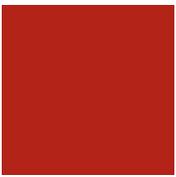




Sveriges Riksbank
Economic Review



2016:1





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Dear readers,

This issue contains six articles about monetary policy and financial stability.

- **What is the explanation for the developments in inflation 1995-2015?**

Björn Andersson analyses the driving forces behind the developments in inflation 1995–2015. He first uses the Riksbank’s macroeconomic model, Ramses, to identify factors that have held back inflation during the period. Then he analyses the explanations for the weak development of inflation highlighted by the Riksbank in the Inflation Reports and Monetary Policy Reports. Two explanations that are considered particularly important are low import prices and strong growth in productivity. The second part of the article therefore focuses on these factors and on an assessment of to what extent they have surprised the Riksbank.

- **What effect does monetary policy have on interest rates?**

Lina Fransson and Oskar Tysklind analyse the transmission mechanism for monetary policy by studying how different interest rates in the economy move when the repo rate is adjusted. This relationship is clearest for shorter market rates, the consequence of which is that the Riksbank can use the repo rate to control the very shortest interest rates in the economy. However, even the longer market rates, which are affected to a greater extent by the development of international interest rates and various risk premiums, also show relatively high covariation with the repo rate. The repo rate also has a close relationship with interest rates for households and companies, particularly at short maturities. The analysis shows that the interest rates are normally adjusted in line with changes in the repo rate.

- **Basel III – what and why?**

Jonas Niemeyer analyses extensive changes to the global regulatory framework for banks made after the international financial crisis that began in 2007. The banks’ capital adequacy has increased and new demands have been placed on their liquidity. Most of these changes have been implemented in accordance with agreements concluded by the Basel Committee on Banking Supervision. The article explains what the Basel Committee is, the background to the tightened regulations, what these regulations mean and why they are important for Sweden and Swedish banks.

- **Does the capital market create problems for the economy?**

Thomas Franzén examines whether excessively high required return on equity in companies has contributed to their investing too little in relation to what would be optimal for society. If economic policy continues to try to adapt to companies’ excessive required return on equity, it could contribute to creating financial imbalances. There is

then a risk that the development of the real economy would not be sustainable in the long term. The article therefore discusses how more reasonable return requirements can be created through stronger corporate governance, and what role economic policy can play in reducing the risks of financial imbalances arising.

- **Macroprudential policy in the Nordic-Baltic area: how does this cooperation work?**
David Farelus and Jill Billborn describe how the collaboration between Sweden, Norway, Denmark, Finland, Iceland, Estonia, Latvia and Lithuania works with regard to macroprudential policy. There is a high degree of financial integration between the countries, which creates a need to jointly manage the risks to financial stability. The article describes the roles played by the authorities in the different countries, as well as which macroprudential policy tools have been introduced and how the different authorities cooperate. It concludes with a discussion of some of the challenges remaining with regard to financial stability work in the region.
- **Thinking about the future of money and potential implications for central banks**
Paola Boel analyses how innovations on the markets for funding and payments may affect the operations of central and commercial banks. New technology is used, for instance, to apply for direct loans outside of the banking system (peer-to-peer lending), to seek crowdfunding for new projects or to use a virtual or digital currency (cryptocurrency) for payments. Technological innovations that contribute to an increase in lending outside of the traditional financial system can reduce the banks' liquidity requirements. The central banks may thus find it more difficult to influence the money supply and liquidity through interest rate setting. If payments are increasingly made through these new techniques, the central banks may also experience difficulty in overseeing the payment system. The conclusion is that it is important for central banks and supervisory authorities to closely follow these developments and to analyse their potential consequences.

Read and enjoy!

