption will decrease, while a loan-to-value limit for example will only have an indirect effect (if it creates prices changes that in turn affect household consumption choices). Changed capital requirements can thus be expected to have a greater influence on demand in the economy than tools that target new lending, since they affect both borrowing costs and asset values for already existing borrowers as well. If the purpose of the tool is to prevent unsustainable development in house prices and borrowing, without at the same time tightening households' "liquidity", tools that target new lending seem to be a more suitable alternative.

The capital requirements are based on internationally agreed standards. Unilateral changes in the Swedish regulatory framework would mean that conditions in the Swedish mortgage market deviated from those prevailing internationally. However, several countries have decided to take this route and apply stricter requirements. In addition, other tools that entail a tightening of mortgage lending would also have an effect on Swedish banks' international competitiveness.

If the capital requirements for mortgage loans are to be applied dynamically, it is important to consider how they should be coordinated with the contra-cyclical capital requirements that will be phased in as of 2016. These will also in fact function so as to enable requirements to vary over time, though not with reference to mortgage lending specifically, but on the basis of the general credit trend in the economy. To avoid two different dynamic capital requirements, a reasonable approach would be to design the contra-cyclical capital requirements so that it is not only possible to activate them when credit expansion in the economy as a whole is high, but also when lending rises sharply in individual sub-markets, such as the mortgage market.

2.2.2 Reserve requirements for mortgage lending

Within the framework of its operations the Riksbank can impose reserve requirements on the banks. These requirements could be used as an instrument to influence the banks' mortgage lending and thus also price and credit growth in the housing market.

A reserve requirement works so that the banks are forced to deposit a certain amount of funds with the Riksbank. The reserve requirement is calculated as a percentage (reserve requirement ratio) of an item (base) in the bank's balance sheet. The Riksbank decides the base on which the requirement is to be calculated, as well as the interest compensation payable on the deposited funds. By introducing a minimum reserve requirement using the banks' mortgage lending as a base, and paying a lower interest rate for this than the interest the banks must pay to acquire these funds, the requirement will in practice function as a tax or fee on mortgage lending. To the extent this cost is added to the banks' lending rates the reserve requirement will have a dampening effect on credit demand.

EXAMPLE: Reserve requirements for mortgage lending
The Riksbank applies a reserve requirement where the base consists of mortgage loans and where the reserve requirement ratio is set at 20 per cent. If the difference between the interest compensation paid by the Riksbank and the bank's borrowing costs is 2 per cent, the bank's costs for mortgage lending will increase by 2*0.2=0.4 per cent. If this cost is added to the lending rate for the mortgage the household's costs will be as follows (we assume that only first mortgages are included in the base for the minimum reserve requirement):

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	3.0	4 250	1 574
Second mortgage	200 000	15	4.6	767	1 667
Down payment	100 000	5			

CONSEQUENCES: The household's initial monthly expense, after tax relief, will be SEK 6 753, of which SEK 3 512 in interest costs. Compared with the basic example the household will have a higher interest cost after tax of about SEK 400 per month.

Achievement of objectives

A reserve requirement that is applied like this is primarily aimed at influencing banks and borrowers in such a way as to reduce lending for housing. The increased costs entailed by the requirement require that the banks raise their lending rates if they want to maintain their profit margins. However, increased lending rates have a dampening effect on household demand for mortgages. If for some reason the banks cannot compensate themselves for the costs through higher lending rates then household demand for credit will not be affected. On the other hand, the banks' propensity to lend money for housing may decrease, which in that case leads to a reduced supply of mortgages. Regardless of whether the increased costs lead to reduced demand or reduced supply, the reserve requirement will have a dampening effect on the price and credit cycle.

Through its effect on the price and credit cycle the reserve requirement reduces the risk of the housing market being a source of shocks in the financial system. However, the requirement does not entail any direct strengthening of the banks'

resilience in the way that tightened capital requirements do, which create greater buffer capital held by the banks.

An attractive quality of a reserve requirement is that it probably gives more accurate price control of loans than increased capital requirements. The effect of capital requirements on mortgage interest rates depends on several different factors over which the authorities have no immediate control. These include the banks' capital costs and internal capital allocation models. The effect of a reserve requirement on mortgage interest rates is, however, probably more direct and controllable, since the cost is depends on factors that the Riksbank itself decides (size of the reserve requirement ratio, interest compensation for the reserves and the borrowing rate for financing the reserve requirement).

A condition for the effectiveness of minimum reserve requirements in restricting a certain category of lending is, however, that the banks decide to pass on the costs to that particular lending category. If the Riksbank decides to introduce a reserve requirement for new mortgage lending and the banks transfer this cost to a wider circle of borrowers, for example also to existing borrowers, the effect will be less on the loan category targeted by the measure, while at the same time an unwanted price effect arises for other loan categories.

Implementation issues

Under the Sveriges Riksbank Act[21] a reserve requirement may only be introduced for monetary policy purposes. Consequently, strictly speaking a reserve requirement cannot be introduced if mortgage lending is only regarded as a risk to the stability of the financial system. At the same time, however, the government bill supporting the Riksbank Act states that there may be situations in which a crisis in the payment system threatens to jeopardise the price stability objective. In such situations, monetary policy tools may be used with a view to avert a crisis. In a wider sense then, it is possible to justify the use of a reserve requirement to manage stability problems, provided that the problems could ultimately threaten price stability. Reserve requirements cannot, however, be used for the isolated purpose of promoting financial stability. In a communication to the Riksdag, the Riksbank has stated that an analysis should be made of whether the Riksbank should be given special tools, such as reserve requirements, that may be used solely for the purposes of stability[22].

The Riksbank itself determines the base for the reserve requirement. Thus there are no legal obstacles to applying the minimum reserve requirement to the existing stock of mortgages as well. As argued in earlier sections, however, tools targeting

21 Sveriges Riksbank Act (1988:1385).
22 2009/10:RB4, Submission on certain areas that require investigation as a result of the financial crisis.

new lending are more efficient if the objective is to affect price and credit growth. Since it is primarily for this purpose that minimum reserve requirements can be used it is therefore also natural to restrict the application to new lending.

One condition that enables minimum reserve requirements to fulfil the purpose of managing mortgage lending is that the lending institutions do not find ways of circumventing the requirements. It is important to ensure that lending is not moved to institutions that are not subject to the requirements or that the institutions choose other forms of lending to avoid the requirements.

2.3 FISCAL TOOLS

Taxes and fees constitute a further category of tools that could be used to affect developments in the housing market. In the very widest sense most fiscal instruments that target households or credit institutions can be significant for the housing market. For example, a change in income tax impacts households' purchasing power and thus also potentially their demand for housing. Here, however, we have decided to restrict the discussion to fiscal instruments that may be assumed to have a more direct impact on the housing market.

In Sweden there are no fiscal tools for the specific purpose of steering price and credit growth in the housing market. Nor does there seem to be any international example of taxes or charges with this express purpose. However, both in Sweden and other countries there are many different rules for taxes and fees that affect the housing market and households' propensity to borrow money for housing.

For Sweden, the housing market includes both transaction taxes in the form of stamp duties and capital gains taxation on the sale of housing, and taxation of housing assets in the form of a municipal real estate charge. One tax rule that is not linked to housing transactions or housing ownership, but nevertheless has great importance for the housing market, is the possibility of households to obtain tax relief on the interest expense for their loans.

A conceivable alternative is to use these rules as a tool to ensure sustainable development of house prices and debt. Another alternative is to develop new tax and fee instruments with the same purpose. These could be for example the introduction of a special tax or fee on household debt, either for all types of debt or specifically for mortgages. With the help of such a tax it would be possible to steer household credit demand. If the tax was also applied dynamically it would be possible to use it as an instrument for active stabilisation of price and credit cycles.

EXAMPLE: Abolished tax relief on interest
Abolition of tax relief on interest means the household must bear the entire interest cost itself. The household's cost will be as follows:

FINANCING	AMOUNT (SEK)	SHARE OF TOTAL (%)	INTEREST RATE (%)	INTEREST COST (SEK/MONTH)	AMORTISATION (SEK/MONTH)
First mortgage	1 700 000	85	2.6	3 683	1 574
Second mortgage	200 000	10	4.6	767	1 667
Down payment	100 000	5			

CONSEQUENCES: Without tax relief the initial monthly expense will be SEK 7 691 per month. The interest cost of SEK 4 450 is SEK 1 335 higher than the basic example in which the tax relief on interest is allowed. The higher the interest rate, the greater the difference the tax relief on interest will make. A three per cent higher interest rate on first and second mortgages gives a monthly cost that is SEK 2 760 higher if the tax relief on interest is not allowed.

Achievement of objectives

All the taxes and fees mentioned could potentially be used both for influencing price formation in the housing market and for dampening households' credit demand and indebtedness. For example, abolition of tax relief on interest would most probably lead to considerable weakening of household credit demand, which would also have a cooling effect on house prices. In a similar way, higher stamp duties and capital gains taxes or increased real estate charges would have a price-dampening effect.

Since the emergence of harmful imbalances in the housing market in most cases is credit-driven, a reasonable point of departure is that the tools should be directed at household debt. Of the rules mentioned above, only tax relief on interest and special taxation of household debt would thus qualify as appropriate tools.

As regards their effects, the differences between these two alternatives are small. Introducing taxation of all household debt would even be an identical measure to reduced or abolished tax relief on interest, which makes it difficult to see the need of introducing such a tool instead of reforming an existing rule. Taxation that only refers to mortgages gives a more targeted effect in the housing market. The problem of such a rule is, however, that it discriminates lending for housing in favour of other types of lending.

Changed tax relief on interest (or a debt tax) is purely a price-adjusting tool. Unlike a binding loan-to-value limit it sets no absolute limits on how much households may borrow, but instead affects credit demand by influencing the cost of the loan. In this respect it works in the same way as capital requirements. An important difference is, however, that changed tax relief rules do not affect credit supply in the same way as capital requirements can, if the banks decide to meet changed requirements by increasing or decreasing their lending volumes. Another difference is that tax relief on interest does not strengthen the banks' resilience in the same direct way as increased capital requirements. Tax relief on interest is then

more to be regarded as a measure to stabilise price and credit cycles rather than a direct way of strengthening stability in the financial system.

In the same way as changed capital requirements, changed tax relief on interest affects the existing stock of mortgages. As discussed in the section on capital requirements, this means that existing home owners are affected in a more immediate way than would be the case with a loan-to-value limit or other tools that reasonably can only target new lending. However, it is probable that these effects will be even greater with changed tax relief on interest, since in the matter of capital requirements it is uncertain to what extent a tightening would really lead to rising lending rates and hence reduced scope for consumption for households. Reduced tax relief on interest would, on the other hand, without doubt lead to increased borrowing costs for households. As was established earlier, it may be redundant to tighten households' "liquidity" in this way if the goal is only to counteract unsustainable development of house prices and debt. For this purpose, tools that target new lending are a more appropriate alternative.

For existing borrowers, changed tax relief on interest means increased interest cost which they could not take into account or predict at the time of taking the loan. For borrowers with small margins this may be particularly problematic, since the conditions for bearing the loan deteriorate if the tax relief decreases.

Other consequences

Even if adjustments to tax relief rules were to be an effective tool to counteract imbalances in the housing market it is important to point out that this, like other already existing taxes and fees, was not created for this particular purpose. Adjusting the rules to make them into a policy instrument for housing market developments risks undermining the primary purpose of the rules and thereby giving rise to unwanted fiscal and macroeconomic effects. In addition, tax relief on interest and capital gains taxation on housing is an important part of the Swedish framework for taxation of capital. Making changes that only refer to individual sectors or classes of assets would cause asymmetries in the tax system which may possibly be regarded as inappropriate.

The alternative, to develop new fiscal tools, would mean refining and increasing clarity regarding the goals of such instruments. This does not mean, however, that conflicts of interest with existing fiscal instruments would be eliminated. If, for example, taxation of household debt was introduced it would be the same thing in principle as reducing or abolishing tax relief on interest. Apart from the fact that this would fully or partly neutralising the intended purpose of tax relief on interest it would also mean – as mentioned above – that asymmetries would arise in the tax system.

Implementation issues

An aspect that must be considered when using fiscal instruments to steer development on the housing market is that only the Riksdag can make decisions on taxes. This means that it is not possible to delegate decision-making powers to an agency that can make the decisions independent of political considerations.

2.4 CONSIDERATIONS IN SUMMARY

The analysis above was made on the basis of which tools, apart from the monetary policy rate, can be used to prevent the housing market from becoming a source of macroeconomic shocks. As described initially, there are two main strategies for preventing such shocks from arising. Either the authorities can try to steer house prices and credit so that imbalances in the housing market never arise, or they can ensure that there is sufficient resilience in the financial system (and households) to prevent such shocks arising if – or when – imbalances are adjusted.

As regards steering price and credit development, most of the tools can be effective - though to a greater or lesser extent. Of the tools that have a price-adjusting effect changed tax relief on interest is probably the most effective. This is because it has a direct effect on household borrowing costs and in addition affects all households with loans, regardless of the size of the loan, wealth or incomes. A reserve requirement based on mortgages can also be expected to have a fairly direct impact on banks' mortgage rates and thus also household borrowing costs. A condition for the reserve requirement to be effective is, however, that the banks decide to pass on the costs of the requirement to the borrower category the requirement refers to.

Provided that they are binding (i.e. function as quantitative restrictions) tools that restrict the size of loans or the amount that must be amortised are expected to have a good ability to influence price and credit growth. The strength of this type of tool is that it can have a stabilising effect over time without necessarily needing to be applied dynamically. If the loan restrictions are not binding (in the sense that households on certain premises can take out mortgages over the limits) they will instead have price-adjusting properties. The effect they then have on price and credit growth will, like other price-adjusting tools, depend on how household borrowing costs are affected. Compared with tax relief on interest and a reserve requirement, however, the loan restriction tools' impact on borrowing costs is more indirect and thus also more difficult for authorities to control with any great precision.

Fixed rate requirements, risk insurance and capital requirements are probably less effective tools if the goal is to control price and credit cycles. Fixed rate requirements can certainly have a dampening effect when introduced, but it is

difficult to see how they could contribute on a more continuous basis to more stable price and credit development. Depending on how they are designed, risk insurance schemes can also have a cooling effect, but since they neither restrict borrowing volumes nor raise costs for borrowing (at least from a theoretical perspective) the effects would probably be limited. That a capital requirement is regarded as a less effective tool is because it is uncertain what impact changed requirements de facto would have on the banks' lending rates, and thus also household credit demand. It can be added here that capital requirements in the present situation cannot – or at least are not intended to – be used for the isolated purpose of influencing house prices or credit stocks (even if they have such an effect indirectly).

A shared feature of capital requirements and tax relief on interest is that they (probably) cannot be restricted to only cover new lending. This is unlike other tools that either can or must be restricted to only cover new loans and loans being rearranged. This speaks in favour of the latter category of tools, since rules that cover the entire loan stock have a tightening effect on all households, which does not appear to be necessary if the intention is to influence prices and credit.

As regards the ability to strengthen the resilience of the financial system, then capital requirements constitute the most direct way of achieving this. In that the banks' economic buffers increase, the risk of macroeconomic shocks arising as a result of stability problems decreases. All the tools that target household debt also contribute to strengthening the financial system's resilience, though in a more indirect way. In that the rules contribute to reducing households' financial vulnerability, credit risks in the banks also decrease. Nor do changed tax relief on interest or reserve requirements have any direct effect on the resilience of the financial system, in the sense that they strengthen the banks' financial buffers. To the extent they contribute to a more stable price and credit development, however, the vulnerability of the financial system and of households will decrease.

As regards implementation of the tools, the difficulties are greatest for amortisation requirements. A repayment requirement would probably require severe restrictions on households' ability to borrow so that the requirement cannot easily be circumvented.

Even as regards the other tools, there are certain central implementation issues to consider. The choice between quantitative or price-adjusting rules is an important such issue. On the one hand, it can be both difficult and costly to introduce absolute restrictions on household debt. This applies above all to a loan restriction based on the value of the residential property, which in principle would require a ban on borrowing without the residential property as collateral. On the other hand, the question is whether rules that do not entail an absolute restriction give sufficient price incentives to influence household debt. If they do not then there is a risk instead of the tool being counterproductive.

Another implementation question concerns whether the tools can and should be applied dynamically. In the matter of price-adjusting tools, such as reserve requirements, dynamic application is more important than for quantitative tools, such as binding limits for household debt. This is because households' reactions to the incentives a price-adjusting tool gives can vary over time. A tool that raises borrowing costs can – depending on how household preferences develop – have a major effect in one period and a minor effect in another period. Since a quantitative tool sets absolute limits on households' actions, shifting preferences are of lesser importance. Stabilising effects on prices and credit can therefore probably be achieved even without applying the tools dynamically. But dynamic application may also be needed for quantitative tools. This mainly applies to the alternative of restricting households' debt in relation to the value of the residential property.

2.5 MONETARY POLICY CONSEQUENCES OF THE TOOLS

In this section we look more closely at how the alternative tools affect monetary policy. By monetary policy we mean changes in the Riksbank's policy rate and interest rate path. We endeavour to answer two questions:

1. How do the tools affect the impact of monetary policy on the real economy and inflation (the transmission mechanism)?
2. How does dynamic use of the tools interact with monetary policy? Will a tightening of the tools strengthen or weaken the effects of a change in the interest rate?

Monetary policy operates through different channels (see for example Hopkins, Lindé and Söderström, 2009). We will focus here on the demand channel, particularly the effects of monetary policy on household demand. The other channels of monetary policy, such as the exchange rate channel or the channel to corporate demand are affected to a small extent by the alternative tools.

The analysis is qualitative. Hence we only try to identify how the tools may conceivably affect the impact of monetary policy. We make no attempt to quantify. Several of the tools operate in different directions, and in that case to be able to say anything about the total effect a quantitative model is required.

2.5.1 Effects on the transmission mechanism

Tools targeting household debt

Several of the tools targeting household debt entail setting a limit for how much households may borrow. Binding rules for how much households may borrow in relation to the value of their residential property or their income are examples of

such direct limits. Repayment requirements also function indirectly as such a limit. In the absence of a limit on how much households may borrow, they can freely change their borrowing and savings when interest rates change to achieve their desired consumption. At first glance, tools that set a limit on how much households may borrow should thus reduce the sensitivity of household consumption to interest rate changes. A reasonable conclusion then would be that monetary policy impact on household consumption will decrease.

But several of the tools targeting household debt imply that the limit for how much households can borrow in kronor will change when interest rates change. For example, the limit in kronor will change if the loan restriction is stated as a percentage of the house price, and the house price changes when there is a change in the interest rate. The effect of the tools on the transmission mechanism will therefore be more complicated, and it is even conceivable that the sensitivity of household consumption to interest rate changes will increase when tools restricting loans are introduced. That is why it is important to differentiate between tools where the loan limit in kronor is affected by the interest rate and tools where the limit in kronor is not affected by the interest rate.

The analysis of the transmission mechanism and tools targeting household debt will be simpler if we first define some simple concepts that describe the effects of an interest rate change on household consumption.[23] As tools targeting household debt in principle only affect households that borrow, we only study the effects of an interest rate change on households that borrow. We differentiate between two effects.

- **The income effect:** When the interest rate is cut, the interest costs fall for a given loan. Households with loans thereby have more over for consumption. The reverse applies when the interest rate goes up.
- **The substitution effect:** When the interest rate is cut, consumption today is cheaper in relation to consumption later. Households tend therefore to consume more now in relation to later. The reverse applies when the interest rate goes up.

To make the analysis as simple as possible we only look at absolute requirements. For example, we will assume that different loan restriction rules are absolute in the sense that it is not possible to borrow in excess of the loan limit. In reality, however, it may be possible to borrow in excess of the loan limit, but at a higher borrowing cost.

23 By "consumption" is meant household demand in a wider sense, including households' real investment demand. "Interest rate" here refers to the real interest rate, since this determines households' demand in real terms.

A **loan restriction based on the value of the residential property** gives lower household indebtedness, provided that the requirement is binding for some households. By "binding" we mean that a household would want to borrow an amount over the limit. With lower indebtedness the income effect of interest rate changes will be weaker for households that have loans, since a smaller mortgage loan amount means that a given change in the repo rate would mean a smaller change in interest costs (interest multiplied by the size of the loan). In isolation this indicates that the effects of an interest rate change will be weaker with a loan restriction than without it.

If house prices are not affected by changes in monetary policy, a loan restriction based on the value of the property would mean that there is a fixed upper limit in kronor for how much a household may borrow. With such a limit parts of the substitution effect are disconnected. Households that already borrow to the upper limit may not borrow more if interest rates fall. For households that borrow less than the limit, the limit may mean that they cannot increase their borrowing as much as they would have wanted when the interest rate was cut (see example 1). However, when the interest rate is increased, the limit has no significance for the substitution effect as the limit only determines the maximum amount that can be borrowed.

EXAMPLE 1. Household whose consumption becomes less sensitive to interest rate cuts under a loan restriction based on the value of the residential property

We assume in this example that house prices are not dependent on the interest rate. Changes in the interest rate will therefore not influence the upper loan limit. We look at a household that owns (or will buy) a residential property for SEK 2 000 000 and has its own capital of SEK 300 000. This means a mortgage loan of SEK 1 700 000. This household has (or will have) a loan-to-value ratio of 85 per cent (17/20). If the interest rate is 5 per cent the household's interest expense will be SEK 85 000 per year (we disregard tax relief). If the interest rate is cut to 4 per cent the annual interest expense falls by SEK 17 000. The household can then increase its borrowing by SEK 425 000, but will have the same annual interest costs as when the interest rate was 5 per cent and the loan was SEK 1 700 000. But with a rule that restricts the mortgage to 85 per cent of the value of the property the household cannot increase its loan (as long as house prices are unchanged). The only effect of the lower interest rate is that the household will have more money left over every month. In that way the household's demand cannot increase as much as if there was no loan restriction.

House prices tend, however, to change with the interest rate, and when house prices change, the limit for how much households can borrow in kronor change.[24] For example, a loan restriction of 85 per cent will mean that a house worth SEK 2 000 000 can be mortgaged for SEK 1 700 000, while the same house can be mortgaged for SEK 1 870 000 if it is worth 10 per cent more (SEK 2 200 000). If the house prices change a lot when the interest rate is changed, the limit in kronor will also change a lot with the interest rate. This may give an extra push to the substitution effect. Example 2

24 According to the model calculations in Chapter II.1 the effects of interest rate changes on house prices may be small.

shows how this can happen. In the example, household consumption becomes more sensitive to cuts in the interest rate if there is a loan restriction based on the value of the residential property than if there is no such restriction.

EXAMPLE 2. Household whose consumption becomes more sensitive to interest rate cuts with a loan restriction based on the value of the residential property

We look here at a household that owns a home and has a mortgage on that property. If there is no loan restriction the household borrows SEK 1 850 000 when the interest rate is 5 per cent, and SEK 1 900 000 when the interest rate is 4 per cent. In that way an interest rate cut from 5 to 4 per cent will lead to an increase in the loan amount of SEK 50 000 in the case without a loan restriction (see the table below). We assume that the entire increase in the loan amount is used for consumption.

Assume now that there is a rule that restricts the loan amount to 85 per cent of the value of the residential property. Assume further that the property is worth SEK 2 000 000 if the interest rate is 5 per cent, and SEK 2 100 000 if the interest rate is 4 per cent.[25] In that way the household can borrow a maximum of SEK 1 700 000 when the interest rate is 5 per cent, and SEK 1 785 000 if the interest rate is 4 per cent. Thus, an interest rate cut from 5 to 4 per cent will lead to an increase in the loan amount of SEK 85 000 in the case with a loan restriction. A cut in the interest rate from 5 to 4 per cent will then have a greater effect on the household's consumption with the loan restriction than without it.

Value of the residential property and mortgage amount with and without a loan restriction[1]

INTEREST	VALUE OF THE RESIDENTIAL PROPERTY	LOAN AMOUNT WITHOUT LOAN RESTRICTION	LOAN AMOUNT WITH LOAN RESTRICTION[1]
4 per cent	2 100 000	1 900 000	1 785 000
5 per cent	2 000 000	1 850 000	1 700 000
Difference	100 000	50 000	85 000

1 Loan restriction in which the loan amount may not exceed 85 per cent of the value of the residential property.

In example 2 we see the effects of a *reduction* in the interest rate. The effects of an *increase* in the interest rate depend on whether the rule only applies to new loans or if it also covers existing loans. If the rule only applies to new loans, the rule has no significance for the effect of an increase in the interest rate for households that already have mortgages. These households can choose freely if they want to retain their loans or reduce them in the same way as if there was no loan restriction.[26] We can thus summarise by saying that if the loan restriction only applies to new loans it will mainly affect the impact of an interest rate cut. If, when there is an interest rate cut, the transmission mechanism becomes stronger or weaker with the loan restriction will depend on the percentage of the population who borrow

25 A five per cent increase in house prices as a consequence of a cut in the repo rate of one percentage point is relatively high, see chapter II.1 "A macroeconomic analysis of house prices" in this report.

26 For households that save up their own capital to buy a home the rule may, however, have significance for the effect of an increase in the interest rate even if it only applies to new loans. When the interest rate goes up, households that save up a cash down-payment do not need to save as much as before, as a higher interest rate means greater interest income and lower house prices and therefore lower cash down-payment requirements for a given residential property. For these households consumption may be more sensitive to a rise in the interest rate if there is a loan restriction for new loans than if there is no such restriction.

and the proportion of them who are subject to the limit.[27] It also depends on how much house prices and hence the limit changes when interest rates are cut.[28] Our assessment is that many households must be subject to the limit and house prices must be very sensitive to interest rates for the transmission mechanism to be stronger with a loan restriction based on the value of the property (for new loans) than without such a restriction.

If the limit is also applied to existing loans, the impact on household consumption of interest rate increases can also be affected; this is because households with existing loans must repay parts of their loans if house prices fall so much that the limit becomes binding. The transmission mechanism could therefore be stronger with a rule that applied to all loans than if no such rule existed. As pointed out earlier it is, however, unrealistic to contemplate a rule that applies to anything other than new loans.

Wallentin and Sellin (2008) make a quantitative analysis of the effects on the transmission mechanism of a loan restriction based on the value of the property. They find that the transmission mechanism becomes stronger when the rule is stricter. We believe, however, that this conclusion is due to two relatively unrealistic assumptions in their analysis: (i) The restriction applies to all loans (new and existing). (ii) 20 per cent of households in the economy borrow to the upper limit. In Sweden this applies approximately to new lending, but for all (existing and new) mortgages the figure is considerably lower. In addition many households do not have any mortgages at all.

Loan restrictions based on household income can be formulated in two ways, either by restricting the loan amount to the income or by restricting the borrowing expenses (interest and repayments) to the income.

When restricting the loan amount the limit for how much households may borrow is not affected by the interest rate. This is because households' incomes are only affected to a small extent by changes in interest rates. That is why the rule functions more as a pure and fixed loan limit in kronor. The income and substitution effect of a change in interest rate will be weaker than if the rule did not exist. The transmission mechanism, and in particular the effect of interest rate cuts, will therefore be weaker with the rule than without it.

27 In reality there will be an upper limit for how much a household may borrow even when the authorities have not set an upper limit. Among other things the banks often require a certain cash down-payment, which in reality means that a limit is set for how much a household may borrow as a percentage of the property value. Requirements imposed by the authorities that reduce this limit will mean, however, that more households encounter a loan restriction.

28 According to the model calculations in the chapter II.1 of this report, a change in the repo rate of one percentage point will give a change in house prices of between 2 and 5 per cent. With such small effects it may be reasonable to assume that the limit for how much households may borrow in kronor will not change very much with the interest rate.

With a rule that is based instead on borrowing expenses (interest rates and repayments) the limit for how much households may borrow will depend very much on the interest rate. If the interest rate is cut, interest expense decreases for a given loan amount, which directly enables an increased mortgage. It can give an extra push to the substitution effect in the same way as for a loan restriction based on the value of the property when the value of the property is very sensitive to changes in the interest rate (example 2). Here too we can summarise by saying that if the loan restriction only applies to new loans it will mainly affect the impact of an interest rate *cut*. If the restriction is also to apply to existing loans the impact on household consumption of interest rate *increases* can also be affected. If when there is an interest rate cut the transmission mechanism becomes stronger or weaker with the loan restriction will depend partly on the percentage of the population who borrow and the proportion of them who are subject to the limit.

An **amortisation requirement** can be compared to a loan restriction based on borrowing expenses. As households must have something left to live on after paying their borrowing expenses, household income minus the left-to-live-on amount will implicitly define an upper limit for borrowing expenses as a percentage of income. The qualitative analysis is therefore similar to that for loan restriction based on a loan restriction in which the borrowing expenses may not exceed a certain percentage of income.

Price-fall insurance schemes, which are the form of **risk insurance** discussed in section 2.1.4, affect the impact of monetary policy on household consumption in different ways, depending on whether the premium must be paid as a lump sum of the cash down-payment or if it is divided into regular payments. If the premium is paid as a lump sum it affects the impact of monetary policy in the same way as a loan restriction based on the value of the property. If the premium is paid regularly, the price-fall insurance can be compared to an amortisation requirement. If a certain premium amount must be paid every month, an interest rate cut means that the monthly expense decreases if the loan amount is unchanged, which increases the possible consumption and loan amounts.

Fixed rate requirements, that is requirements that mortgages are to be taken at a fixed rate of interest, mean that monetary policy cannot affect the cost of mortgages in the same way as if the mortgages were at a variable interest rate. Consequently, such a requirement can lead to monetary policy affecting demand to a lesser extent. If household debt decreases as a result of the fixed rate requirement the income effect of an interest rate change can also be weaker. For more information on the effects of monetary policy when there is a variable or fixed mortgage rate, see Chapter II.2.

Tools targeting credit institutions' operations

In section 2.2.1 **capital requirements for credit institutions** are discussed. To analyse the effect of the capital requirement on the transmission mechanism we assume that the banks' lending rate for mortgages is set in a standardised way as follows:

Mortgage rate = repo rate + "capital requirement add on" + "other add ons"

We assume here that the add ons on top of the repo rate are additive. A higher capital requirement is assumed to make the banks' funding of lending more expensive, which raises the "capital requirement add on". The effect of higher capital requirements will then be, all else being equal, a higher lending rate for mortgage customers. All else being equal, the effect of monetary policy on the lending rate will be exactly the same as without such a requirement. If household debt decreases as a result of the capital requirement the income effect of an interest rate change can, however, be weaker.

As discussed in section 2.2., the **minimum reserve requirement for mortgage lending** in practice can function as a tax or charge on mortgages. If this cost is paid through a supplement on banks' mortgages it can be analysed in the same way as capital requirements for credit institutions (see above).

FISCAL TOOLS

Tax relief on interest

The relevant interest rate for calculating the cost of a mortgage is the real interest rate after tax relief. The current tax relief on interest costs of 30 per cent means that only 70 per cent of the nominal interest costs are paid by the borrower. An increase in the nominal interest rate of 1 percentage point therefore increases the interest paid by the borrower by only 0.7 percentage points.

Abolition of tax relief on interest would instead mean that an interest increase of 1 percentage point would increase the interest paid by the borrower by the same amount. The impact of a given change in the interst rate would therefore be stronger if tax relief on interest was abolished.

2.5.2 The interaction between monetary policy and alternative tools

All the tools described above can potentially be used both contractionary and expansionary. Changes in the interest rate and loan restrictions can thus be complementary. For example the introduction of a loan restriction – or the tightening of an already existing loan restriction – will have a contractionary effect. Another example is changed capital requirements. If the capital requirement is made more stringent, the banks must reduce their lending or increase their capital. In both

cases the increased capital requirements can have a contractionary effect. In the first case because the banks reduce their lending to households. In the second case because the banks will be forced to rise their lending rates as a result of increased capital costs.

The fact that the tools complement monetary policy means that they can help to support current monetary policy. If the tools are introduced or tightened for example in a period where inflationary pressure is expected to increase, the need for monetary policy restraint may decrease. However, potential conflicts of objectives may arise. One example may be a situation in which household borrowing increases substantially but inflation is low. This could motivate stricter requirements through the alternative tools, but a central bank with an inflation target could keep the policy rate unchanged or cut it.

An important difference between monetary policy and the tools described above is, however, how general their effects on the economy are. The alternative tools mainly affect household demand, while monetary policy affects demand throughout the economy.

The interaction between monetary policy and alternative tools is further discussed in the following section, where we analyse the institutional arrangements concerning the tools.

3. Institutional arrangements – who should be responsible for alternative tools?

Up to now we have discussed a number of different tools that can potentially be used to prevent and manage the risks that the housing market may pose for the economy as a whole. In this section a general discussion is pursued concerning which authority is best suited to be responsible for the application of such alternative tools.

To the extent this is a matter of detailed regulation of a tool in legislation, in other words describing in the text of a law when and how the tool is to be used, the institutional arrangements are of less significance. In such a case the tool is implemented and no independent decision-making by individual authorities is necessary. An example of this could be that the rules for tax relief on interest were changed as a one-off measure. If, however, the more detailed formulation and/or application of the tool is delegated to an authority, the issue of responsibility becomes important. This matter is particularly important if the application of the tool is to be discretionary, i.e. if the tool must be adjusted regularly in accordance with the authority's assessment of developments in the housing market.

To determine which authority is best suited to monitor and possibly correct events in the housing market, several aspects must be considered and investigated further. But before we go into this it may be appropriate to first describe what

mandates and tools the Central Bank (the Riksbank) and the Financial Supervisory Authority (Finansinspektionen) have today. At present it is these two authorities that have the more explicit task of monitoring the financial system and preventing financial crises.

3.1 WHAT CAN THE RIKSBANK AND FINANSINSPEKTIONEN DO TODAY?

The Riksbank's mandate is to maintain price stability (monetary policy) and to promote a safe and efficient payment system (financial stability). Most of the tools (for example the repo rate, minimum reserve requirement) that the Riksbank has at its disposal are, however, classified as monetary policy instruments in the Sveriges Riksbank Act and its preparatory work. The Act certainly allows these instruments to be used to avert a financial crisis, provided that this ultimately benefits the price stability objective. This gives the Riksbank a margin for using these tools even for stability purposes. One such tool could be that the Riksbank introduces a minimum reserve requirement for the purpose of dampening credit expansion in the economy and in that way averting a threat to financial stability and ultimately to price stability as well. Apart from these mainly monetary policy tools, the Riksbank has few sharp instruments that can be used to prevent the housing market, or other parts of the economy, from causing financial stability problems or otherwise giving rise to macroeconomic shocks. With the exception of minimum reserve requirements, the Riksbank at present has no possibility of introducing any of the tools discussed in this chapter. Provided that the Riksbank is judged to be the most appropriate authority to have control of such tools, it will therefore be necessary to adapt the Riksbank's mandate and its arsenal of tools.

Finansinspektionen has a different role in financial stability than the Riksbank. The task of the authority is to promote stability and efficiency in the financial system as well as to ensure an effective consumer protection. Unlike the Riksbank, the authority has relatively far-reaching powers to introduce various types of regulation of the agents in the financial system. Within the framework of its remit Finansinspektionen can decide on binding regulations or issue general guidelines (that are not binding) to financial institutions.[29] On the other hand they have no direct mandate to safeguard macroeconomic stability. This means, for example, that Finansinspektionen cannot prescribe rules if it is considered that developments in the housing market only risk leading to a substantial loss of household demand. Under its current mandate, Finansinspektionen must be able to demonstrate reasons of efficiency, stability or consumer protection for taking action. For example, Finansinspektionen adduced consumer protection as the main reason for

29 General guidelines allow a company to behave in another way than is recommended in the guidelines, as long as the company can show that it fulfils the purpose of the regulation.

deciding on a loan-to-value cap of 85 per cent from 1 October 2010. Provided that alternative tools should be possible to use to avert threats to both financial stability and the economy as a whole, and that Finansinspektionen is deemed to be the most appropriate authority to shoulder this task, the authority's current mandate must be extended.

3.2 THE PURPOSE OF THE TOOL IS OF GREAT SIGNIFICANCE FOR DIVISION OF RESPONSIBILITY

The problems the tool is mainly intended to counteract provide some guidance on which authority should be responsible for it. The consequences that imbalances in the housing market can lead to are discussed in several of the chapters in this report. Two types of macroeconomic shock are involved; instability in the financial system and/or loss of demand in the economy due to weakened household consumption. That these shocks can also act together and strengthen each other is an important aspect to consider in discussing the question of responsibility.

If the main purpose of the tool is to ensure stability in the financial system it would be best if it was placed with an authority that currently has a responsibility for financial stability. In Sweden this is a responsibility that is shared between several authorities – the Riksbank, Finansinspektionen, the Ministry of Finance and the Swedish National Debt Office – but where all have responsibility for different sub-areas. The more explicit task of monitoring the financial system and preventing crises lies, however, with the Riksbank and Finansinspektionen.

If the main purpose of the tool is instead to prevent imbalances on the housing market from causing or exacerbating macroeconomic shocks as a result of weakened demand, the tool would best be assigned to an authority that has a broader macroeconomic remit than just responsibility for financial stability. In that case it is a matter of the Riksbank and the Ministry of Finance, with their responsibility for monetary policy and fiscal policy in Sweden.

A pure division of responsibility on the basis of this template is, however, made more difficult by the fact that the economy and the financial system affect each other. For example, a negative shock to the real economy can generate financial instability, which in turn can cause a downturn in the real economy. Nor is there any individual tool that gives an isolated effect in one or other area. This fact is an argument that the responsibility should fall to an authority that has responsibility in both areas.

At the same time, it is important to point out that there may also be other reasons for using the tools discussed in this chapter. Several of the tools actually already exist today or can be introduced within the framework of the authorities', mainly Finansinspektionen's, existing mandate. As in the example of the recently implemented loan-to-value ratio, it may be a matter of applying the tools for

reasons of consumer protection. Another reason for implementing the tools may be to ensure that the economic resilience of each individual lending institution is at an acceptable level, without there necessarily being any immediate threat to financial stability. If it is important that the tools chosen will be possible to use in the future for these purposes as well, regardless of whether there is any threat to macroeconomic or financial stability, this is an argument in favour of the responsibility being given to the authority that already controls several of them. This is because in that way the risk of the same type of tool being used by different authorities for completely or partly different purposes will be avoided.

3.3 MAJOR POINTS OF CONTACT WITH THE DEVELOPMENT OF A MACROPRUDENTIAL FRAMEWORK

The purpose of the new tools also touches on a larger question. In the international debate following in the wake of the crisis, many voices have been raised for a stronger macroprudential framework, i.e. a framework for monitoring and preventing financial systemic risks. The need for such a framework is a consequence of the rules and supervision in many places having been far too focused on the state of health of individual institutions and too little focused on broader development tendencies, such as credit expansion in the economy. A large part of the discussion concerns the need for clear responsibility and access to effective "corrective tools" that make it possible to be better able to influence risk behaviours and increase resilience in the financial system as a whole.

The authorities often mentioned in the international debate as most suitable to be responsible for macroprudential tools at national level are the central banks.[30] The arguments put forward in this literature include the fact that the central banks already have a responsibility for financial stability, that monetary policy and macroprudential tools complement each other[31] and that there are significant similarities of expertise, analysis, institutional capacity and independence that are needed to effectively pursue the policy in both areas.

Within the EU a new structure of supervision and a new body, the European Systemic Risk Board, tasked with responsibility for a more comprehensive oversight of stability at macro level, have recently been created. At national level an important role is envisaged for central banks to identify at an early stage signals of imbalances in the economy, including the need for measures. From the Swedish point of view it is, therefore, important that the roles, tasks and tools of the authorities in these contexts are determined in more detail. This is one of the reasons that the

30 See for example Group of Thirty (2010), HM Treasury (2010), Caruana (2010) and Brunnermeier et al. (2009).

31 The correlation between macroprudential policy and monetary policy is mentioned for example in Angeloni and Faia (2010), Kannan, Rabanal and Scott (2009), and Angelini, Neri and Panetta (2010).

Government in February 2011 decided to appoint a committee to make a review of the Swedish regulatory framework for managing financial crises. The Committee's instructions also include a remit to propose measures to improve the regulatory framework so that future financial crises can be mitigated primarily through preventive measures.[32]

Several of the alternative tools we have dealt with in this chapter are a subset of the tools also being discussed in macroprudential contexts. That the tools are to some extent the same, as is the objective of maintaining financial stability, means that there are efficiency gains from coordinating these two tasks in one authority. This is not least apparent in view of the fact that risks linked to developments in the housing market can constitute a system-wide risk. Hence the issue of responsibility for macroprudential tools has significance for the issue of responsibility for the tools we deal with in this chapter.

A strong argument for coordinating these tools is that it would be unfortunate if two authorities controlled the same type of tool, or tools with similar effects on the housing market, but applied them independently of each other and for purposes that did not quite overlap. At the same time the not quite overlapping purposes of the tools can also be an argument that speaks against a coordination of tasks. The tools that we have discussed in this chapter can have a broader purpose[33] than only financial stability, while macroprudential tools are implemented and used solely to protect the financial system as a whole.

If the decision is made to introduce alternative tools with a different or broader purpose than financial stability, this must be managed in some way. If the tools are to be coordinated by one authority, one solution could be to write into the authority's mandate that one or more of the macroprudential tools may be used for this broader purpose. If the decision is not to coordinate the tools, then it will be important that the authorities have clearly defined roles and areas of responsibility, and that a clear structure for exchange of information and coordination is created to avoid conflicts of interest.

3.4 ANALYTICAL RESOURCES AND INDEPENDENCE

3.4.1 Need for analytical resources

Provided that use of the tool is intended to be discretionary it is important that the authority to which it is assigned has the competence and analytical resources to use it appropriately. The authority must be able to identify, understand and monitor the risks and imbalances that may arise in the housing market, particularly with

32 Committee terms of reference (ToR 2011:6), Översyn av regelverket för hantering av finansiella kriser (Review of the regulatory framework for managing financial crises), Government Offices.

33 The tools may also be aimed at preventing imbalances in the housing market from having negative consequences for the economy, despite the fact that financial stability is not under direct threat.

reference to the connections that exist with the financial system and the economy as a whole. When these risks and imbalances have been identified the authority must also be able to determine how the tool should be best used, which means obtaining knowledge about the timing, intensity and duration of its use.