Claes Berg and Jesper Lindé

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An analysis of the driving forces behind inflation 1995-2015

BJÖRN ANDERSSON*

The author is adviser in the Monetary Policy Department at the Riksbank

The purpose of this article is to contribute to the discussion on the Riksbank's attainment of the inflation target by describing the driving forces behind inflation during the period 1995-2015. An analysis using a model of the Swedish economy is presented in the first section. These results are then compared with the descriptions of the causes for the development in inflation made by the Riksbank in real time. One recurring factor of those that have contributed to holding back inflation is low price increases on imported goods. Another important explanation is strong productivity. A third section of the article examines to what extent developments in these two factors have surprised the Riksbank. The analysis shows that productivity was much higher than the Riksbank had forecast, while forecasts for import prices, according to the measure used during the period, partly overestimated developments.

Introduction

In January 1993, the Riksbank announced that monetary policy would, with effect from 1995, be aimed at attaining a target for CPI inflation of 2 per cent. Although the Riksbank has changed a number of details in its strategy along the way, during these two decades monetary policy has been governed by this inflation target.

Monetary policy has often been a subject for economic debate during this period. The discussion has largely centred on what level is most appropriate for the Riksbank's policy rate, the repo rate, given the outlook for the Swedish economy at a particular point in time. But at times the debate has also focused on more fundamental issues, and on whether the inflation-targeting policy should be reformed in some way. In recent years, this discussion has intensified as a result of inflation targeting, as conducted in Sweden and abroad, being questioned as a result of the experiences from the financial crisis in 2008 and the ensuing economic recession.

Judging from the debate in Sweden, the majority agrees that inflation-targeting has functioned well on an overall level. It has served Sweden well, as the expression goes. One therefore should not make any overall changes to the monetary policy strategy too hastily. But of course, they should not be ruled out altogether. It is important that there is a

* I would like to thank Claes Berg, Pernilla Meyersson, Christina Nyman, Ulf Söderström and Anders Vredin for their valuable comments. A big thank you also goes to Vesna Corbo for help with the model analysis. Material provided by Stefan Palmqvist was also very useful. Any errors are of course entirely my own responsibility. The opinions expressed in this report are those of the author and are not necessarily shared by the Riksbank.

constructive and well-informed debate on possible changes that can contribute to a better monetary policy and better economic developments in general.

Naturally, a central role in this debate is the extent to which the Riksbank has attained its inflation target. Discussions on target attainment often start with what inflation has been on average over a certain period of time. Monetary policy cannot guarantee that inflation is exactly on target all of the time. But, the argument goes, although the target does not explicitly apply to the average inflation rate, the average over time should nevertheless be close to 2 per cent – if it is not, this indicates that monetary policy could have been conducted in a better way. If, for instance, the average inflation rate has been below 2 per cent, as has been the case with CPI inflation, monetary policy could have been more expansionary, which could probably have contributed to a stronger development in, for instance, growth and employment.

However, it is difficult to discuss changes to the framework for implementing monetary policy to improve target attainment without first analysing *why* inflation has deviated from the target and to what extent the Riksbank has *predicted* the factors that have led to the deviation. Without this kind of analysis it is difficult to gain an impression of which changes to the framework might be justified and how target attainment could be improved if they were made.

The purpose of this article is to contribute to the discussion on target attainment by, to begin with, presenting an analysis of the driving forces behind inflation outcomes during the period 1995-2015. This analysis is divided into two sections. The first uses the Riksbank's macroeconomic model, Ramses, to identify factors that have pushed down inflation during the period. The second section presents the explanations for the weak development of inflation highlighted by the Riksbank in the Inflation Reports and Monetary Policy Reports. This analysis is interesting in itself, as it provides a more detailed picture of developments. Although Ramses is a relatively complex model, it is of course a stylised representation of the Swedish economy. Moreover, it is interesting to see how the Ramses analysis concurs with the Riksbank's analysis of economic developments made in real time.