Hence the need for analysis covers a wide area, even if it can of course vary, depending on the choice of tool. Examples of what may need analysis are: how sensitive to interest rates is household demand for housing? How does the tool affect other household consumption and saving? How may credit institutions act when the tool is applied? For example, to what extent and to which business areas will they pass on their higher costs if the tool is price-adjusting? Good indicators that "measure" imbalances and risk levels will also need to be developed, and various target variables will be needed for the tool, for example debt and house price levels. Analysis will also be needed of how the effects of the tool will be influenced by repo rate and the forecast repo rate path decisions (and vice-versa).

In conclusion, it is important that the authority assigned the tool has adequate analytical resources or at least the means of building up such resources.

3.4.2 Is independence important?

The arguments for having independent central banks as regards monetary policy are relatively strong and now fairly undisputed. It is an open question if similar independence is also important as regards responsibility for new tools targeting the housing market, particularly considering that they may be part of a new framework for monitoring financial systemic risks.

There is some research showing a positive correlation between central banks' independence and financial stability.[34] Various efforts have been made to explain this correlation. One explanation is that political involvement can imply that action is taken too late.[35] This could be because decisions in these cases must go through several political levels or perhaps first be negotiated in coalition governments or parliaments. Another explanation is that it may be politically difficult to "apply the brakes" without complete proof that developments – for example in the housing market – are unsound. Hutchison and McDill (1999) also believe that political involvement can increase the probability of ultimately giving government support to problem banks, which in turn increases the moral hazard problems. Several of these arguments relate to the fact that there would be a time-inconsistency problem in financial stability, which to a great extent is similar to that in monetary policy.[36]

34 See for example Garcia Herrero and Del Rio (2003), Cihák (2007, 2010), and Klomp and de Haan (2009).
35 This explanation is given by Cihák, (2007), for example.
36 Cihák (2007, 2010) has described this time inconsistency problem in financial stability.

The time-inconsistency problem in monetary policy arises because economic policymakers' short term motives may come into conflict with the long-term ambition to keep inflation at a low level. Cihák (2010) has argued that the same type of confidence problem exists in financial stability. Fundamentally it is the Government that has the ultimate responsibility for financial stability and in somewhat simplified terms the Government can either be tough or lenient when risks build up or a crisis develops. If the market participants believe that the Government will be tough (for example use tools early and treat problem institutions firmly) the Government has a short-term incentive to act leniently (for example await developments and give help to problem institutions) when risks start building up or a crisis has developed. This is because the short-term costs of acting leniently are lower than those that follow from acting tough.[37] Rational participants will, however, expect this behaviour and act accordingly (for example by taking greater risks). The consequence will be that economically and financially unsound situations or even crises will arise more often than if the Government was able to commit itself to the strategy of always acting tough. Just as in monetary policy, there would be arguments for the Government needing a mechanism to make credible, i.e. binding, undertakings on how it will act when risks and crises arise. One way of doing this is to delegate the task to an independent authority.

Extending the mandate for independent authorities, however, comes at a cost. This cost is that the elected representatives waive parts of decision-making on supervision and regulation to an authority. If there is a time-inconsistency problem in financial stability and if, in that case, it is sufficiently serious to motivate such a measure, is a difficult question that must be investigated thoroughly, particularly bearing in mind that there may be synergies between monetary policy and macroprudential tools.

3.5 CONCLUDING COMMENTS

As an isolated question the choice of tool – which to a great extent depends on the purpose of introducing alternative tools to the policy rate – and how it is designed is crucial to deciding which authority is best suited to control it. In reality, however, this issue of responsibility must be related to the question of which authority is to be entrusted with the task of monitoring and managing financial systemic risks, and for that purpose is assigned responsibility for various macroprudential tools. It would be appropriate to make this authority responsible for alternative

37 One example is that decisions entailing a tightening of the housing market will be unpopular and need to be implemented when everything still looks good. Political decision-makers have short-term goals – a consequence of a representative democratic system – which do not always go hand in hand with long-term goals such as stability in the real economy and financial stability. There is an obvious risk that non-one wants to do anything about a problem if the risk of its becoming a reality lies far in the future.

tools specifically targeting the housing market, unless there are strong reasons for another arrangement.

If these tools are to be coordinated by one authority, or not, is also intimately associated with the question of responsibility for financial stability. A conclusion in many countries after the financial crisis is that it was a weakness that no single authority had a clear responsibility, authority and power to oversee the system as a whole. Authorities either had a mandate but no tools to manage systemic risks, or they had the tools but no clear mandate to use them for this purpose. If this is the case, then command of new tools should be coordinated with responsibility for more general management of financial systemic risks.

An alternative to collecting all tools in one authority with a clear mandate, thus clarifying responsibility, is instead to link authorities up with each other.[38] This may be a matter of pure merger[39] of authorities to more or less formal cooperation and coordination between authorities.

Learning from the crisis, the United Kingdom will establish a Financial Policy Committee (FPC) within the Bank of England with the express task of being responsible for maintaining financial stability. They will also reshape the supervisory authority into a new authority, the Prudential Regulation Authority (PRA), which will be transferred to and become an operationally independent subsidiary of the Bank of England. This supervisory authority will be in charge of most of the tools targeting the financial sector. To ensure that the FPC can fulfil its mandate, this committee will, most likely, be given control of the macroprudential tools, for example the contracyclical capital buffer, and a mandate to order the PRA to use their tools as needed.[40]

Another conceivable alternative is that the authorities are very loosely linked to each other, and continue to share responsibility for financial stability.[41] But for this to function, the roles and areas of responsibility must be made very clear, so that it is evident who is responsible for what. One example could be that the central bank is given overall responsibility and the mandate to monitor and propose measures to manage financial systemic risks. For this purpose the central bank can also have

38 Another alternative is to create a whole new authority. The greatest drawback of that alternative is that there will be yet another authority working on financial stability and thus lose the potential synergies and efficiency gains that follow from using the existing structure.

39 A pure merger must, however, be weighed against the arguments in favour of a separation of supervision and monetary policy. One such argument is that a conflict of interest may arise between the monetary policy goals and the supervision goals, for example the central bank could be tempted to set interest rates far too low to prevent acute problems for banks. Another argument is that if a bank under the supervision of the central bank should fail, there is a risk that public confidence in the central bank's monetary policy responsibility will also suffer (Ingves and Lind, 2007).

40 For a more detailed description of the reforms in the United Kingdom, see HM Treasury (2010, 2011).

41 In Finland and some other countries banking supervision is carried out by an organisation that is closely linked to the central bank, but not a part of it. In that way it is possible to benefit from the resources of the central bank and make some savings, but nevertheless avoid some of the arguments against placing the supervisory function within the national central bank (Ingves and Lind, 2007).

some new macroprudential tools. The supervisory authority may, however, continue to oversee financial companies and control its toolkit, which contains several tools that are also applicable for systemic risk purposes. For such an arrangement to work the central bank must, where necessary, also be able to use the supervisory authority's tools. One way of managing this is to induce the supervisory authority to relate to the central bank's analysis and policy proposals on a "comply or explain" basis. In other words, if the central bank finds that the conditions in the financial system occasion measures that include application of tools over which the supervisory authority has control, the supervisory authority must either implement the measures or explain why these measures do not need to be taken, or – if other measures are taken – why they were more appropriate.

Saying which institutional arrangement is best suited to Sweden would be to pre-empt the government inquiry. One of the overall purposes of the inquiry is to ensure that the regulatory framework is designed so that different types of financial crisis can primarily be mitigated by means of preventive measures. The committee will analyse the division of responsibility and the interaction between the Riksbank, the Swedish National Debt Office, Finansinspektionen and the Government Offices (mainly the Ministry of Finance) and the possible accountability procedures for the authorities and propose necessary improvements. Regardless of what is found to be appropriate in the end, it is important to have accountability procedures. It is also clear that the authorities' current mandate and division of responsibility will need to be changed.

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The Riksbank's monitoring of the Swedish mortgage market – expanded statistics base

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As lending to Swedish households for housing purposes grows, the Riksbank is increasing the resources it allocates to monitoring the housing market in Sweden. As a result, the standards for available statistics and the quality of these statistics have been raised. This report summarizes the statistics developed within the framework for the investigation into the risks on the Swedish housing market. The statistics include an indicator for an inventory of unsold homes, information about how long homes were available for sale and the ratio between the list and sale price. Furthermore, the results from a survey of real estate agents in Sweden are presented.

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1. Introduction

Statistics Sweden (SCB) is responsible for a large portion of the statistics about the Swedish housing market. The statistics reported on SCB's website include, for example, Real Estate Price Index (quarterly) and Real Estate Prices (monthly). SCB also reports statistics of prices for tenant-owned apartments based on transfer prices for tenant-owned apartments. However, these statistics are based on annual data. Because of this, the Riksbank has also used statistics for tenant-owner apartments from Hemnet and Svensk Mäklarstatistik in its analysis of the development of the housing market. These statistics give tenant-owner apartment prices per square meter (rolling three-month moving average) on a monthly basis since January 2002.

At the same time, as lending to Swedish households for housing purposes grows, the Riksbank is increasing the resources it allocates to monitoring the housing market in Sweden. As a result, the standards for available statistics and the quality of these statistics have been raised. One example of this are statistics that can facilitate the analysis of house price fluctuations and risks on the Swedish housing market, including variables that can be interpreted in terms of supply and demand. .

This report presents a brief description of the results of the Riksbank's project to develop new statistics and indicators and proposes further developments for housing market statistics.

2. New statistics for the housing market

New statistics include an inventory of unsold homes, information about how long these homes were available for sale and the ratio between the list and sale price. The data include statistics for both tenant-owner apartments and one- and two-dwelling buildings broken down into the following categories: National, Greater Stockholm, Greater Gothenburg, Greater Malmö and National (excluding the major cities).[1] The statistics are reported both with and without new production.

The Riksbank, in cooperation with The Association of Swedish Real Estate Agents, will also regularly conduct surveys of the real estate agents' expectations regarding the developments on the housing market.

2.1 INVENTORY OF UNSOLD HOMES

In several countries, for example the U.S., statistics about an inventory of unsold homes have been used for a long time as an indicator of the supply on the housing

[1] The geographical borders for Greater Stockholm, Greater Gothenburg and Greater Malmö are based on SCB's definition. National (excluding the major cities) includes all municipalities except the municipalities included in the three major cities specified above.

market.[2] An increased inventory or supply can often be an indicator of pending price contractions on the housing market. In Sweden, Svensk Mäklarsstatistik and Hemnet have together developed statistics that can be used as an indicator for the supply of houses. This data reflects the number of homes (tenant-owned apartments and one- and two-dwelling buildings) that are for sale and is based on advertising data from Hemnet (see charts 1-3). Supply is clearly influenced by significant seasonal fluctuation as demonstrated in charts 1-3. In Greater Stockholm, the seasonal fluctuations appear to be somewhat higher than in the other major cities. The difference in absolute terms, however, is most probably due to the greater number of homes in Stockholm. In addition to the number of homes for sale, the Riksbank also studies how long the houses have been available on the market. For example, charts 4-5 illustrate that considerably more tenant-owned apartments were available for sale for more than 30 days in October 2008 than in both October 2009 and October 2010. The change in time-to-sale distribution appears to be relatively uniform between the major cities and the rest of the country. In general, the number of days an object is available for sale, assuming the number of new objects has not changed too excessively, is used as a rough measurement of the demand for houses. If more apartments are available for a greater number of days, this can be a sign of a pending decline in housing prices when taking seasonal fluctuations into consideration.

2.2 RATIO BETWEEN SALE PRICE AND LIST PRICE

The ratio between the sale price and the list price can also be used as an indicator for the situation on the housing market. This ratio cannot be interpreted as a pure measureof demand since the numerator is affected by the buyers and the denominator by the sellers. However, with some caution, the ratio can be used as a measure of the bidding intensity as well as as an indicator of demand when list prices are assumed to be more sticky. A rising ratio can be interpreted as higher competition between bidders, assuming that the seller did not set too low of a list price. Charts 6-9 show the ratio between the sale price and list price. It is clearly evident that the bidding intensity has been relatively low during the autumn of 2008, when the average sale price was lower than the list price (i.e. the ratio is less than one) for one- and two-dwelling buildings. In addition, the ratio appears to give an earlier indication of the future development of housing prices than compared to SCB's Real Estate Price Index, see chart 9.

Chart 7 also shows that there are also clear regional differences, although there is extremely high covariance between the regions, which can indicate a similar trend for demand across the entire country.

[2] The method used to calculate an inventory of unsold homes can vary between countries.

2.3 MÄKLARINSIKT – A SURVEY OF REAL ESTATE AGENTS ORGANISED BY THE ASSOCIATION OF SWEDISH REAL ESTATE AGENTS

A study of qualitative indicators, for example real estate agents' expectations about the trends on the housing market, can, in addition to the analysis of advertisement data and data on actual house sales, can provide valuable information about developments on the housing market. The Riksbank has therefore established a cooperation with The Association of Swedish Real Estate Agents, which has conducted a long-running survey called Mäklarinsikt that is sent to a large number of real estate agents across the entire country. During the autumn of 2010, the Riksbank, in collaboration with The Association of Swedish Real Estate Agents, surveyed real estate agents about topics related to their expectations with regard to changes to supply and demand on the housing market and price and interest rate levels. During the autumn of 2010 the survey was expanded to also include questions about how Finansinspektionen's recommendation for a loan-to-value ceiling could affect the housing market. The survey thus provided insight into what the real estate agents' expect with regard to both the general price development and how specific factors can affect housing prices, see charts 10 and 11. The charts illustrate that the forecast horizon strongly affects their expectations and that there are regional differences. One such difference is, for example, that the Stockholm and Gothenburg regions have a higher share of agents that believe housing prices will rise in the coming year. In two years, the expectations are more unified across all of the regions. One interesting observation is that real estate agents in Greater Stockholm report the smallest impact on housing prices as a result of the mortgage ceiling.

Chart 12 shows the agents' expectations regarding the level of the variable mortgage rate in one, three and five years for the National category and the three major cities. According to the responses, the expectations for interest rates are similar across the country. Chart 13 shows the breakdown of the agents' expectations regarding the level of the variable mortgage rate in one, three and five years. Both the average interest rate and the distribution of the responses indicates low interest rate expectations for the next few years. In five years the average expected mortgage rate is very close to the historical average for short-term mortgage rates.

3. Summary

With the help of an expanded base of statistics, the Riksbank can deepen its analysis of the Swedish housing market. The analysis of the housing market is expected to require increasingly more data in the future.

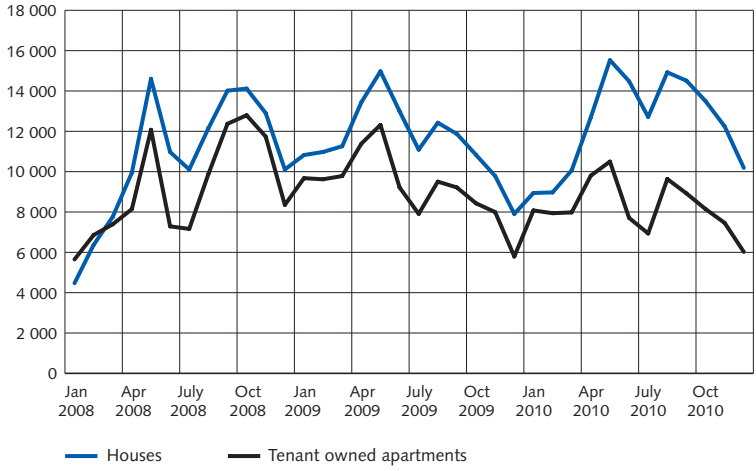
One plausible resource could be the new apartment register that is expected to be completed in 2011.[3] The register can be used to provide information about the development of prices for individual homes. For example, this could be used to create a price index that is based on comparisons of the same home over time. Other qualitative indicators such as surveys directed at private individuals that own or are expected to buy homes could also provide additional information about the situation on the housing market and the households' behaviour when faced with sharp fluctuations in price or changed regulations on the housing market.

[3] The apartment register entails that each person who lives in an apartment building will be registered to the apartment in which they live. According to Statistics Sweden (SCB), they will begin gathering new statistics based on the registers that are formed when the registration is finished.

4. Chart appendix

Chart 1. Number of dwellings (houses and tenant owned apartments) for sale nation wide, excluding new production

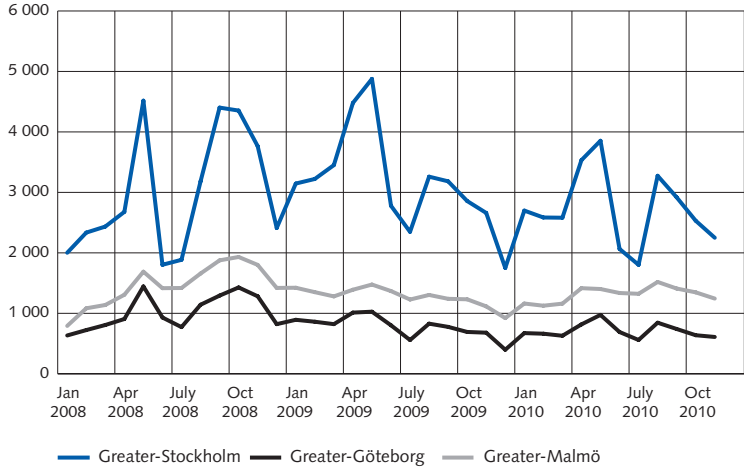
Number



Source: Mäklarstatistik.

Chart 2. Number of dwelllings (tenant-owned apartments) for sale in major cities, excluding new production

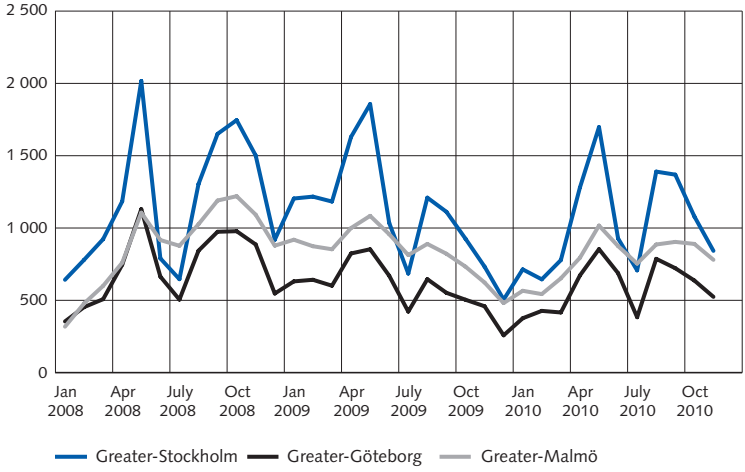
Number



Source: Mäklarstatistik.

Chart 3. Number of dwellings (houses) for sale in major cities, excluding new production

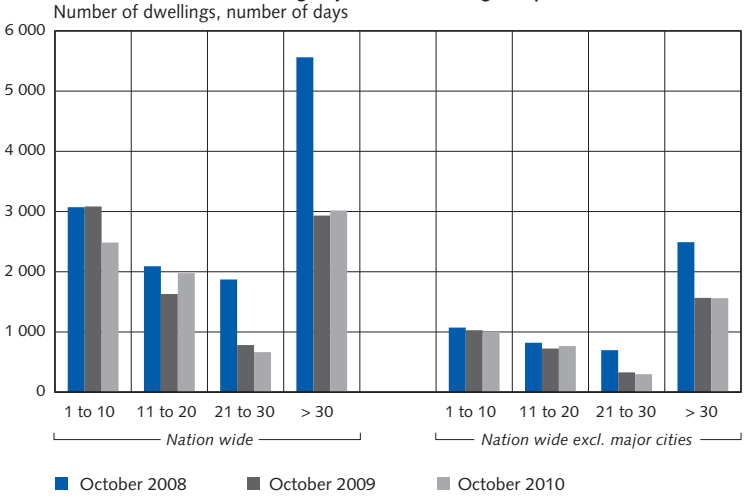
Number



Source: Mäklarstatistik.

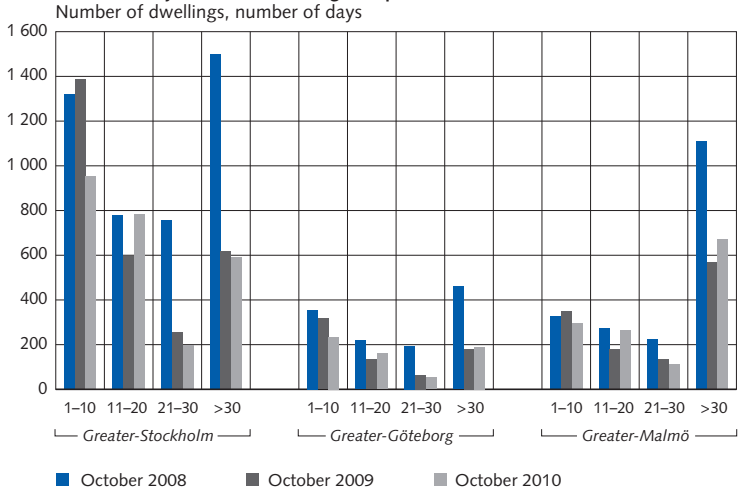
Chart 4. Number of tenant-owner apartments for sale by number of days for sale, nation wide and nation wide excluding major cities, excluding new production

Number of dwellings, number of days



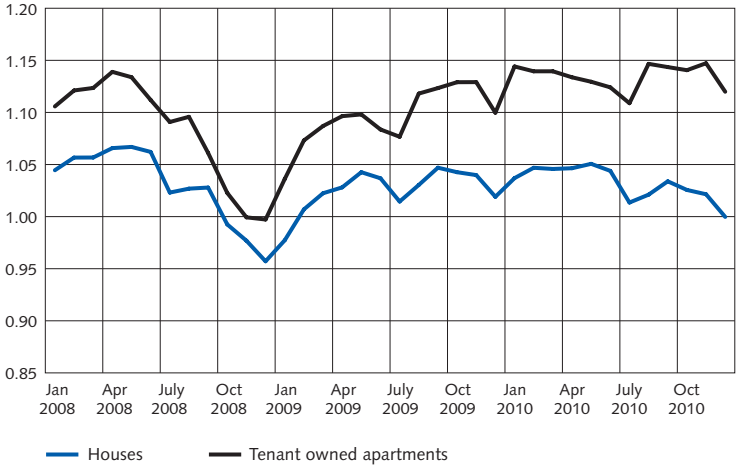
Sources: Mäklarstatistik and Riksbanken.

Chart 5. Number of tenant-owned apartments for sale in three major city areas by number of days for sale, excluding new production
Number of dwellings, number of days



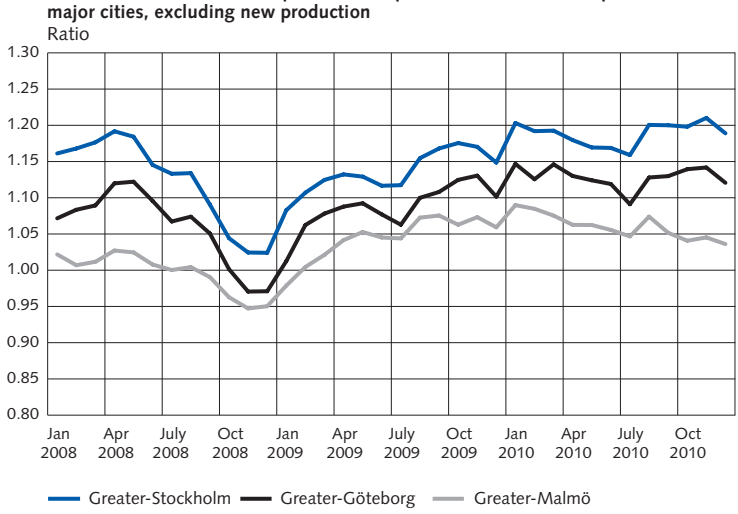
Sources: Mäklarstatistik and the Riksbank.

Chart 6. Ratio between sale price and list price for houses and tenant-owned apartments, nation wide, excluding new production
Ratio



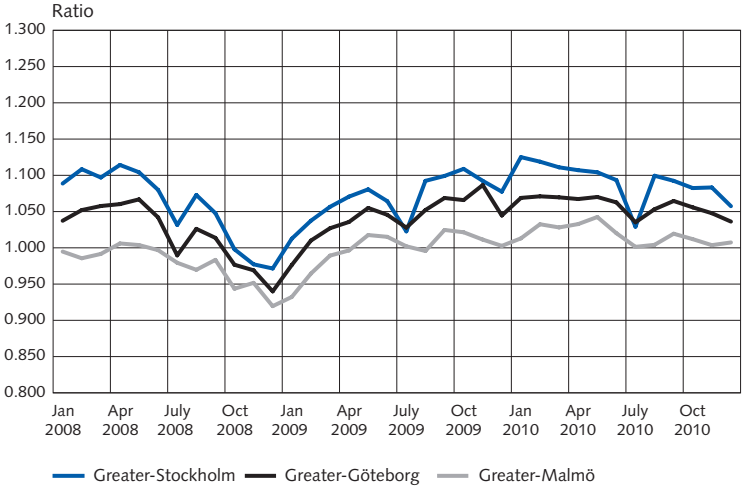
Source: Mäklarstatistik.

Chart 7. Ratio between sale price and list price for tenant-owned apartments in major cities, excluding new production



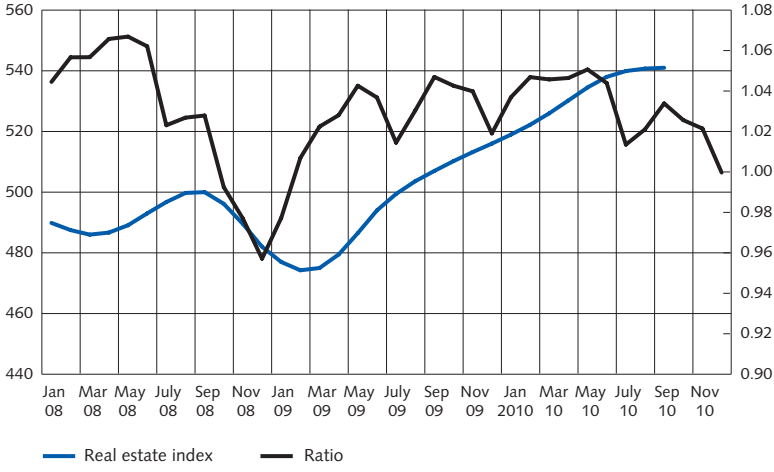
Source: Mäklarstatistik.

Chart 8. Ratio between sale price and list price for houses in major cities, excluding new production



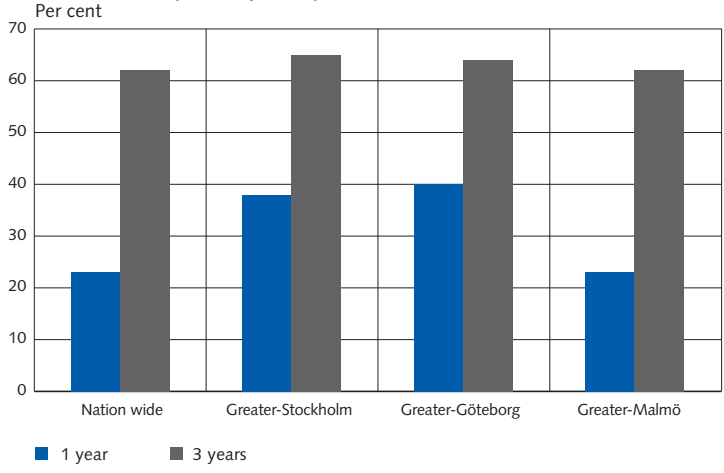
Source: Mäklarstatistik.

Chart 9. Real estate index and ratio between sale price and list price for houses nation wide, excluding new production
Index and ratio



Sources: Mäklarstatistik, Statistics Sweden and the Riksbank.

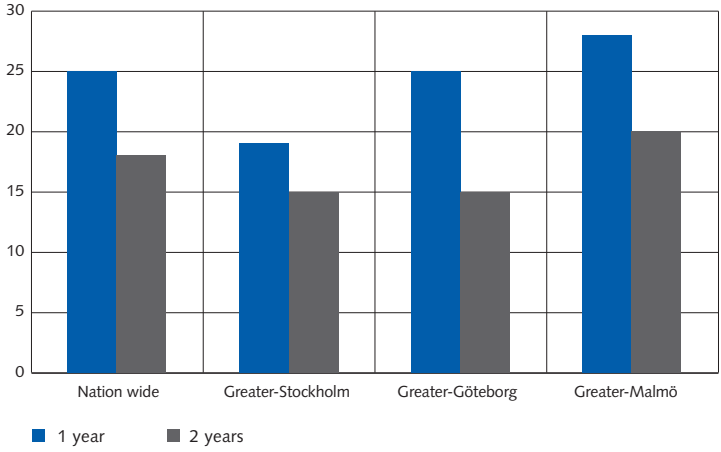
Chart 10. Share of real estate agents who believe in rising sale prices for houses in one and three years respectively
Per cent



Sources: The Riksbank and The Association of Swedish Real Estate Agents' survey, Mäklarinsikt

Chart 11. Share of real estate agents who believe that the loan to value cap will lead to lower sale prices for houses in one to two years time respectively

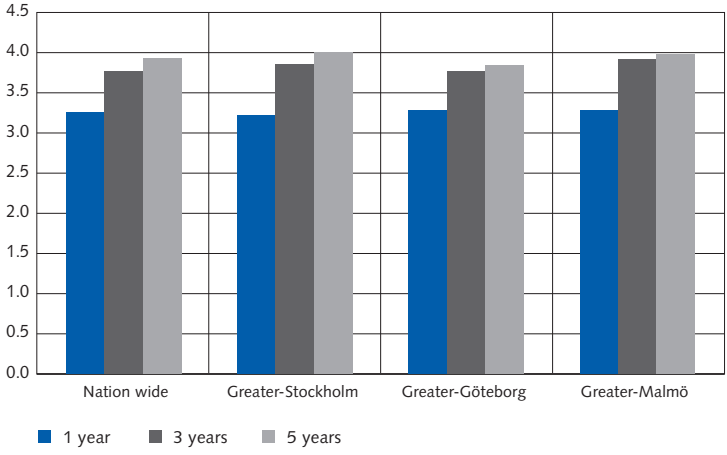
Per cent



Sources: The Riksbank and The Association of Swedish Real Estate Agents' survey, Mäklarinsikt.

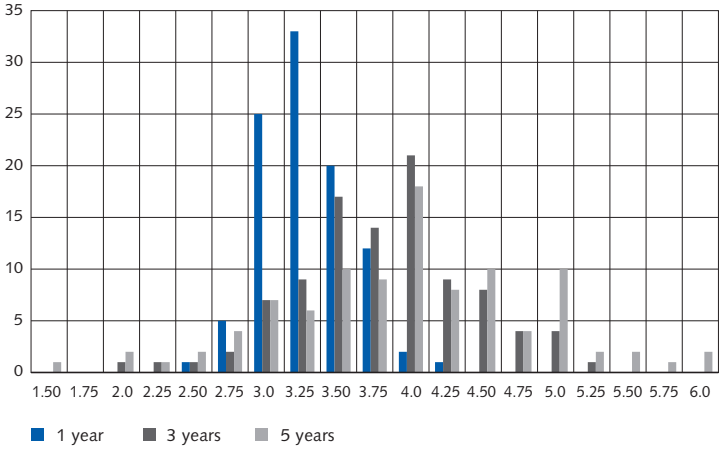
Chart 12. Real estate agents expectations of the average variable mortgage rate in one, three and five years time respectively

Per cent



Sources: The Riksbank and The Association of Swedish Real Estate Agents' survey, Mäklarinsikt.

Chart 13. Distribution of real estate agents expectations of the average variable mortgage rates in one, three and five years time, respectively
Per cent



Sources: The Riksbank and The Association of Swedish Real Estate Agents' survey, Mäklarinsikt.

Commercial property and financial stability

Bo Nordlund and Stellan Lundström*

We have been commissioned and entrusted by the Riksbank to prepare a document intended to serve as a basis on which to develop the commercial property section in the Riksbank's Financial Stability Reports. As part of this work, we have analysed information, information structures and risks relating to the commercial property market from a partly new perspective. One conclusion is that the Riksbank and commercial property players have a common interest in improving access to as well as the quality of the information on which the strategic decisions made by the Riksbank and the market participants is based. Improved information will provide data for more advanced econometric models as well as opportunities to identify early signals of escalating risks in the rental, property, construction and credit markets.

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1 Introduction

BACKGROUND

Financial stability is an important social goal and a key priority in the work of the Riksbank. The reason is that the property sector and its funding can cause instability as well as significant damage to the national economy. Freshest in the memory is the property and banking crisis of 1990-1993 when defaults in the commercial property sector brought the Swedish banking system to the brink of collapse, necessitating bold government action to secure the functioning of the credit system. The most recent financial crisis, which began in the second half of 2008, has so far not led to any significant problems in Sweden's commercial property market. However, there are international examples of how problems linked to the commercial property market have created more negative effects in connection with the most recent financial crisis.

To promote financial stability, the Riksbank needs better data on which to base decisions, mainly in the form of elaborated information on the functioning of the commercial property sector, e.g. how property valuations are handled, and improved analysis models. Direct players in the property industry – primarily investors and lenders – have much to gain from better information about the functioning of the property sector.

PURPOSE

The purpose of this report is to

- provide a more detailed definition of the concept of commercial property
- present a conceptual model for the function of the commercial property sector that can be used as a basis for information gathering and analysis models
- illumine and analyse risks associated with the development of the commercial property market and its potential impact on financial stability
- briefly describe developments in Sweden's commercial property market, including the performance of property companies with regard to the market value of their underlying property assets and debt levels
- illumine how institutional factors can affect rents and property prices, thus having an impact on financial stability
- describe whether, in addition to the information currently used by the Riksbank, there exist information or indicators that are able to identify at an early stage risks which depend on funding structures, the refinancing of bank loans and debt levels related to price trends for property

- illumine institutional relationships and various measures that are applied internationally to prevent build-up of risks in the commercial property market
- evaluate the Riksbank's analysis of the commercial property market from the vantage point of the analysis made in the Financial Stability Reports (2009:1-2010:1) and to provide recommendations on which parts of the analysis should be deepened or performed differently

METHOD

In preparing this report, we have compiled existing literature, conducted interviews with key individuals and performed analyses based on our own experience of the market, valuations and financial analysis. Throughout, our work has focused on those circumstances in the Swedish commercial property sector which have the potential to affect financial stability.

Readers interested in a more general overview of the commercial property sector in Sweden can read *Kommersiella fastigheter i samhällsbyggandet,* Lind & Lundström (2009). Those looking for a direct discussion of risks to financial stability linked to commercial property can read Congressional Oversight Report, February 10, 2010: *Commercial Real Estate Losses and the Risk to Financial Stability.*

STRUCTURE OF THE REPORT

The report is divided into six chapters. After this introduction (Chapter 1) a conceptual model for the relationship between, on the one hand, growth and interest rates and, on the other, the rental market, property market and construction market is presented in Chapter 2.

Chapter 3 is devoted to the valuation of property, in particular the issue of how inadequate valuation data can create uncertainty about estimated values.

In Chapter 4 we discuss which risks are associated with the funding of property and how the commercial property sector can affect financial stability.

The fifth chapter addresses the issue of how various forms of institutional rules can affect financial stability.

The report is concluded in Chapter 6 with a set of conclusions and recommendations on how the data used in preparing the Riksbank's Financial Stability Reports could be improved.

THE CONCEPT OF COMMERCIAL PROPERTY

In this report we limit the concept of commercial property to properties that are not private homes in the form of single-family homes or apartments in tenant-owner's associations and that can normally be bought and sold in the property market. The meaning of the concept of commercial property can vary depending on the

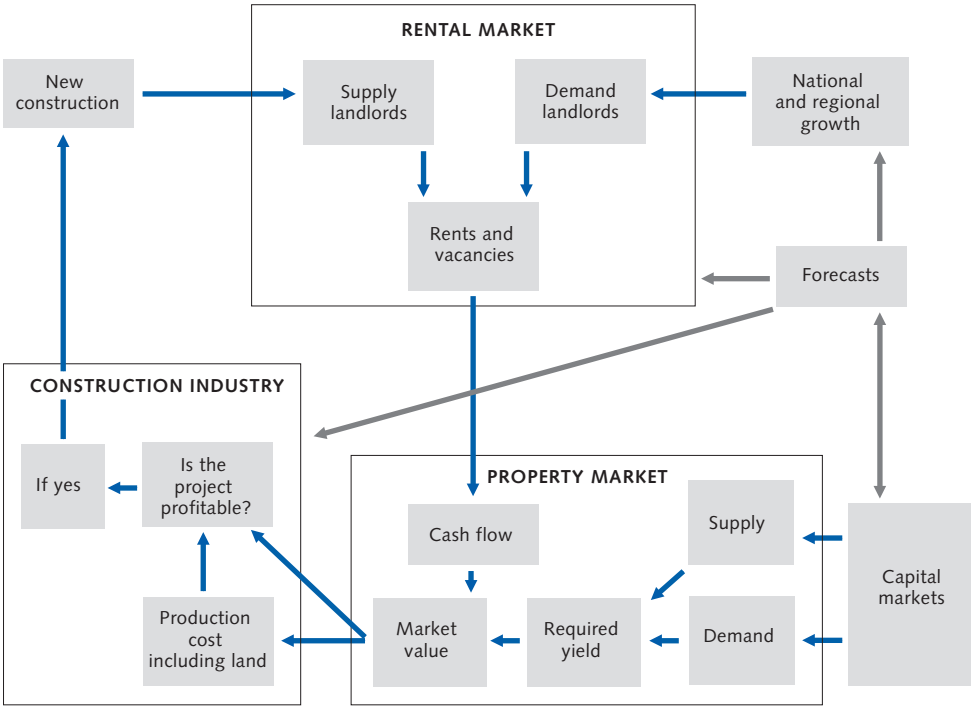
purpose of the analyses. Our purpose is to discuss how economic conditions tied to commercial property can have an impact on financial stability. We have therefore excluded private homes from the analysis.

2 Relationships among the different parts of the property market

A CONCEPTUAL MODEL

The purpose of the conceptual model is to create a framework for the information and analyses presented in the subsequent sections. The model is shown in figure 1, and is primarily associated with Geltner & Miller et al. (2007).

Figure 1. A model showing how growth and capital markets relate to the rental, property and construction markets.



The model mainly reflects the fact that the rental market, capital market, property market and construction market are linked to each other, and that the driving force is created by economic growth in combination with required yields in capital markets. The model shows that the rental market is affected by new construction, which in turn is affected by the construction industry. The construction industry makes decisions on new building projects based on information from the property

market and forecasts. The property market is affected by required yields in capital markets and rents and vacancy levels in the rental market. It is this interaction among growth, the capital market, the rental market, the property market and the construction market that gives rise to various business and financial risks.

THE DIVIDING-UP AND PROFESSIONALIZATION OF THE PROPERTY SECTOR

The first big growth phase in the Swedish commercial property sector took place in the 1970s and 1980s. The property market grew on the back of the rapid expansion of the service sector and a gradual shift in ownership. The most striking development was that the "builder-owner tradition", where the builder would own, manage and in some cases also use a property, gradually weakened and gave way to a more financial view of ownership. This paved the way for a professional rental market and a more liquid property market. The interplay among the various parts of the property sector shown in the conceptual model was thus established at this time.

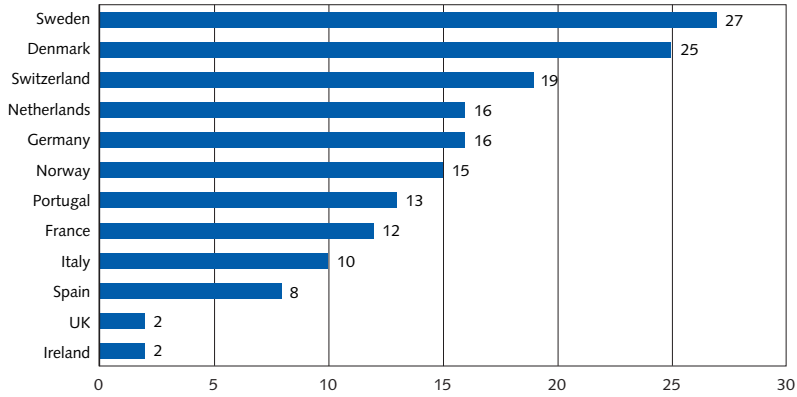
This process of restructuring continued into the 1990s, resulting in an increasing degree of separation of ownership, management, construction and use. In the 1990s this functional division and professionalization also gave rise to the emergence of a consultant industry with international links, reflecting the increasingly borderless nature of the commercial property market and its integration into global capital markets.

Property has gradually come to be regarded as a legitimate commodity, which has also strengthened the link to and impact of the capital market. In some respects the property sector has come to resemble other sectors in society. In the 1970s trading in commercial property was regarded as speculation. This can be seen in the Swedish Rental Property Acquisitions Act (1975:1132), which was repealed in 2010. The Act reflects a zeitgeist and a view of the property market which seem alien today.

THE RENTAL MARKET

The Swedish rental market differs from the European rental market in the sense that rental agreements are structured in a way that is in some respects unique to Sweden. In Swedish commercial rental agreements the rent is a total rent, which means that the property owner provides and receives payment for the operation and maintenance of the property. In principle, under a British rental agreement, the owner provides a capital while the tenant is responsible for operation and maintenance, see figure 2.

Figure 2. Operating and maintenance costs as a share of gross rents in 12 European countries in 2005.



Source: IPD.

The average term of a Swedish office rental agreement is 4-5 years while the average British rental agreement is twice as long. British rental agreements have become considerably shorter over the past 20 years. However, the British model has a set of integrated checkpoints, known as rent reviews, where rents are adjusted to prevailing market conditions during the term of the agreement.

A Swedish rental agreement also has a few other particular characteristics. The most obvious is that a majority of agreements, with the exception of those for shopping centres and hotels, are formulated based on a standard template produced by the Swedish Property Federation. Rent adjustments in standard agreements are often tied to changes in consumer prices. The rationale behind this is partly to protect rents against inflation. However, in recent years there has been a tendency to link rent adjustments to short-term interest rates rather than consumer prices. The reason for this is the low level of inflation coupled with the fact that property owners use short-term funding. Another effect is that changes in rents have been tied more closely to the Riksbank's monetary policy decisions.

The rental market's impact on the property market

The rental market determines the development of the property market, as shown in figure 1. It is often said that "the rental market is the mother of the property market". Economic growth leads to higher rents and affects lease terms and conditions and vacancies, i.e. how large a portion of the space has not been let. As the model in figure 1 shows, the market value of property is determined essentially by cash flow expectations (rent flows) combined with a required yield.