The conclusions from these sections are, in brief, that different factors have been particularly important for the development of inflation during different periods. Although the model results are in some cases open to interpretation, they largely concur with the descriptions of the driving forces behind inflation contained in the reports. Among the various factors low price increases on imported goods and services have recurred in the reports as an explanation for the low inflation. Periodically this has been linked to weak international economic activity and/or a strong krona, but sometimes the reasons have not been as clear and the reports have also highlighted more structural explanations, such as the shift in the Swedish import patterns to countries with lower prices. Another important factor holding back inflation, according to the Riksbank's reports, has been the strong development in productivity. However, here too the causes have been difficult to identify with any degree of certainty.

The review of the Riksbank's analysis of the driving forces behind low inflation provides a background to the second part of the article, which focuses on the Riksbank's actions. The Riksbank's forecasts for inflation during this period generally overestimated inflation – this is for example documented in the material the Riksbank compiles every year for the Riksdag Committee on Finance's assessments of monetary policy.¹ If the forecasts had been more accurate, monetary policy would probably have been more expansionary during this period.² This would in turn probably have contributed to average CPI inflation being closer to 2 per cent.³

So why was inflation overestimated? The main explanation, according to the material provided for the Committee on Finance's assessment, is that the Riksbank was surprised by factors that caused inflation to be lower than expected. These include, of course, several of the factors behind the low inflation discussed in the first part of the article. However, two factors that have been emphasised as particularly important among these are low import prices and strong productivity. The second part of the article therefore focuses on these two factors and to what extent they have surprised the Riksbank.

The conclusions from this analysis are that the Riksbank's forecasts for import prices excluding oil products overestimated the size of the price increases round the middle of the 2000s. This was partly counteracted by the increases in oil prices being underestimated. But much suggests that surprisingly low import prices were an important explanation for inflationary pressures at longer horizons being overestimated by the Riksbank. However, this conclusion is based on what turned out to be an uncertain assumption that the measure of import prices on which the Riksbank based its forecasts actually reflected developments in import prices satisfactorily. With regard to productivity, the analysis shows that it was much stronger in the 2000s than the Riksbank had predicted, which probably contributed to the overestimation of inflationary pressures in the economy. Later revisions to the National Accounts also indicate that inflationary pressures were even lower than there was reason to believe in real time.

1 Previously, this material was included as an in-depth article in the first Inflation Report published every year. From 2008 onwards, the material is published in a separate series of reports known as *Account of Monetary Policy* (prior to 2013, *Material for Assessing Monetary Policy*).

2 It is probable, but not definite. Possibly, the forecasts would then have indicated lower inflationary pressures in the economy and scope for lower interest rates, all else being equal. However, monetary policy is not only governed by inflation prospects. The outlook for the real economy also plays a role, for instance, and this outlook would also have been different.

3 This conclusion is consistent with how one normally imagines the correlation between a central bank's policy rate and inflation, that is, when the central bank cuts the policy rate, this contributes through various channels to an increase in inflation. One complication in the case of Sweden is that this is not self-evident in the shorter term for CPI inflation, as interest rate adjustments also have a counteracting effect on the CPI via household mortgage costs. This singularity of the Swedish CPI is discussed in more detail in the text.

The driving forces behind inflation 1995-2015

As Table 1 indicates, inflation has on average been lower than the target level since 1995.⁴ Exactly how much lower depends on whether or not one uses real-time data. In 2005, Statistics Sweden changed its method for calculating CPI inflation and at the same time recalculated earlier inflation outcomes in line with the new method. However, when analysing and evaluating monetary policy, it is more accurate to use the earlier definition of CPI inflation for the years prior to 2005, as it was inflation according to this definition that the Riksbank used as a basis for its analysis and that the Riksbank was evaluated by in real time.

Given that, the CPI increased on average by 1.2 per cent a year during the period 1995-2015 (1.1 per cent if one ignores the method change in 2005). As a comparison, Table 1 also includes the average inflation rate according to two other measures often used. The CPIF is the CPI where interest expenditure is calculated using a fixed mortgage rate, while the HICP is the harmonised index for consumer prices prepared by the EU. Inflation according to these two measures was on average 0.4 and 0.3 percentage points higher per year, respectively, during the period 1995-2015 in relation to CPI inflation.

Table 1. Average inflation

Per cent	1995-2001	2002-2008	2009-2015	1995-2015
CPI, real time	1.3	1.8	0.6	1.2
CPIF, real time	1.9	1.8	1.2	1.6
CPI	1.0	1.7	0.6	1.1
CPIF	1.6	1.8	1.2	1.5
HICP	1.4	1.8	1.1	1.4

Note. The table shows the average value of the monthly outcomes for the annual percentage change in the CPI, the CPIF and the HICP in different periods. "Real time" here means that CPI inflation in 1995-2004 is calculated according to the definition that applied during those years. Calculation of the CPIF began in June 2008, that is, the series for CPIF real time is the one that would have applied if the CPIF had been available in real time during the period. Data for the HICP is available from 1995, which means that the average values for HICP inflation are calculated with effect from 1996.

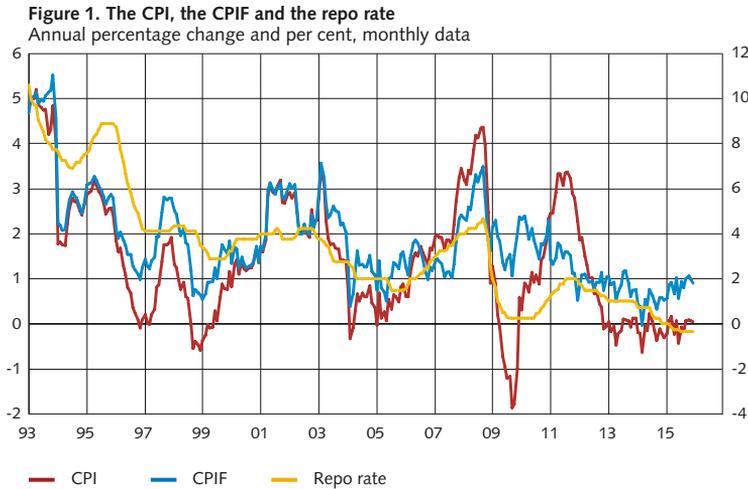
Sources: Statistics Sweden, Eurostat and own calculations

Given that the CPI increased by almost 9 per cent a year on average during the period 1975-1990, there was thus a clear slowdown in inflation in the middle of the 1990s. Why did inflation slow down like this? A preliminary observation is that Swedish is not alone in having experienced such a change; it was an international trend. The starting point varies a little between countries, but generally speaking there was a period from the mid-1980s when inflation levels and fluctuations in many industrial nations' economies were dampened substantially in relation to earlier decades. The reasons for this development, "the Great Moderation" as it came to be called, have been the object of considerable

⁴ In January 1993, the Riksbank announced that monetary policy would, with effect from 1995, be aimed at attaining an inflation target of 2 per cent, with a tolerance interval of +/- 1 percentage point, with inflation being measured as the change in the CPI. Over the two years leading up to 1995, monetary policy was to be aimed at preventing the underlying rate of inflation, which had decreased to a level around two per cent, from increasing again.

analysis and debate.⁵ Most likely, it was the result of several interacting factors. However, there are many indications that the changes in the monetary policy area that took place on a broad front during this period, not least the introduction of an inflation target in many countries, was an important factor behind the slowdown in inflation.⁶

Figure 1 illustrates the monthly developments of inflation according to the CPI and the CPIF and the Riksbank’s repo rate from the introduction of the inflation target in 1993 and onwards. As shown in the figure, there was a clear and relatively sudden slowdown in inflation at the beginning of the period, when confidence in the inflation target was established in Sweden. As a natural consequence of this, interest rates also declined, and the Riksbank gradually cut the repo rate from an average of more than 10 per cent at the end of the 1980s and early 1990s to around 2 per cent.