The commercial rental market vs. the residential rental market

Residential property has over the past 20 years displayed greater stability in terms of rents, property prices and returns than offices, retail space, hotels, etc. The main reason for this is that residential rents are set through a collective bargaining system which in recent years has been influenced by a mix of cost and market thinking. This approach has created stability in the rental market, which has meant that nominal rent reductions have generally not been applied. The stability is also affected by the fact that residential property is a form of necessity good and that new construction has not led to increased vacancies, as in the 1980s.

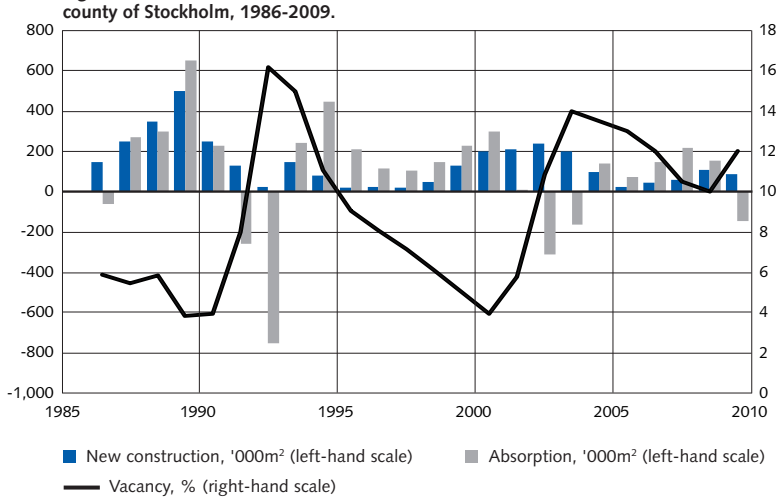
The fact that residential rents are increasing in fast-growing localities can be explained by the fact that rents in these areas were previously below market levels. In smaller localities with a declining population increases in rent are partially explained by the fact that property companies have taken various measures to reduce the supply of housing. Another factor is that the municipal housing companies have had a large market share and have been able to keep rents high through their leading role in setting rents.

The stability of rents has also, somewhat surprisingly perhaps, had the effect that total returns over the last 10 years have on average been higher for residential rental property than for other types of property in the investor market. This can be explained by the fact that rents in fast-growing localities have generally been deemed to be below market levels and that a large portion of the increase in property prices is due to the option of changing the form of tenure from tenancy to tenant-ownership.

THE CONSTRUCTION MARKET

For the construction market the chief criterion for determining whether to build a new property is that the market value of the property exceeds the cost of producing it. Another way of expressing this is that construction begins when the ratio of market value to production cost exceeds 1 (Tobin's $q > 1$). But the planning and building process is often protracted, which means that it can take several years from starting shot to turnkey building. Because of this, new builds often hit the market when growth rates and economic activity are falling, which in turn further increases vacancies and pushes down rents. This is illustrated in figure 3.

Figure 3. New construction and lets, net (m²) and vacancies (%), for offices in the county of Stockholm, 1986-2009.



Source: DTZ Sweden AB.

The figure shows, for instance, the significant volume of new construction in the late 1980s and how this volume was let out up to the year 1990. Two years after that about 800,000 square metres of office space was vacated in the county of Stockholm, pushing vacancy levels sharply higher. However, office premises started to be filled again as early as 1993, while new construction got going again only towards the end of the 1990s.

THE PROPERTY MARKET

A useful concept in this context is the investor market, which essentially comprises the markets for office, retail and hotel premises. Lind and Lundström (2009) also include some property owned by industry and by central and local government, primarily the municipal housing companies. However, they do not include farm properties and specialised properties used for electrical generation, for instance. According to Lind and Lundström, the investor market has a market value in the region of SEK 1,000 billion.

Investment properties are owned primarily by four different categories of owner, each of which holds roughly one quarter of the total. These are listed (public) property companies, private individuals and businesses, Swedish institutions and foreign investors.

The SEK 1,000 billion market value should be set against private residential property in the form of single-family homes and tenant-owner apartments, which have a market value of about SEK 5,000 billion. Another way of illumining these figures is to look at banks' credit exposures to different types of borrower, such as

property companies. According to the Riksbank's Financial Stability Report 2010:2, lending to property companies accounts for about 16 per cent of the Swedish banking groups' total lending. It is also interesting to note that 50 per cent of the total value of commercial property in Sweden is located in the county of Stockholm while the counties of Skåne and Västra Götaland together account for about 25 per cent of the value. The investor market is thus essentially a metropolitan market.

Out of the total investor market value of SEK 1,000 billion an estimated 55 per cent refers to offices, 20 per cent to retail premises, 10 per cent to rental apartment buildings, 10 per cent to industrial properties and 5 per cent to hotels. The market for these property types follows certain common patterns but can also display significant differences in terms of commercial logic and cyclicality.

The property owners

Looking at the owners of all types of income-generating rental properties in Stockholm, it is immediately apparent that the public sector and institutional owners are by far the dominant players.[1] In descending order of owned floor space, the ownership structure is as follows: Svenska Bostäder, Stockholmshem, Familjebostäder, Vasakronan, Micasa, Fabege, Akademiska Hus, Stockholms Kooperativa Bostadsförening (SKB), AMF Pension and AFA Fastigheter.

One conclusion is that the largest owners in Stockholm can be regarded as financially stable. Four of the ten largest owners – Vasakronan, Fabege, AMF and AFA – operate in the investment market.

Malmö has a different ownership structure than Stockholm, with a stronger presence of privately owned firms. Stena fastigheter, ACTA, Akelius, Heimstaden and Ulla Åberg are privately owned. Three companies are listed: Wihlborgs, Dagon and Castellum. The largest is municipally owned MKB, and Vasakronan, which is owned by pension funds, also has a large holding. Gothenburg occupies a middle ground with three entirely dominant municipal housing companies.

The size of the market

Transaction volumes in the commercial property market have varied strongly over the past ten years, see figure 4 below.

1 Sources: DTZ Sweden AB and Bygganalys AB.

Figure 4. Transaction volumes in SEKbn in the Swedish commercial property market in 2000-2010 broken down by Swedish and international investors.

Source: DTZ Sweden AB.

The figure shows that transaction volumes doubled between 2003 and 2008 and then dropped sharply in 2009. The county of Stockholm dominates the market with approximately 50 per cent of the capital and turnover.

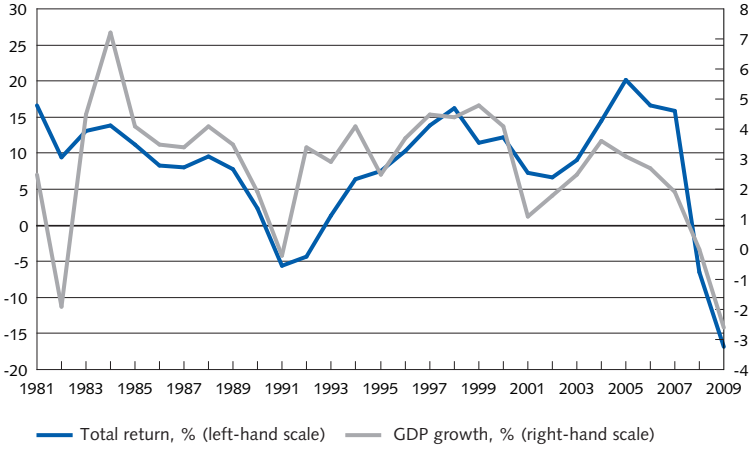
The average annual transaction volume in Sweden's commercial property market is about SEK 100 billion, representing a turnover of 10 per cent. Out of the total figure, the ten largest transactions account for a third. By comparison, the Swedish market for single-family homes and tenant-owner apartments has an annual turnover of about SEK 200 billion.

NATIONAL AND REGIONAL GROWTH

Economic growth is the single most important factor affecting trends in rents, property prices and construction activity. Empirical surveys of the commercial property market[2] show that most of the variation in total returns and capital appreciation, in some cases over 70 per cent, can be explained by variations in economic growth. The relationship between growth and return on total capital for commercial property in the US is illustrated by a longer series in figure 5. Similar relationships exist in most countries, including Sweden.

2 Most surveys have been conducted by property consulting firms and show essentially the same level of correlation as in figure 5.

Figure 5. Changes in growth and return on total capital for commercial property in the US, 1981-2009.

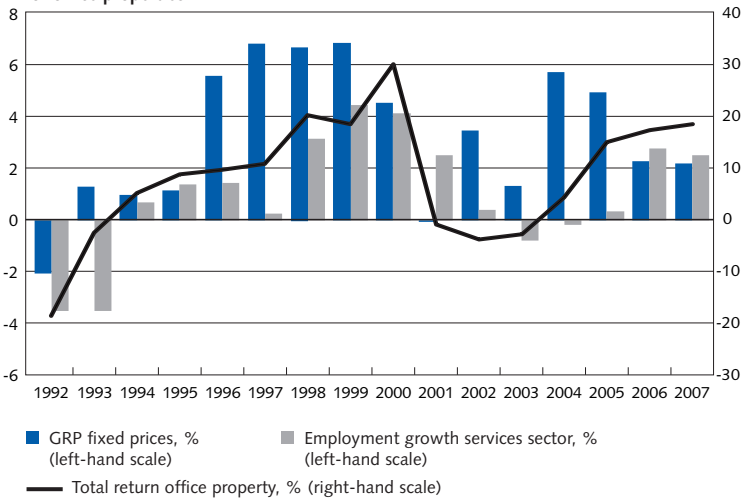


Source: IPD.

It is also becoming increasingly clear that growth varies regionally and locally. In Sweden this means that the metropolitan areas offer significantly higher returns as well as greater variations in returns than county towns and local centres. The variation over time in the metropolitan areas is a consequence of high economic activity coupled with large gaps in time between decisions in the rental, property and construction markets. After the developers have made their decisions it can take a few years before the new commercial premises are ready to be let in the rental market due to the protracted planning and building process. The decision to build may have been made during an economic upswing while the new premises will reach the market during a downturn, which increases variations in returns on property investments.

The impact of economic growth on returns from commercial property is illustrated in figure 6. Here growth is expressed as gross regional product (GRP, "local GDP") and employment growth in the service sector in Stockholm. The return is measured for office properties.

Figure 6. Changes in gross regional product (GRP) in 1992-2007 for Stockholm, service sector growth for the same area and time in relation to annual total return for office properties.



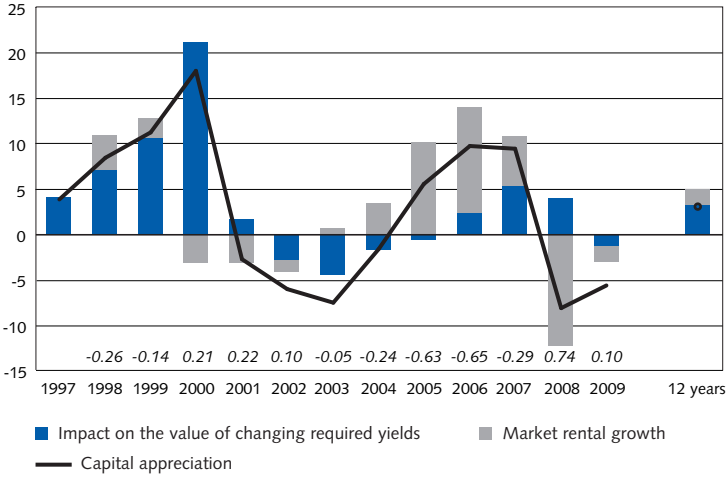
Source: DTZ Sweden AB.

The figure shows that the sharp acceleration of growth and employment up to 2000 resulted in a significant increase in returns. Likewise, the low growth rate after the IT boom in 2000 resulted in negative returns for offices, retail premises and hotels, but not for residential rental properties.

As shown above, returns in the commercial property market – capital appreciation and yield (net operating income levels) – are affected by local as well as regional and global economic growth. Conversely, the crisis in 1990-1993 shows that conditions in the property sector can affect the financial system as well as the real economy, and ultimately growth. A more recent example of this is the property and financial crisis in the Baltic States.

Changes in market value (capital appreciation) are generated mainly through the interaction between cash flow (rental growth) and a required yield, which is formulated in the capital market. The biggest impact on capital appreciation occurs when rents are expected to fall while required yields are increasing, see figure 7.

Figure 7. Impact of rental growth and changes in required yields ("yield shift") on capital appreciation for office properties in central Stockholm.



Note. Change in required yield, %, in italics.

Source: IPD Svenskt Fastighetsindex.

From 2000-2002 required yields increased while market rents fell. This resulted in negative capital growth from 2001 to 2004. Conversely, required yields declined from 2003 to 2007 while rents increased, resulting in rapid capital appreciation. This means that the value of property assets is positively affected both by a decline in required yields and by rising rents.[3]

3 Valuation of properties

The valuation of a portfolio of properties is based on the flow in the form of transactions. A recurring question in this context is how representative the properties in the flow are for the portfolio as a whole. The problem becomes particularly evident when turnover falls to extremely low levels, as in 2009. Other significant factors in this context are that each property is more or less unique and that the characteristics of the portfolio are not known in all details. In theory, different characteristics could be taken into account in an econometric model, but this assumes that several characteristics of the flow as well as the portfolio are known.

3 Chapter 3, under the heading "Calculating yield as part of the valuation", provides a more general discussion of required yields in the property market based on expectations of real interest rates, risks and net operating income.

CALCULATING THE VALUE OF RENTAL AGREEMENTS

The key parameter for a valuation is the rental agreement. Simply put, the value of a property could be defined as the "present value of the rental agreements". However, there is no official source for the characteristics of rental agreements.

In an extreme case the dearth of information about these characteristics can result in an incorrect valuation for the entire portfolio. A more probable outcome of the lack of information, however, is that high-yield properties are undervalued while low-yield properties are overvalued.

There are also several uncertainties concerning how the value of rental agreements should be calculated. In the standard Swedish contract for commercial premises property tax is charged separately from rent. This means that the definition of market rent does not include property tax. In central Stockholm the annual property tax can be as high as SEK 400 per square metre. From the property owner's perspective property tax is equivalent to value-added tax – the end customer pays. From the tenant's perspective property tax is a very real cost. These differing perspectives can lead to misunderstandings about the effective rent for the premises.

The commercial rental market in the metropolitan areas, primarily Stockholm, is dominated by a number of large and very stable property owners. This creates resistance to any downward movement in rents. The incentives to lower rents in a downturn are small, as lower rents affect the whole market. By means of various discounts property owners can maintain an officially high rent level while holding down vacancies. For instance, many contracts contain clauses on rent-free months and graduated rents. These openly described clauses and any applicable real options are manageable when it comes to calculating the effective rent. What is more difficult to access and value are any ancillary agreements providing for the upgrading of premises or arrangements where the lease terms form part of a wider business deal. These types of hidden terms and conditions make it harder to assess the effective rent and also complicate the valuation and pricing of the properties. As it is difficult to observe certain fundamentally important parameters which form part of a property valuation, a degree of uncertainty can arise about whether market prices at any given time reflect rationally set equilibrium prices.

PROPERTY VALUATION METHODS

A property's market value is defined at a certain point in time. The assessment is valid at the date of value but gives no explicit indication about future capital appreciation or the risk of a fall in value. Formally, almost 100 per cent of all valuations of commercial property are based on a procedure involving the discounting of estimated future cash flows. However, it is unclear which valuation

method is actually applied in this procedure.[4] Forecasts for rents, operation, maintenance and reinvestment are to a large extent based on the use of flat-rate methods and follow a form of industry standard.

The valuers tend to smooth out sharp fluctuations in value in the market ("valuation smoothing"). They also tend to lag the market in their assessments of value ("lagging"). These two characteristics of property valuations create problems when investors, employing their own portfolio models, seek to determine how much portfolio capital should be allocated to different asset classes, including property, equities and bonds. A lot of research, e.g. Geltner (1991), has been conducted to eliminate the impact of the valuations on the yield figures used in the portfolio models.

BANK VALUATIONS FOR CREDIT ASSESSMENTS

When banks offer credit for properties and property companies they make a number of qualitative as well as quantitative assessments. The qualitative assessments often centre on the owners of the property company or those who control the company structure while the quantitative assessments focus chiefly on the borrower's cash flow and ability to repay the loan. The assessment of the collateral is also important, of course, but it is secondary. The assessment of the borrower's financial position is another key factor (loan-to-value ratios, solidity, etc.) This focus on cash flow suggests that it is the analyses of the rental market that are crucial to the assessments of financial stability.

The assessment of the collateral is based on the amount of the loan relative to the market value of the properties. Normally, the maximum loan-to-value ratio is 60-75 per cent. Higher ratios do occur, primarily for residential rental properties which experience suggests have more stable market values than offices, retail premises and hotels.

Property valuations for lending purposes are largely performed using internal valuation experts, i.e. employees of the banks, but external valuation consultants are also used. Internal valuers generally go through some form of internal certification process at the bank. The banks' expertise in property finance and valuation is generally of a considerably higher standard today than at the end of the 1980s.

The banks' valuation methods comprise both sales comparison methods (analysis of transactions in the market) as well as cash flow and yield estimates. The methods used can also vary from one bank to another. Banks commonly have access to contract information for rents and often make inspection-like reviews of the properties to assess their maintenance status and reinvestment needs. Assessments

4 See, for instance, the discussions in Lind & Nordlund, 2010.

of required yields are made using market systems like Datscha[5] and Svefa as well as on the basis of the banks' own transaction analyses.

It is not common for banks to compare an estimated market value with other information sources, such as reference values or trends in implied[6] values derived from listed property shares.

The lack of information in the property market leads to uncertainty. As it is unclear whether the property market can function effectively and in a fully rational manner, it is also somewhat debatable whether the prices obtained in transactions in the property market at any given time reflect rationally set equilibrium prices. This, in turn, creates uncertainty about whether those market prices which can be assessed on the basis of transaction market and other data are sufficient to enable the lender to assess the security for its loans. A risk that can arise in this context is that transaction prices, which in turn constitute essential input data for property valuations, will be too high in relation to what would be motivated over the long term if one had access to all relevant information.

In many cases assessments of future repayment ability are, as regards macro factors, based on the bank's own forecasts for inflation, interest rates, economic growth and other factors. For individual properties banks also adapt their scenarios for trends in rents and vacancies based on the type of property and its geographic location.

CALCULATING YIELDS AS PART OF THE VALUATION

Analyses based on material from the Swedish Property Index show that the required yield applied in property valuations generally exceeds the actual yield. This difference is due to the fact that valuers generally make optimistic assumptions about operation and maintenance costs as well as future vacancy levels. The result is that they overestimate net operating income, which in the valuation is offset by a relatively high required yield. This means that the end result – the market value – will be "correct". For an outside observer – investor or lender – faith in the input data used in the estimates can involve a risk, however, especially when the interest coverage ratio turns out to be lower than expected.

Many aspects of the analyses used for various types of property transactions are based on the concepts of yield and required yield. In a formal sense, many of the analyses made in connection with acquisitions are based on detailed cash flow analyses, but for analyses at a general level a simpler model can be applied.

5 See also Chapter 6 – Conclusions, where we provide a brief description of Datscha.

6 Implied value is calculated, somewhat simplified, by adding the market capitalisation of a listed property company to the market value of the company's total liabilities in order to identify the equity and liabilities side of the balance sheet. An assessment is then made of the market value of all other assets that are not property assets. Finally, the property value is determined by balancing the assets side of the balance sheet with the equity and liabilities side.

This simple model, which involves a valuation by capitalisation in perpetuity (the Gordon model), has a widespread application for valuations of properties as well as businesses.

$$V = \frac{(H - D - U)_1}{p - g}; \qquad p - g = \frac{(H - D - U)_1}{V}$$

V is the present value of a perpetual and exponentially growing income stream, in this case the net operating income *(H-D-U, rent minus operation and maintenance),* which is discounted to the present using the cost of capital, p per cent, less the expected growth rate for net operating income, g per cent. In this context the p-g factor constitutes the required yield.

As shown above, the required yield could be said to consist of three main elements:

- an expected real rate of interest
- a risk premium – including business risk and liquidity risk
- an expectation for growth in net operating income – positive or negative[7]

Growth in net operating income could be said to consist of two factors: a component reflecting the aging of functions of the building and a change – generally growth – in the economic base. In a city like Stockholm the value of the land (the value of the development rights) can make up as much as 80 per cent of the total market value of a property. The value of the building represents the remaining 20 per cent. In smaller localities the value ratio can be the reverse. This creates different yield effects for capital appreciation and unmodernised premises, respectively.

The following is an attempt to conduct a more theoretical discussion on what constitutes a "normal" required yield for office and retail premises in central Stockholm:

We assume that the ex ante risk-free real interest rate is 2-3 per cent and that the business risk premium – mainly vacancy risks, technical risks and liquidity risks – in prime office locations is 2-3 per cent. This risk-adjusted yield is thus 4-6 per cent. For a property that is not subject to investments the expected growth in net operating income can be estimated at minus 2-3 per cent.[8]. The reason for the expected negative growth in net operating income is the aging of the building capital. Maintenance costs and vacancies will increase. The aging can be offset by growth in the economic base, which has a positive impact on rent levels and can in

7 See also the discussion in Baum, 1997, which describes how this aspect can be linked to the yield formula based on real price studies for office properties in London.

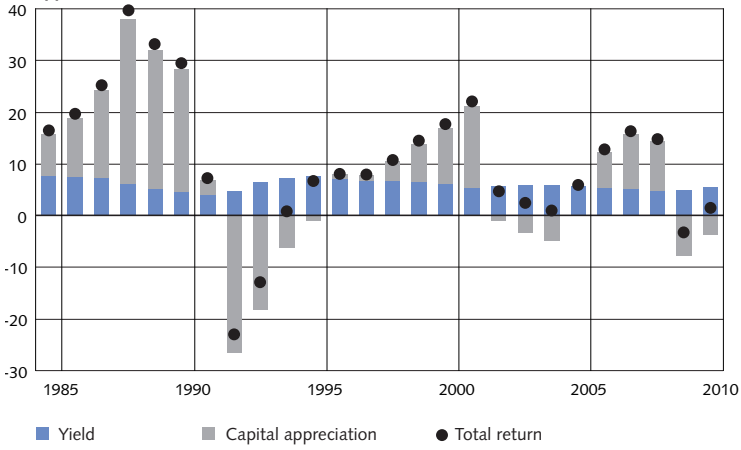
8 See, inter alia, Baum, 1997. See also the results relating to property and building depreciation described in Bejrum, 1995.

turn make it easier to achieve profitability on investments aimed at renewing the building capital, e.g. modernisation.

From the above discussion it is possible to draw a general conclusion concerning required yields for office buildings in prime office locations in Stockholm: Required yields that have fallen to 4-5 per cent are based on assumptions about future net operating income and risk levels that are often not sustainable over the long term.

In this context it is interesting to study how yields and capital appreciation (i.e. the total return) have varied over a longer period of time. This is shown in figure 8.

Figure 8. Return on total capital in 1984-2009 broken down by yield and capital appreciation.



Source: IPD Svenskt Fastighetsindex.

It is immediately evident that yields, with the exception of the period around 1990, have remained relatively stable while the halving of yields, from 8 to 4 per cent, between 1984 and 1990 was not sustainable over the long term. Total returns vary sharply due to sharp fluctuations in capital appreciation. This is typical for a market where there are long gaps between growth signals and the completion of new builds.

The figure also shows that the long-term yield accounts for two thirds of the total return. An average yield of 6 per cent thus implies a nominal total return of 9.8 per cent over 26 years. This means that it is important to pay attention to whether the increase in the total return is attributable only to the capital appreciation component of the total return, i.e. whether the market values of properties are increasing without a corresponding growth in underlying cash flows. In this case there is a risk that expectations of capital appreciation may not be realised, which can lead to future downward adjustments of property values.

In some cases it is thus difficult to "extract" the market's required yields for specific properties. An undesired side-effect of excessively optimistic assumptions

in yield-based estimates can be that the valuations of certain properties will be too high. This, in turn, can result in "locking-in effects" due to the fact that the properties cannot be sold in the market at the prices estimated in the valuations.

Overall, these difficulties create uncertainty about the market values of properties that do not change hands in the market. This, in turn, creates uncertainty about property companies' "real" financial positions when studying the market valuations of their properties in their balance sheets.

VARIATIONS IN MARKET VALUES IN METROPOLITAN AREAS

Figure 8 shows sharp variations in capital appreciation in 1984-2009 for the properties included in the Swedish Property Index. The sharp variation in capital appreciation shown is a phenomenon typical to metropolitan areas. An office property in the central areas of Stockholm, for instance, can be valued at SEK 80,000 per square metre. Out of these SEK 80,000, the value of the land (the value of the development rights) accounts for about SEK 60,000. The SEK 60,000 level is determined by the value of the land for the best alternative use, which may differ from the actual use. In a growing city like Stockholm centrally located development rights should increase in value over the long term. The value of development rights may be expected to fluctuate sharply depending on economic conditions, however, and in line with the property cycle illustrated in figure 8. In the above example the value of the building is SEK 20,000. This is because the building quickly becomes outdated in a growing city, and because of depreciation.

The conclusions for investors and lenders, as well as for the Riksbank, can be summarised as follows:

- Market values in the metropolitan areas (chiefly Stockholm) will vary significantly over time, requiring that investors have a strong equity position.
- The building capital ages rapidly, requiring that any second, unsecured mortgages be repaid quickly, especially in a low-inflation environment.

4 The impact of the property industry on financial stability

THE INTERACTION BETWEEN GROWTH AND MARKET VALUES

Figures 5-8 illustrate the cyclicality of the market for commercial property in the metropolitan areas, i.e. how various rents, vacancies, yields and other value drivers ultimately affect the market values of properties. The cyclical and protracted processes can be explained by the high transaction costs involved in adapting premises to changing tenant requirements, the complexity of the planning and building process and what are for most market players hard-to-assess risks linked to the construction and sale of properties. There are also underlying market risks,

which can affect the stability of the financial system. Other risks that need to be taken into account are risks relating to individual properties, especially those linked to market position and technical condition, i.e. the risk that the property owner will face an unforeseen need to pay for extensive maintenance or reinvestment measures. However, these specific risks are rarely systemic.

Often, changes in market values of properties are used as an indicator that financial stability may be affected. Yet market values could be seen as a product rather than an indicator. They are the product of a process where economic growth and required yields in capital markets drive a complex interaction among the rental, property and construction markets. It is therefore to these markets that we need to look to find early signals of risks to financial stability, coupled with analyses of growth and required yields.

The conceptual model in figure 1 is based on the assumption that there exist stable causal relationships in the interaction among macroeconomic factors (chiefly GDP and the cost of capital) and the various markets. However, the problem is that different factors affect growth at different times. This means that growth, in turn, affects the property sector in different ways. The latter circumstance can be illustrated by the fact that many believed the negative trend in GDP in 2008-2009 would affect the service sector in Stockholm, and that this would push up vacancies and depress rents in the office sector. With the benefit of hindsight, it is clear that there has been no marked effect of this type.

Another problem, and a core issue linked to financial stability, is that the "natural variations" in the model described above can shift and eventually "work in reverse", i.e. that growth in the economy can be affected by conditions in the property market.

One further dimension, which is not addressed explicitly in the analysis model, concerns the effects of changed institutional regulations. It is clear that the property and banking crisis of 1990-1993 was to a large extent affected by a large number of institutional changes, each of which was logical in isolation but which jointly had an unexpectedly strong impact on the property market and financial system. The financial system was strongly affected by the deregulation of the currency and credit markets coupled with the radical overhaul of the tax system and the abolition of the previously generous interest subsidies for housing construction. No equivalent regulatory changes are being implemented in the Swedish market today. The commercial property sector is now more affected by global regulatory changes, including new accounting rules (IFRS) and capital adequacy rules (Basel III).

THE CAUSES AND PROGRESSION OF PROPERTY CRISES

Figures 5-8 illustrate that there exist empirical relationships between the markets and activities described in the conceptual model in figure 1. However, the

relationships are not unequivocal and they vary over time. Some sequences of events could be called normal while others, such as the train of events that took place in the early 1980s, paved the way for the financial crisis between 1990 and 1993. In this case, relationships within and between the banking and property sectors were strong driving factors. It may therefore be relevant to take a closer look at which particular developments lead to crises, and what role commercial property plays in the course of a crisis.

Retrospectively, the 1990s crisis can partly be put down to the fact that Swedish investors had in the late 1980s ventured into other parts of Europe to invest in property, along with Swedish banks and Swedish advisers and valuers. The consequences are well known: major economic losses and problems for the banks. Since the late 1990s the capital flows have turned, and in the first few years of the twenty-first century Sweden has been a popular country in which to invest, see figure 4. The attraction can be explained by a combination of factors, ranging from political and financial stability to comparatively high levels of transparency and low transaction costs.

However, the large inflow of capital from other countries gave rise to new problems as foreign investors and lenders quickly returned to their home countries after 2008, see figure 4. Property owners' difficulties in refinancing maturing loans now pose a significant risk.

If, like Kärrlander (2008)[9], we look back at the major financial crises that have occurred since the eighteenth century we notice that certain patterns recur. There appears to exist an "anatomy of property crises". The crisis begins with an expansion of credit coupled with "aggressive" lending, often with property as underlying security. In the mature phase of a crisis there is often a widespread belief in the "new economy".

Lessons to be drawn from the crisis in 1990 and other crises include the following.

- Longer periods of credit expansion and rising property prices which diverge significantly from growth rates in the economy as a whole provide a seedbed for property and financial crises.
- Extensive leverage-related financial arrangements, such as property investments with a high loan-to-value ratio, create big financial risks.
- Longer periods of rising property prices create a situation where investors from other sectors of the economy are drawn to property. These investors do not always use the prevailing forecasting models or ways of thinking. This may be because investors from other industries have insufficient experience from the property industry and poor knowledge of the longer-term industry logic for cash flows, market values and other factors. Generally speaking, when

9 See also Reinhart & Rogoff, 2009.

required yields fall below a certain level some long-term investors tend to withdraw from the market.

- Complex financial instruments pave the way for crises, and these instruments are largely employed by individuals who do not understand the basic mechanisms of the instruments. An example of this is the crisis in the United States triggered by lending to households with little ability to pay (the sub-prime crisis).

To the above we can add that extensive institutional changes, such as in Sweden around 1990, create a partially new playing field which affects decision-making processes for market players. The deregulation of credit markets coupled with extensive housing subsidies and a radical overhaul of the tax system helped to shape a to some extent entirely new environment for property investments.

In the above we indicate that there certain sequences of events which are common to most crises. These should be studied more closely from a historical perspective to enable us to identify various types of risk at an earlier stage.

FROM PROPERTY CRISIS TO BANKING CRISIS

If we combine our conceptual model with the description of the course of property crises above a number of relationships emerge which illumine how the commercial property sector can affect the financial system and financial stability.

Firstly, fluctuations in yields and capital appreciation are significantly greater in the commercial property sector than in the residential sector. In the property sector empty commercial premises appear as soon as unemployment rises while the residential sector is more stable, as housing has more the character of a necessity good.

Secondly, property prices fall already when there are expectations of rising vacancies. Falling property prices can trigger renegotiations of loan terms based on specific covenants in the loan agreements. Experience from Sweden suggests, however, that banks are reluctant to impose tougher loan terms, as this can lead to further declines in value and realised losses.

Thirdly, banks place a strong premium on maintaining a positive cash flow. As long as the cash flow is positive and is expected to remain so, any negative equity can be overlooked if it is expected to remain negative only temporarily.

Cash flow is the key factor for determining when a property crisis turns into a banking crisis. Cash flow is essentially determined by rents, loan-to-value ratios and nominal interest rates. Nominal interest rates can be influenced by the Riksbank through active monetary policy. The loan-to-value ratio is a product of risk assessments in the financial system. The lease terms are formulated by the parties in the rental market.

GENERAL RISKS ARISING FROM THE USE OF LOAN FUNDING

The basic criterion for a risk assessment concerning commercial property is the real economy and how it is reflected in vacancies, lease terms, the construction of new premises, etc. When loan funding is used a financial risk is added.

There are two main risks associated with loan funding. The first lies in the ratio of market value to loan amount. When prices fall sharply, as in 1990-1993, loans with poor collateral may lack cover while equity is wiped out. This is brought to a head when the loans need to be renewed at maturity but it can also influence banks' policies and handling during the term of the loans due to the existing loan and credit terms, or covenants. The expected variation in loan-to-value ratios and property prices thus constitutes a key parameter in credit assessments.

Right now, in autumn 2010, the issue of most immediate concern is how that part of the property sector which has been funded with capital from other countries will be refinanced after a number of foreign banks decided to withdraw to their home countries. Loans involving foreign banks that will need to be refinanced, mainly in 2010-2013, are estimated at SEK 100-150 billion.

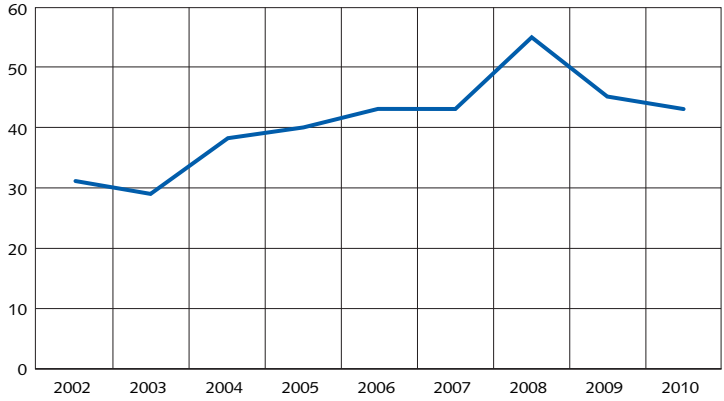
The second risk is that in the short and long term the yield or yield potential (net operating income less investments) for property will not be sufficient to cover the interest and principal on the loans while also generating a return on equity. The outcome, in other words, is a negative cash flow. There may be several reasons for this negative cash flow. Firstly, that vacancies are rising while rents are falling and, secondly, that the loan terms have been changed. The risk in this respect is linked to the durations, maturity structure and other terms and conditions of the loans.

RISKS ARISING FROM HIGH LOAN-TO-VALUE RATIOS AND SHORT FIXED-RATE PERIODS

By international standards, Sweden's listed property companies have relatively high loan-to-value ratios (low solidity[10]) defined as borrowed capital relative to market value. All else equal, this makes them more sensitive to changes in financial and commercial conditions. Figure 9 shows the trend in average loan-to-value ratios for European listed property companies.

10 Solidity is defined as equity divided by total assets – Equity/assets ratio.

Figure 9. Average loan-to-value ratios for European property companies in 2002-2010.



Source: EPRA Research 2010b.[11]

The figure shows that the loan-to-value ratio increased from around 30 per cent at the beginning of the twenty-first century to as high as 55 per cent in 2008. It has then fallen back to just over 40 per cent. It is likely that the rising trend in LTV ratios is due to the relatively low interest rates during the period concerned. Another explanation behind the peak in 2008 is the significant downward adjustment of market values of European property companies that occurred in connection with the financial crisis in 2008-2009, as discussed below. To put it differently, if debts remain constant the LTV ratio will increase in line with downward adjustments to market value.

It is also important to note that the choice of population for this type of survey can produce very different outcomes. Sweden's listed property companies currently have loan-to-value ratios of around 60-65 per cent and the figure has varied within this range since 2000. Property companies in the UK and Continental Europe, which thus have loan-to-value ratios of around 40 per cent, wrote down the value of their properties much more aggressively than their Swedish peers during the crisis years of 2008 and 2009. To what extent Sweden's relatively high LTV ratios are offset by institutional factors and better transparency[12] is hard to say. In the UK market values were trimmed by 30-40 per cent during these years. The corresponding writedowns on the Continent were 10-15 per cent on average, although figures vary significantly among individual companies and countries[13]. In Sweden market

11 See also the results in Ooi, 2003, which indicate that international property companies have lower LTV ratios than Swedish listed property companies.
12 Jones Lang LaSalle, 2010, measures and places Sweden's property market in an international perspective in terms of transparency.
13 Based on analyses of listed property companies in Europe. The group includes those property companies which had the largest market capitalisations at the beginning of 2006, excluding those Swedish companies that were included in this group.

values were written down by 5 per cent on average while the estimated fall in value reported in the Swedish Property Index was 11 per cent between 2008 and 2009.

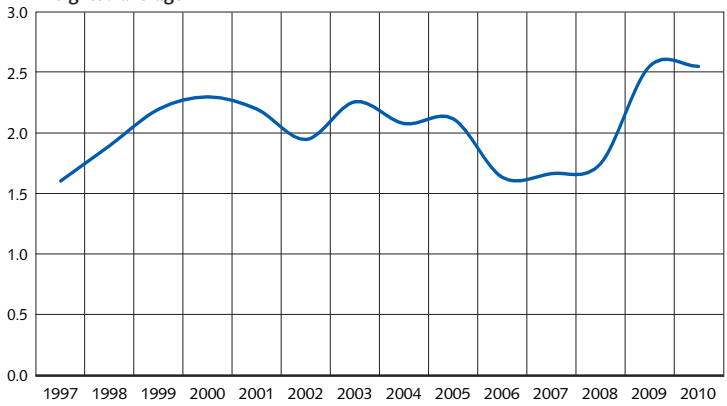
Here we would also like to mention the fact that a small number of players have the ability to control the large listed property companies, or different groups of such companies. This can constitute a risk, if these owners have higher LTV ratios than the industry as a whole. It is harder to analyse the solidity of such groups of owners than for listed companies or municipal housing companies, for instance. A small number of highly leveraged players can pose a risk to financial stability. This can be illustrated by the sub-prime market in the United States. Although many analysts believed there were risks in this lending, they dismissed the notion that there could be systemic risks, as the volumes involved were relatively small. Despite this, a financial crisis ensued, due to the lenders' poor solvency.

Another example of where high levels of borrowing can trigger a financial crisis is the collapse of Nyckeln, a Swedish financial firm, in the early 1990s. Nyckeln's failure brought to light what would today be called a systemic issue. It was revealed that a large number of major property companies were operating with negative cash flow. Their funding was based on money which had been borrowed on the basis that market values would continue to increase.

Sweden's municipal housing companies are often dominant in local markets for rented housing, and they are behaving in an increasingly commercial manner. Their solidity has also strengthened. From 1992 to 2009 their loan-to-value ratios based on market values fell from around 70-75 per cent to 50-60 per cent. This applies mainly to large companies in major cities.

When property companies have high LTV ratios fixed-interest periods become a risk factor, primarily for the individual companies but also for financial stability. Short fixed-rate periods coupled with high LTV ratios can create problems for companies if interest rates go up. If the whole group of property companies were to have a loan structure with very short fixed-rate terms any unforeseen sharp increases in interest expenses could lead to a situation where all these companies experience problems simultaneously. This, in turn, could trigger chain reactions, and such chain reactions can have a negative impact on financial stability. Fixed-rate periods in the listed property companies have varied from 1.5 to 2.5 years over a longer period of time (1997-2010), as shown in figure 10. The figures are based on the companies' published fixed-rate periods and take account of any swap agreements.

Figure 10. Average fixed-rate period (years) for listed property companies in Sweden 1997-2010.
Weighted average.



Source: Leimdörfer.

Fastighetsrapport (2010) makes the assessment that only a small number of Sweden's listed property companies have a significant degree of interest rate sensitivity. This suggests that a change in interest expense levels of a few percentage points would not pose a major risk to these companies at present. The analysis in Fastighetsrapport suggests that interest expense levels of around 6 per cent would be needed before a significant number of these companies would encounter problems paying their interest. At the beginning of 2010 the average interest rate on loans owed by Sweden's listed property companies was just under 3.5 per cent. At the end of the third quarter of 2010 this interest expense had risen to around 3.7 per cent[14]. The interest expense levels described include the effects of derivatives.

The property companies generate the funds for interest on borrowed capital and return on equity in the first hand through yields and in the second hand through capital appreciation. Sweden's listed property companies reported an average yield of 6 per cent for 2009. This is a relatively stable long-term level, see figure 8. If we include capital appreciation the total return is a few percentage points higher. However, the rate of capital appreciation varies significantly over time, which means that investing and funding are a matter of being able to interpret early signals and get the timing right.

The actual yield potential is a recurring point of contention when the results from the Swedish Property Index are presented. The reports often show that actual yields are lower than those which are generally assumed in the industry. The optimism of investors and property valuers mainly takes the form of assumptions about low vacancies, operating and maintenance costs, and modernisation requirements. This

14 Figures from Leimdörfer.

optimism can fuel price increases in a rising market but can also provide a cushion for falling prices in a declining market.

EFFECTS OF INCREASED COLLABORATION BETWEEN THE PRIVATE AND PUBLIC SECTORS

Newell & Peng (2008) describe a trend where pension funds and other long-term investors look for alternatives and complements to property in the form of infrastructure projects such as roads, railroads, water and sewage installations, wind farms, telecom satellites, etc. Many of these investment projects take the form of partnerships between the public and private sectors and are based on long and secured contracts that are attractive to investors. Similar motives exist for private companies, such as Kungsleden AB, which purchases properties used for the provision of public services and then leases them to the seller. This means that the public sector is a party in what is known as a sale-leaseback transaction.

A common feature of all forms of public-private partnerships is that they involve long contracts with a specific party – public or private – which provides the funding. A typical example is the Karolinska Institute in Stockholm, where the investment in the building runs into several billion kronor and is covered by extensive appendices which specify what should happen to the property capital as activities in the premises change.

So far, the commercial operations described above are of relatively limited scope, but they are expected to grow. The deals are covered by long contracts, and it is difficult to predict how trading in the underlying contracts will evolve. It is also too early to comment on the extent to which this type of commercial operation will assume a character and scope with the potential to affect financial stability.

RISKS ASSOCIATED WITH PROPERTY INCLUDED IN FUNDS

Another example of the blurring of boundaries between industries is that a growing share of properties in the investment market is being packaged into funds, which are then not listed on an exchange. A part of the idea behind this concept is to expose the funds to various degrees of risk. This can lead to increased herd behaviour when a large part of the market operates on the basis of similar rationales.

LISTED PROPERTY COMPANIES

Several studies[15] published in recent years indicate that public trading in property shares produce price movements which anticipate changes in the market for directly

15 The following five sources exemplify the issue: 1) EPRA Research, 2010 2) Morgan Stanley research presented in EPRA News – March 2009 3) Deutsche Bank report RREEF Research – Global Real Estate Securities – January 2007 4) Cohen & Steers research presented in EPRA press release April 20, 2009 5) EPRA Research, 2009.

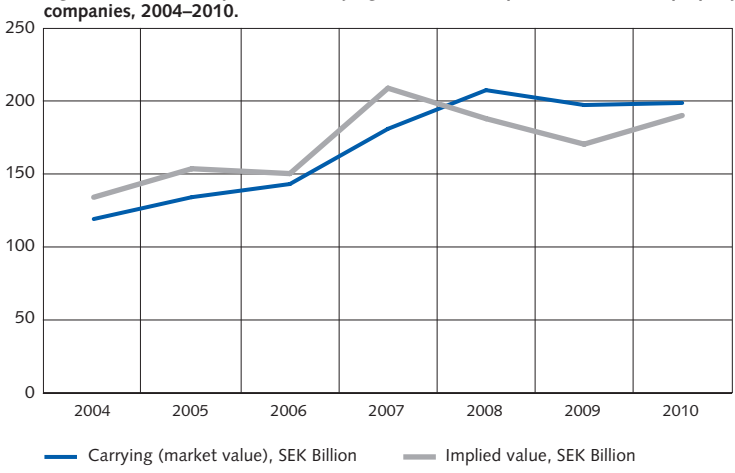
owned properties by a few months. One message in such studies, however, is that price movements, partly due to the use of leverage, tend to exaggerate price movements in the underlying property assets[16].

The underlying reasons why the stock market has a signal value are to be found in the inertia that exists in the transaction process in the market for directly owned properties coupled with the fact that transparency in the stock market is in some respects much better than in the property market. However, there are concerns about the transparency of financial reporting,[17] particularly in respect of the valuation methods applied, significant assumptions used in companies' property valuations and the relationship between estimated market values and transaction prices (market evidence).

The lack of adequate information in financial reports on the assumptions underlying the valuations limits investors' ability to make rational investment decisions. Several studies have pointed to wide margins of error in assessments of properties' market values. Different valuers can, in other words, arrive at different conclusions on what the market value of a property or property portfolio is. This, in turn, can have a material impact on how a user of financial reports assesses a certain company's financial strength.[18]

The correlation between the index for Swedish property companies and the value of the underlying property assets is illustrated in figure 11.

Figure 11. Relationship between carrying amount and implied value in listed property companies, 2004–2010.



Source: Leimdörfer.

16 See, for instance, EPRA Research, 2010.
17 Compare the information contained in the annual reports of property companies with the need for information in this respect, as discussed in Nordlund, 2010.
18 See, for instance, the discussions in Nordlund, 2008.

The figure shows that the implied values of underlying properties vary over time around the carrying amounts (market values). The over- or undervaluation is about 15 per cent.

Note, however, that figure 11 only shows one observation per year. More frequent observations would show a greater variation in implied property values.

International studies have measured the correlation between the pricing of property shares and the underlying property assets over different periods of time. Some of these studies have pointed to a relatively strong correlation between the pricing of property shares and the value of the underlying property assets, especially when viewed over a period of a number of years. Another way of expressing this is that over the long term the price of property shares is driven by the value of or return on the underlying property assets[19]. In our view, this means that one cannot ignore trends in the prices of listed property shares when assessing the underlying property market.

5 Institutional factors and financial stability

In this section we discuss a number of institutional factors which can affect financial stability both positively and negatively. In this context institutional factors refer to formal regulations in the commercial property sector, coupled with procedures and cultures. Generally speaking, however, it is hard to assess what effects individual rules of an institutional character will have on financial stability.

HARMONISATION OF VALUATION PROCEDURES

Sweden has since 1994 had a voluntary authorisation scheme for property valuers. The effect has been that valuers of commercial property are to a large extent authorised today. Many of these valuers have university degrees in the area, and for new authorisations a university degree is a requirement. Swedish valuers can also be authorised under a British system run by the Royal Institute of Chartered Surveyors. As the property market becomes increasingly globalised the Swedish authorisation scheme may gradually diminish in importance, at least in situations where international players are involved.

Worldwide extensive efforts are underway to harmonise the conceptual apparatus as well as the actual process of valuing properties. This work is being driven by the valuers through organisations such as the International Valuation Standards Committee/Board (IVSC/IVSB), the Royal Institute of Chartered Surveyors (RICS), the Appraisal Institute (AI) and the European Group of Valuers Association (TeGoVA), as well as by organisations working in the field of accounting,

19 See, for example, EPRA Research, 2010, and EPRA Research, 2009.

such as the International Accounting Standards Board (IASB), and banking, such as the European Mortgage Federation (EMF).

It is clear that common concepts and procedures help to improve transparency but there is also a clear risk that a high degree of harmonisation will lead to herd behaviour if valuers in all regions have an increasingly similar education, read the same books, follow the same instructions and use the same analysis models. Herd behaviour in the commercial property market could in a worst-case scenario have an impact on financial stability.

CHANGES IN THE SWEDISH PROPERTY INDEX

A Swedish property index was established in 1997 at the initiative of the country's two major pension funds, AP and SPP. The Swedish Property Index (Svenskt Fastighetsindex) has played an important role in creating a common conceptual apparatus and promoting higher standards of professionalism. The index is updated annually based on actual reported net operating income figures and estimated market values at year-end. But the Swedish Property Index does not function as a problem-free signaller of circumstances that could endanger financial stability. The problems can be summarised as follows:

- The one-year update interval is too long. Monthly or quarterly updating would be desirable.
- From an international perspective the market coverage is relatively low – about 25 per cent. It would be good if more companies were included in the index.[20]
- Capital changes in the yield index are assessed through property valuations, which means that the valuation figures are both smoothed out and lag the market.

An alternative to Sweden's valuation-based index is a transaction-based index. In the United States there exists such an index for commercial property, which is based on repeat sales. The index is administered by MIT and covers the whole of the United States. The transaction-based index generally displays a higher degree of volatility than the valuation-based index. However, the index needs to cover large markets in order to provide relevant data for the information provided. A valuation-based index in the United States is administered by NCRIEF (National Council of Real Estate Investment Fiduciaries).

20 The index is currently dominated by institutional investors such as Vasakronan and Diligentia. No listed company is included in the data on which the index is based.

NEW ACCOUNTING RULES AFFECTING THE PROPERTY INDUSTRY – IFRS

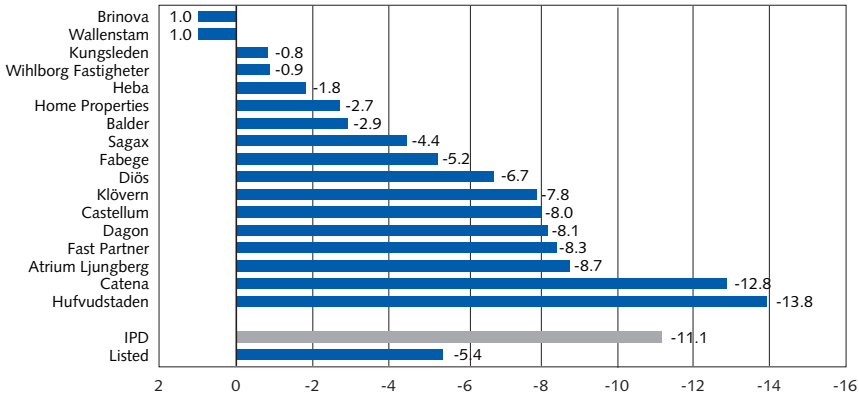
The new International Financial Reporting Standards (IFRS) were introduced in Sweden in 2005. The aim was to improve the transparency of financial reporting and thus provide a better basis for decision-making for users of the reports. At present the primary users are venture capital investors, however other stakeholders mentioned are banks and other groups. They would obtain better data on which to base decisions if different asset classes, properties in listed companies for instance, were valued at market value in financial reports.

The effects on Sweden's listed property companies have been mixed. During the years 2005-2007 property valuation was a little discussed subject, as market values were rising by double digits and because the capital appreciation could be recognised in the income statement under the new IFRS rules.

In autumn 2008 Sweden's commercial property market ground to a halt, with almost no properties changing hands. This meant that only a small number of price observations could be made, which sparked a discussion about how properties should be valued in the absence of a sufficient number of price observations in the direct property market for comparison. One issue was whether it was possible to draw any conclusions from trading in the shares of listed companies, i.e. whether the calculated implied values could provide guidance for assessing the underlying market values of the property assets. During a period share prices pointed to a decline in value of 20 to 25 per cent for property, but many representatives for the property companies asserted that the stock market and property market were two separate things.

The listed property companies wrote down the fair value of their properties by about 5-6 per cent in 2008-2009, although the figures varied widely among different companies. Figure 12 below shows a comparison of adjustments to market values in 2008 and 2009 for Sweden's listed property companies and companies included in the Swedish Property Index.

Figure 12. Swedish listed property companies' adjustments to market values of properties in 2008–2009 compared with the Swedish Property Index.



Source: IPD Svenskt Fastighetsindex.

In the prevailing situation the application of IFRS had the effect of replacing objective market assessments with subjective views of values. However, the assessments did not lead to any transactions. The banks were not lending and the buyers were unable to obtain funding for many proposed deals. One may ask, therefore, what the "actual market values" were. One conclusion, however, is that IFRS did not improve transparency.

Benefits and drawbacks of reporting market values in financial reports

Financial reports often contain general information about the assumptions on which the companies' valuations are based. This makes it difficult for users to assess the reliability of the stated market values. One of the benefits of stating the fair value (market value) directly in the income statement and balance sheet is that you immediately see the current property value. The alternative is to state the historical cost, which in many cases cannot be used as a basis for economic analyses. This becomes particularly evident in cases where the properties were acquired a long time ago. A drawback of reporting market values may be that the sharp fluctuations in these could encourage behaviour which exaggerates upward as well as downward price movements in the property market.

The estimated market value of an individual property is always uncertain. This uncertainty is not reduced by the use of improved methods of estimating values. A good way to illumine the uncertainty is to provide additional information on the methods applied and the assumptions used in preparing financial reports.[21]

21 See the discussions in Nordlund, 2008.

In their consolidated financial statements the listed property companies apply current valuations, which are recognised directly in the income statement and balance sheet. Another common practice among the big municipal housing companies is to report market values in the additional disclosures section of the annual report. Under a draft set of new accounting rules for large companies produced by the Swedish Accounting Standards Board, these will in future be required to disclose information on the market value of investment properties in their annual reports.[22]

IMPROVED TRANSPARENCY IN PROPERTY TRANSACTIONS

For tax reasons the great majority of commercial property transactions in Sweden currently take the form of the sale of a company. Shares and interests change hands. As a result, price information is rarely published. The information remains with the parties to the transaction and the consultants taking part in the deal. Transparency is reduced compared with a situation where the buyer applies for registration of title based on a purchase document. In property transactions taking the form of the sale of a company there is often no information on assessments of underlying property values, actual or estimated net operating income or valuations of deferred tax. This makes it difficult to perform an external analysis of the underlying property values. Often, there is also no information about the existence of "soft loans"[23] and rent guarantees and about how these "special terms" have affected the price. This lack of information can have the result that analysts' information about transactions becomes hard to assess, creating a risk of misinterpretations. If the price of an underlying property asset has been affected by preferential loan terms or rent guarantees, for instance, the price achieved should be adjusted accordingly[24] before it is used for comparison in property valuations. If such adjustments of "comparison purchases" are not made there is a risk that these transactions will create a consensus in the market that the market prices of sold properties are higher than they are in reality. Another risk, if negotiations on terms become common, is that the negotiated prices as well as the valuations will eventually have no basis in sustainable fundamentals.

22 Investment properties are properties which are held for the purpose of generating rental income and/or capital gains. See the draft rules of the Swedish Accounting Standards Board for companies defined as large companies under the Swedish Annual Accounts Act.

23 Loans where the terms deviate from normal market terms in respect of repayment terms and/or interest levels. Such financing could for instance be provided by sellers in transactions.

24 See, for instance, the rules contained in the international accounting standard IAS 40 Investment Property, which states that the fair value of an investment property excludes estimated prices that have been affected by certain types of non-market-based situations and terms. Similar formulations are contained in the Swedish accounting recommendation RR 24 – Investment Property.

REITS AS INSTRUMENTS FOR PROMOTING STABILITY

In the United States public property funds called real estate investment trusts (REITs) were set up in the 1960s with the aim of creating a transparent form of ownership where risks and returns are in various ways locked in for the benefit of private individuals as well as professional investors. A basic idea was also to create an institutional framework which favours equity funding. A relatively high equity/assets ratio would create stable financial conditions.

A special and crucial rule for REITs in the US is that profits are taxed only once. Companies do not pay any tax if they pay out at least 90 per cent of their profits to shareholders. There are also rules designed to ensure that the fund does acquire dominant owners whose shares are not traded as well as rules limiting opportunities for risky expansion. The regulations governing the activities of REITs are designed to guarantee low transaction costs, good transparency and high liquidity. The goal is to ensure that REIT investors gain a risk exposure and return in which certain influencing factors have been neutralised. REITs also encourage the use of equity funding. A transition from debt to equity capital for funding of property assets also reduces the risk of insolvency in the sector[25].

About 30 countries, including Australia, Canada, the UK, France, Belgium, Italy, Germany, the Netherlands and Finland, have introduced or are in the process of introducing regulations similar to those governing REITs in the United States. It is hard to draw any conclusions about the extent to which these variants of REITs have helped to promote financial stability, as they have existed in the market for a relatively short time. In the US REITs have a longer history but still account for only a small share of the market compared with direct ownership. What is clear, whatever, is that the ready accessibility of information about REITs, through research and development, has significantly increased knowledge about property as an investment.

AN ALTERNATIVE MORTGAGEABLE VALUE

Some European countries have introduced a specific mortgageable value called mortgage lending value as an alternative to market value for the mortgaging of property. Mortgage lending value is defined as:[26]

Mortgage Lending Value shall mean the value of the property as determined by a valuer making a prudent assessment of the future marketability of the property by taking into account the long term sustainable aspects of the property, the normal and local market conditions, as well as the current use and alternative possible uses of the property. Speculative elements should not be taken into account in

25 See also the discussion in Jaffee, 1994.
26 European Mortgage Federation, 2009.

the assessment of Mortgage Lending Value. Mortgage Lending Value should be documented in a clear and transparent way.

According to the definition, the MLV should thus be determined by reference to long-term market trends and indicate a realisable value for a property at a future date with a high degree of certainty.[27] The idea behind MLV appears to be to identify a long-term sustainable value of a property to be mortgaged and ensure that the MLV never exceeds the property's market value.

MLV is used as lending value in Germany and Spain, among other countries.[28] Germany has applied MLV since a very long time and also has legislation regulating how the value should be calculated. Opinions differ, however, on whether the application of MLV would have a positive impact on risks arising from secured lending for property investments[29]. An obvious problem in this context is to predict where the lower limit for the market value lies in a longer-term perspective[30], and there is also a significant risk that the calculated MLV will be seen as more "certain" than an estimated market value even though, in practice, the calculation of MLV may involve significant problems as well as providing ample leeway for arbitrary assessments[31].

In Sweden MLV is not applied as a basis for mortgaging, at least not by Swedish banks. Our assessment is that the introduction of MLV in Sweden would probably not make a significant contribution to improving financial stability.

6 Conclusions

In this section we describe the key conclusions about which aspects of Sweden's commercial property market could have an impact on financial stability. Finally, we offer a number of direct recommendations on which actions the Riksbank should take in order to provide better information and analysis models in its Financial Stability Reports.

CHARACTERISTICS OF SWEDEN'S COMMERCIAL PROPERTY SECTOR

Sweden's commercial property sector is largely concentrated to the country's metropolitan areas. The Stockholm region accounts for 50 per cent of the market's capital value and turnover. If the Gothenburg and Malmö regions are included the share rises to 75 per cent. Analyses of risks and financial stability can therefore be concentrated to Stockholm, Gothenburg and Malmö.

27 Champness, 1999.
28 European Mortgage Federation, 2009.
29 See, for instance, the discussions in Crosby, French & Oughton, 2000 and Bienert & Brunauer, 2007.
30 See, for example, the discussions in Lind & Persson, 1998, concerning the problems relating to different types of values from long-term perspectives.
31 See, for instance, the discussions in Persson, 2008.

The property cycle, with links among the capital market, rental market, property market and construction market, is driven chiefly by economic growth. Access to macro statistics is also good. What could be improved is the information on growth and growth drivers, especially at the regional and local levels.

From an international perspective, Sweden occupies a somewhat unique situation in that the rent for the majority of residential and commercial premises is the total rent. Compared with countries where rent is defined as the net rent, i.e. the rent exclusive of heating and water costs, one would therefore expect greater volatility in net operating incomes and market values in Sweden.

Over the past 30 years Sweden's commercial properties have gradually acquired the character of financial investments. The old builder-owner idea, where the developer would also manage the property and use a large share of equity funding, has gradually been replaced by a division into separate functions where capital is more mobile and where short-term players have increased their share of ownership. Fluctuations in property prices can thus be expected to increase.

In terms of capital value the commercial property sector is about one fifth the size of the residential sector (single-family detached homes and tenant-owner apartments). Variations in rents and capital values may, however, be expected to be considerably larger in the commercial sector compared with the private housing sector.

RISKS TO FINANCIAL STABILITY TODAY

The banking and financial crisis which flared up in 1990 was to a large extent due to conditions that were specific to Sweden. However, the biggest latent risk to the commercial property sector right now, in autumn 2010, lies outside Sweden in a global recession. A recession can lead to higher unemployment and thus rising vacancies, which in turn can exert downward pressure on rents and property prices. It is hard to say how likely such a scenario is, and what impact this would have on financial stability.

Right now there is a latent risk in the US commercial property market where prices have fallen by 40 per cent over a period of two years. There is a significant risk of major defaults, as a large portion of all outstanding loans will need to be rolled over in the next few years. In many cases the loans exceed the market values of the properties, wiping out the investors' equity. Based on current market values, lenders will be reporting capital losses, some of which will also need to be realised.

Sweden is a low-inflation economy, and in this perspective it is interesting to look at historical patterns in real-term prices. Between 1970 and 1981 rental property prices[32] in Sweden declined by about 40-45 per cent in real terms. During the property crisis in the early 1990s the real-term decline in prices was also about 40

32 Rental property with residential and/or commercial premises.

per cent.[33] These historical patterns in real-term property prices in Sweden as well as the sharp downturn which has taken place in the US and UK should be set against equity/assets ratios in Sweden's listed property companies, which currently average 35-40 per cent. To put it differently, a decline in value of the same magnitude as before could create significant problems for property companies in Sweden with "normal" equity/assets ratios.

General latent risks can always be discussed with reference to the so-called property cycle based on the conceptual model shown in figure 1. The risks normally arise in the intervals in time and information gaps occurring between different activities, especially when large amounts of capital flow into the sector over a longer period of time. This pushes down required yields, raises rents and increases the degree of loan funding, which in turn results in property values which exceed long-term sustainable levels.

Over the long term, demographic factors probably have a relatively strong correlation with economic growth. Many large economies in the West have an aging population. Some studies show that an aging population normally has a long-term negative impact on economic growth, which in turn can have a negative impact on the market value of property[34].

DESIRABLE GUIDELINES FOR IMPROVED DECISION-MAKING DATA

At present it is hard to create indicators for how commercial property will affect financial stability. This is partly due to the lack of reliable and comparable data that can be used as a basis for decisions. An initial step would thus be to define a set of general criteria for how input data from property companies should be presented.

General quality requirements

To assure quality, such data should be (see, for example, Arthur (2005)

- updated frequently
- accessible and representative
- comparable and based on uniform definitions
- constant over time in order to create a long, unbroken series

Today structured information about commercial property is rarely up-to-date when it reaches the decision-makers. The information is not public, placing large consulting firms providing advisory, transaction and valuation services at an advantage in terms of access to information.

33 Turner, 2000.
34 See, for example, Lindh & Malmberg, 2000.

Nor is the information accessible to decision-makers to a sufficient degree, as it is of a private nature. The exception is the structured information provided by the Swedish Property Index and the processed information provided by large consulting firms in the form of market reports. Up-to-date, but unstructured, information on transactions and organisational changes is provided continuously by companies like Fastighetsnytt AB and Fastighetsvärlden AB.

To what extent the information provided is representative for the market as a whole is often unclear, as it is not known how large the flow is for each type of category of properties.

The comparability of the information has improved since the introduction of the Swedish Property Index, as this established a set of uniform definitions. How these are applied in practice may vary, however. This applies particularly to comparisons among countries, where we need to be aware that key concepts such as rent, vacancy and yield may have different meanings.

There are a few long and unbroken series of information, which have been reconstructured retrospectively. One example is the yield and total return data contained in the Swedish Property Index for a mixed portfolio starting in 1984, see figure 8.

Basic information structure

Sweden's commercial property sector does not in any respect have the same level of transparency as the residential sector in official statistics. There are no structured official statistics from the capital market, rental market, property market or construction market. The statistics should provide information on new construction – current and planned – and on owners, property prices, required yield, rents and vacancies as well as credit types and lenders. At present relevant information needs to be obtained from private organisations such as the Swedish Property Index and from consulting firms.[35] These consulting firms have generally retrieved the data from their own activities in advisory, transaction and valuation services.

It should be stressed that there is no detailed or general information on the commercial property sector's funding arrangements with regard to maturity structures, loan durations, loan-to-value ratios, interest rates, repayment terms and what proportion of the funding comes from which source.

Many Swedish property companies, banks and consultants now use the same source of information – Datscha[36] – as a basis for, for instance, the required yields

35 For example, diversified companies like CBRE, DTZ, JLL, Leimdörfer, NAI Svefa, NewSec, Savills and Pangea Property Partners or companies specialising in construction industry and property information such as Bygganalys AB.

36 Datscha is a tool that has been developed and is owned by the Stronghold Group, which also includes Newsec AB. Datscha is also a web-based platform for market information etc. provided by Newsec, Forum and DTZ.

applied in valuations. Datscha is a good tool which provides extensive access to various types of market information, but it is not clear how the information provided is quality-assured and to what extent use of this information has the effect of smoothing out property valuations. Nor do market information systems like Datscha provide a full description of the methods applied[37] to extract information from the market, such as required yields for various sub-markets.

It is also highly likely that the lack of public and quality-assured information influences those professional analysts who monitor the Swedish commercial property market. The market reports presented have similar content and it is apparently hard to deviate from the prevailing assessments.

INFORMATION THAT SHOULD BE PRIORITISED

A type of information which has the highest priority in analyses of financial stability is a transaction-based rental index for offices in Stockholm. If we assume that central Stockholm serves as a signal market, such an index could, if delivered on a monthly basis, have the character of an "early warning system". Central Stockholm is in this context a sufficiently large and liquid market to provide reliable data for a rental index.

The Swedish Property Index is currently updated at one-year intervals. The signal value is therefore limited at the time of publication of the figures. A quarterly index or, ideally, a monthly index would increase the value of the information. A more frequent index can provide a basis for financial products, which in turn can be traded and increase the provision of information on the market values of the underlying properties.

Another fundamental problem is that for tax reasons "property"-transactions often take the form of the sale of a company. The effect of this is that information about prices and price drivers remain within a small group of closely affected players. This reduces transparency and increases the risk of incorrect information. Changes to existing tax laws could thus improve the quality of information in the commercial property market.

To be able to systematically and continuously monitor Sweden's listed property companies, the Riksbank as well as analysts working in the commercial property market need more detailed information on a set of well defined variables. This applies also to the monitoring of implied values of the underlying property assets. Such monitoring would provide early and therefore useful information on the underlying property market.

37 For a further discussion of the valuation methods applied in property valuations, see, for example, Lind & Nordlund 2010.

Changes in vacancies for various segments of the property market generally serve as an early indicator of changes in the balance between demand and supply. However, the property consulting industry has developed different methods for measuring vacancies and therefore reports vacancy figures which differ for the same market segment. It is desirable to create common definitions and a common method of measuring so that vacancies can be used as an indicator.

Variations in rents and property prices are caused partly by inadequate knowledge about supply in the market and about future new builds. Improved knowledge about competing supply could give developers, investors, lenders and, not least, tenants a better basis on which to make decisions.

Updated reference values[38] in the form of longer series of data on yields and gross rent multipliers (property value/rent) would be very useful for the Riksbank. Such values provide the same type of information as P/E ratios in the stock market. When the yield, for instance, falls below a certain threshold for a certain market this could be an indication of instability.

Analyses of demand for premises are based on a view of the outlook for various industries, especially the performance of various service sectors – number of companies and workplaces, space requirements and payment ability. This type of information can provide early signals of trends in the rental, property and construction markets.

HOW THE FINANCIAL STABILITY REPORTS COULD BE DEVELOPED

The section on commercial property in the Riksbank's Financial Stability Reports could be developed by including the prioritised information described above. However, the information should to a greater extent be integrated into an improved analysis model, based, for instance, on the conceptual model shown in figure 1.

The use of a more model-based approach can also assist in early identification of stability-affecting factors. Partly, such a model-based approach concerns the links between macro and micro. This raises a general issue for the industry as a whole. What are the relationships between, on the one hand, macroeconomic variables such as growth and interest rates (real and nominal) and, on the other hand, rents, vacancies, property prices and new construction? How do changes in institutional factors, such as new accounting and capital adequacy rules, affect these relationships in different situations?

Trends in a number of index series covering several business cycles can provide valuable reference figures. The following types of new indexes should be prioritised:

38 See the definition and the discussion on reference values in Nordlund, 2008.

- a rental index for offices in Stockholm
- vacancy indexes and vacancy levels for retail and commercial premises in metropolitan areas
- new construction indexes and new construction volumes for retail, office and hotel premises in metropolitan areas
- indexes for implied property values based on listed property companies

The funding of the commercial property sector is of particular interest. The stability reports should therefore provide a developed form of analyses of how rental agreements and fixed-rate periods and maturity structures change over time and of how loan maturity volumes relate to the properties' market values. This type of analyses provides information on how payment flows may change.

In-depth analyses of listed property companies can provide early signals of trend breaks in the commercial property market. Of primary interest is how share prices will perform relative to the underlying property values. The hypothesis is that share prices constitute an early indicator of changes in property values. This should therefore also be included in the stability reports.

Once the volume and quality of input data has been established, more advanced mathematical models can be applied to the property cycle, for instance how combinations of changes in growth rates and interest rates affect rents, property values and new construction.

To interpret and value all available information about the commercial property market, a group of experts could be appointed consisting of representatives from the research community as well as the financial and property industries. An important role for this group could be to seek to establish uniform definitions of key concepts.

A FINAL WORD

Previously, the issue of how to develop the Riksbank's Financial Stability Reports has been assessed based on an ideal situation where the Riksbank would use fully up-to-date information in a model with a high predictive ability. The basic problem, however, relates to the volume and quality of the information that the Riksbank has access to.

Our key message is that the Riksbank, working together with the commercial property sector, should seek to promote more frequent provision of high-quality information. This would create a basis for systems that could provide early signals of a build-up of risk.

The Financial Stability Reports we have analysed from 2009 and 2010 are carefully considered and well written based on the best available information, which

does not permit an enhanced model-based approach using econometric methods. The information from the rental market, property market and construction market is not quality-assured and is also provided at a high level of aggregation.

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Summary of the Sveriges Riksbank workshop on 'Housing markets, monetary policy and financial stability'

Michael Thornley*

As part of the commission of inquiry into the risks in the Swedish housing market set up by the Executive Board of the Riksbank in February 2010, the Riksbank held a workshop on 'Housing markets, monetary policy and financial stability' in Stockholm on 12 November 2010. There were over 100 attendees and 14 guest speakers, including Charles Goodhart, Franklin Allen and Kenneth Rogoff, at the workshop which was introduced by Governor Stefan Ingves.

Below is a summary of the presentations and discussions in each of the four sessions of that workshop.

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Session 1: Real estate markets and financial stability

Philip Davis (NIESR) began the session with a presentation on 'International developments in housing markets – lessons for Sweden'. Recent trends in 12 OECD countries were assessed (it was noted that care should be taken when drawing conclusions as housing markets are not homogenous because of differences in structural features across countries). It was noted that there was coordination of the house price 'boom-bust cycle' in recent years in some OECD countries, and that the scale and duration of the increase in the build-up to the recent 'bust' was greater than in the average boom period. Over the long-run, housing debt-to-income ratios were shown to be increasing in most of the selected countries and housing investment to GDP ratios were generally falling. The change in housing investment-to-GDP was shown to be highly correlated with the change in house prices. There was also a review of research showing house prices to have an explanatory power for consumption, the national fiscal position and banking crises. This suggests that house prices may be an important factor for macroprudential policy.

The discussant, Peter Englund (Stockholm School of Economics), considered whether central banks should be concerned with house prices. A panel regression on 14 OECD countries over 17 years (and covering 12 crises) showed that house prices can be used to predict banking crises. It was suggested that there was no obvious direct link between house prices and crises (so it is not immediately clear that house prices can cause crises). However, research suggests there is an indirect link through the impact of house prices on consumption. Therefore, it was suggested that policy makers may wish to affect house prices in order to control cycles in housing collateral.

Nancy Wallace (University of California, Berkley) presented on 'Real estate price measurement and financial stability crises', which evaluated the potential financial stability implications of mortgage lenders using the 4 major US real estate price indices (2 residential and 2 commercial) for risk management purposes. The indices were shown to produce downwardly biased estimates of expected real estate price growth and volatility, and they also lead to biased estimates of the correlation between real estate prices and interest rates and the distribution of real estate prices (e.g., skewness). This may have financial stability implications because mortgage lenders rely on the biased estimates for risk management purposes. As a result, there is a need for investment in real estate price indices in the US. In particular, it is important to move away from using indices based on the repeat-sales methodology towards the hedonic methodology. Some Swedish house price indices, being hedonic, were considered superior than US indices but there is room for improvement (eg they should not be based on assessed values).

The discussant, Kristopher Giradi, focused on (i) the size of the downward bias on the expected growth of house prices caused by repeat-sales indices and (ii) the potential impact of underestimating house price volatility on estimating mortgage default risk. The results of a recent paper were shown that find the size of the bias in the estimation of expected house price growth using repeat-sales indices to be considerable. Multiple sources for the bias were outlined. Similarly, the downward bias in estimating house price volatility using repeat-sales indices has recently been estimated to be large. However, the effect that this has on the estimation of mortgage borrowers' default risk, a key estimate for risk management purposes, is not certain. Underestimating house price volatility could cause the default risk for mortgages to be underestimated (because it underestimates the probability of borrowers falling into negative equity) or overestimated (because it underestimates the probability that future house price increases could take a borrower out of negative equity).

Session 2: Asset prices, financial stability and monetary policy

Kenneth Rogoff (Harvard University) gave a presentation, 'Asset prices, financial stability and monetary policy', based on findings from a recent paper he co-authored with Franklin Allen (who, in session 3, presented additional findings from the paper). Leverage was proposed as a key driver of financial crises – house prices bubbles are just one manifestation of the problem. In the build-up to the recent crisis, low long-term interest rates and volatility helped drive up asset prices and increase equilibrium leverage levels. A problem for policymakers is that it is difficult to introduce financial frictions into standard economic models and, when they are introduced, they are difficult to estimate because of non-linearity. The potential problems in the build-up to this crisis were not missed: in 2004 and 2008 the IMF identified risks in many of the housing markets that have since suffered a significant downturn. But it is difficult for policymakers to act against low probability events. These difficulties create a danger that responsibility for macroprudential policy will be shifted between authorities. It was suggested that central banks may be good at implementing macroprudential policy, as they are experienced in identifying the key risks involved.

The discussant, Jean Rochet (Universität Zürich), provided comments on the Allen and Rogoff paper as a whole. It was suggested that a clearer stance was needed on key issues, such as on the range of macroprudential tools required and whether there should be instruments that 'lean against the cycle'. And it is worth considering whether it would be beneficial for the macroprudential authorities' mandate to relate to smoothing the cycle rather than preventing the build-up of systemic risk, given the difficulty of predicting financial crises. There was also a general discussion of methods for modeling the build-up of financial bubbles and

for preventing bubbles. Whilst bubbles are almost incompatible with the rational expectations hypothesis, it is possible to obtain bubbles in overlapping generations models. Bubbles can also occur from irrational behaviour. It was proposed that the most convincing explanation is that bubbles build-up due to bad regulation or low refinancing rates and they burst due to some exogenous event. Three approaches to the use of monetary policy to affect bubbles were outlined: (1) that central banks should react to asset price movements if they are expected to affect inflation; (2) monetary policy should be used to tackle asset price bubbles i.e. "lean against the wind"; and (3) monetary policy is not required to respond to asset price bubbles, if macroprudential instruments are used effectively.

Cladio Borio (Bank for International Settlements) gave a presentation on 'Credit in monetary and (macro) prudential policy'. It was suggested that credit was at the heart of the recent crisis. Hence policymakers have recently focused on developing macroprudential policy. The problem of finding useful indicators for macroprudential purposes was discussed. It is difficult to find a single indicator that is useful for predicting the build-up of systemic risks and for signaling when there is financial distress. The most promising leading indicators of financial distress exploit the fact that typical financial indicators appear strong when systemic risks are building (e.g., when risk premia and volatility are low). One such indicator was discussed: joint positive deviations from historic norms of credit-to-GDP (a very rough measure of economy-wide leverage) and asset prices (a very rough measure of the likelihood and size of asset price reversal). It was shown that using this indicator to guide the build-up of countercyclical capital buffers (with the release of buffers determined by signs of stress, e.g., credit terms, and losses) would have caused buffers to be built-up in the US and certain European countries ahead of the recent crisis. However, macroprudential tools are unlikely to be sufficient as it is unclear whether they could prevent the build-up of financial imbalances. Consequently, monetary policy may also need to play a role, as it clearly acts on credit conditions and asset prices and is less easy to arbitrage than macroprudential policy. One possible approach is to lengthen the monetary policy horizon.

The discussant, Stefan Gerlach (Geothe Universität), agreed with much of the presentation but focused his discussion on areas of possible disagreement. First, the information content of credit-to-GDP and asset price gaps was debated. Results of a recent study showed that credit and asset price gaps reduce the predictive power of certain econometric models for estimating inflation and output in 18 OECD countries between 1986 and 2008. So it is unclear whether they are useful indicators for macroprudential policy purposes. Second, it was questioned whether monetary policy should be used to supplement macroprudential policy. Monetary policy is too blunt a tool and using it to lean against excessive credit or asset price

growth is likely to be costly. It was proposed that the focus should instead be on developing a macroprudential framework that works.

Session 3: Housing markets and alternative public measures

Franklin Allen (Wharton) began the session with a presentation on 'Macro-prudential tools and regulation – an international perspective', which complemented Kenneth Rogoff's earlier presentation on their joint paper 'Asset prices, financial stability and monetary policy'. Global imbalances and loose monetary policy have been proposed as key contributors to the housing bubble that preceded the recent financial crisis but it was argued that we need a more detailed understanding of how bubbles develop to inform policy. Four general theories for explaining the formation of bubbles were outlined: infinite horizon models, asymmetric information models, agency problem models and behavioral models. But the theories need to be developed further if they are to contribute to the policy debate. An understanding of how bubbles develop is important because the policy should be to stop bubbles forming as they are difficult to handle once they have started. Monetary policy and control of credit can have a role in handling bubbles in small, homogeneous countries but in large, heterogeneous economies macroprudential policy is probably required. Possible macroprudential tools to deal with a potential housing bubble include: mandatory reductions in LTV ratios, increases in taxes on real estate transfers, increases in annual real estate taxes, and direct restrictions on real estate lending. However, it was noted that some of these policies have been used in China in the past but they appear to have failed to be effective in major cities.

The discussant, Lucy Ellis (Reserve Bank of Australia), presented her assessment of the five key points she selected from the Allan and Rogoff paper. It was argued that there was little empirical support for loose monetary policy being a key driver of the housing bubble. For example, the deviation of actual monetary policy from the Talyor rule does not appear significant enough to have caused the systemic problems that arose in the US. And the part played by global imbalances in the build-up of the bubble is also not clear. Instead an alternative story was posited. In this explanation of the crisis, systemic risks were allowed to build-up through bad *micro*prudential supervision which allowed bad assets to be created, widely distributed and funded short-term. So the appropriate response to the crisis is to improve microprudential policy as well is to introduce macroprudential policy.

The next presentation, by Cho-hoi Hui (Hong Kong Monetary Authority), summarized Hong Kong's experience with the loan-to-value (LTV) ratio, which has been in place since 1991. In an econometric study of four countries with LTV ratios and nine without, it was shown that the use of LTV ratios is effective in reducing the sensitivity of mortgage delinquency rates to falls in property

prices and GDP. In addition, it was shown that the mortgage insurance program introduced in Hong Kong in 1999, which protects banks from credit losses on the proportion of mortgage loans over the 7 percent LTV ratio, does not reduce the effectiveness of the LTV ratio. It is therefore proposed that LTV ratios are an effective macroprudential tool and that mortgage insurance programs can mitigate the liquidity constrain imposed by maximum LTV ratios, without reducing the effectiveness of the policy.

The discussant, John Hassler (Stockholm University), commented on the results of the econometric study. It was argued that many factors could affect the sensitivity of mortgage delinquency rates (e.g., personal bankruptcy regulations) and it would be useful to investigate whether such factors influenced the results. Turning to the theory, it was argued that whilst LTV ratios should probably reduce banks' risk exposure, it is probably more meaningful to focus macroprudential tools on households' ability to repay rather than house prices. However, LTV ratios could also be used for consumer protection purposes or to control credit growth. But to control credit growth there are likely to be better tools than an LTV ratio, e.g., monetary policy, mortgage taxes or property taxes.

The final presentation of the session was given by Howell Jackson (Harvard Law School) on "Who should be responsible for macroprudential tools". First, there was discussion of what is macroprudenital risk, what are the different transmission channels through which systemic risks can emanate from an institution's failure and what are possible macroprudential tools to address systemic risks. Next there was an overview of the different governance approaches to macroprudential policy being pursued in the US, UK and EU. Finally, there was discussion of the regulatory framework in Sweden. It was shown that the Finansinspektionen (the Swedish FSA) has low staff numbers (per capita) relative to the financial regulators of other developed economies and, given its broad mandate, it has relatively limited resources to dedicate to microprudential oversight. In addition, relatively few of its employees have advanced training in disciplines relevant to prudential oversight. The relevant expertise is often found in the other Swedish authorities but the Finansinspektionen has the information and tools.

The discussant, Charles Goodhart (London School of Economics), outlined a number of challenges to setting up and conducting macroprudential policy. It was agreed that in Sweden the Finansinspektionen is under-resourced and is unable to offer competitive salaries so has a high staff turnover. Ideally those with regulatory powers should have the analytical capacity to use the powers but at the moment in Sweden, the Riksbank has the analytical capacity but the tools lie with the Finansinspektionen. Considering the design of macroprudential policy more generally, there should be greater discussion of how we can ensure that there is

sufficient incentive to use macroprudential tools. This is challenging because it is difficult to identify potential risks and estimate when they might crystalise. Current indicators of systemic risk are complex and uncertain. On top of this, the use of macrorpudential tools can be easily criticized as it will be difficult to determine whether they have helped prevent a risk or merely dampened benign economic activity. The failure to introduce countercyclical buffers under Pillar II of Basel II illustrates the difficulty of using such tools. One possible solution is to set out specific thresholds at which the macroprudential authority must act or explain its decision to not act.

Session 4: Panel discussion – How do we avoid that real estate prices drive future financial crises?

The final session of the conference was a panel discussion involving Claudio Borio, Lucy Ellis, Stefan Gerlach and Nancy Wallace. Lucy Ellis began the discussion by looking at where risks to the financial system emanate. She proposed that commercial real estate and construction and development, not residential housing, are typically the key risks to financial stability (although this was not the case in the US in this crisis). Households typically do not default on mortgages in significant numbers unless prompted by a large increase in unemployment. Therefore, vulnerabilities in household balance sheets typically will not initiate a crisis, but they can exacerbate one. It was proposed that the effective conduct of microprudential policy is key to preventing risks in the commercial real estate and construction and development sectors, and can also help avoid house price crashes. It is important that the scope of prudential and consumer protection regulation is comprehensive, and that asset-based lending is prohibited and tax policies to promote home ownership avoided. Central banks should have a role in the regulation because they look at data differently from microprudential supervisors and are well respected public bodies than can help manage public expectations about the development of house prices. It was also proposed that the macroprudential instruments currently under debate are mostly microprudential instruments that are used for another objective, and it is not clear that macroprudential instruments are required by countries that set their own domestic monetary policy.

Claudio Borio argued that central banks need to be aggressive and long-term in their response to banking crises. However, there is a cost to such actions because monetary policy is a blunt tool so can have unintended consequences on other aspects of the economy (e.g., on the exchange rate). The authorities' optimal policy response will vary depending on the type of recession or crisis faced. Many recessions in the past not involving a financial crisis saw high levels of inflation but in this crisis inflation was low going into the crisis (and has remained low). The financial crisis evident in this crisis is likely to lead to a larger and longer recession

because the scale of the pre-crisis boom has created a large debt-overhang and disrupted the financial system, which has made monetary policy less effective. To recover from the crisis requires the economy to rebalance but low interest rates delay this.

Nancy Wallace discussed a number of issues related to the US mortgage market. She highlighted the efforts currently underway to improve consumers understanding of the risk of loan products by expressing risk with one indicator. And whilst there is not a sufficient market for debt-to-equity swaps on mortgages in the US at the moment, if debt restructuring become more common-place it will be important to educate homeowners given the financial complexity of these transactions. It was also noted that in the US, like Sweden, mortgage interest payment are tax deductible, which disproportionately benefits high-income earners. And there was discussion of how some of the major mortgage lenders in California are not regulated.

Stefan Gerlach ran through a number of his key points from the workshop. First, stronger microprudential policy is required to help 'bullet-proof' the financial system. Policy should respond gradually to the emergence of vulnerabilities, as it is easier to spot vulnerabilities than predict crises. Monetary policy is not the right tool for addressing system-wide risks so there is a need for macroprudential policy. And macroprudential policy should be introduced gradually. The macroprudential governance arrangements are important – they must be clear and sound. It should be recognized that macroprudential and monetary policy are connected so cannot be conducted independently. Low interest rates can create risks to financial stability but are sometimes warranted. Financial supervision and regulation should be tightened when risks are low. Finally, we should not forget the importance of non-financial factors, such as the bankruptcy code, recourse to loans and tax policy.

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