Note. CPI and CPIF inflation are measured on the scale on the left-hand vertical axis, while the repo rate is measured on the scale on the right. Both inflation rates are real-time series, that is, the values 1995-2004 are calculated according to the definitions of the CPI applying in these years. Calculation of the CPIF began in June 2008, which means that the real-time series for the CPIF is the one that would have applied if it had been available in real time during the period.
Sources: Statistics Sweden and the Riksbank

THE SIGNIFICANCE OF THE INTEREST RATE FOR CPI INFLATION

So Sweden was not alone in experiencing a sequence of events whereby interest rates slowed down in this way. But a period with a falling interest-rate trend has a direct and relatively large effect on CPI inflation in Sweden via the component that measures housing costs, unlike the way inflation was affected in other comparable countries. This component can be calculated in different ways. Sweden uses an approach where mortgage interest expenditure plays an important part. The same approach is also used in Canada, but the

5 For a survey of the discussion of the “the Great Moderation”, see Bernanke (2004).

6 See, for instance, Summers (2005) and Giannone, Reichlin and Lenza (2008).

properties in the method of calculation differ somewhat and the effects on the CPI become relatively larger in Sweden.⁷ The effects are also long-lasting. So when mortgage rates fluctuate, this component provides a relatively large contribution to the fluctuations in CPI inflation in Sweden.

The fact that the fall in interest rates is an important explanation for the low CPI inflation becomes clear if one compares CPI inflation in Figure 1 (the red line) with inflation measured as the change in the CPIX (the blue line) since the difference between those lines represents the effects of interest expenditure on CPI inflation. The figure shows that interest rate increases in certain periods have contributed to pushing up CPI inflation (the red line is above the blue one). But for the period as a whole, the relationship has mostly been the reverse. Interest rates in general have shown a downward trend that has contributed to holding down CPI inflation around 0.4 percentage points on average (see Table 1). Measured in terms of the CPIX, inflation was on average 1.6 per cent per year for the period 1995-2015, according to real-time data (1.5 per cent without real-time adjustment).

As also illustrated in Figure 1 and Table 1, the downward trend in interest rates can largely be attributed to two specific episodes. Firstly, interest rates fell substantially at the beginning of the period in connection with the introduction of the inflation target, the implementation of reforms in the fiscal-policy framework and the strengthening of confidence in Swedish economic policy after the 1990s crisis. This contributed to pushing down the CPI during the second half of the 1990s. Secondly, the Riksbank cut the repo rate heavily from the end of 2008 in connection with the financial crisis, which had a considerable effect on CPI inflation. During these periods of falling interest rates, the average CPI inflation is clearly lower than the average CPIX inflation. During a period without a clear trend in interest rates, for instance 2002-2008, the average for the two inflation measures is in principle the same.⁸

FACTORS THAT HAVE AFFECTED INFLATION ACCORDING TO THE RIKSBANK'S MACROECONOMIC MODEL OF SWEDEN'S ECONOMY

Which factors have been the main driving forces and contributed to the relatively low average inflation rate during the inflation-targeting period? One tool that can be used to try to answer this question is the Riksbank's macroeconomic model of the Swedish economy, Ramses.⁹ This model is used mainly in the Riksbank's forecasting process and in calculations of the effects of different monetary policy alternatives. However, it can also be used to try to determine why, for instance, inflation has developed in a certain way.

7 Further details of how mortgage interest expenditure is calculated in the Swedish CPI can be found in Johansson (2015). The differences between Swedish and Canadian CPI with regard to calculations of interest expenditure are described by Palmqvist (2013).

8 For a more in-depth description of the downward trend in interest rates and the average development of inflation, see Andersson, Palmqvist and Österholm (2012).

9 The model is described in Adolfsson, Laséen, Christiano, Trabandt and Walentin (2013). The official name of the model is Ramses II, to mark that the current version of Ramses is a revised and further-developed version of the original model.

Ramses is a so-called dynamic stochastic general equilibrium model, which tries to explain the development in the Swedish macroeconomy as a result of an interplay between households, companies, the government and central banks, as well as supply and demand on many different markets at the same time. That the model is dynamic means that it is possible to study the development of the economy over time. That it is stochastic means that it includes events outside of the model – random shocks – which can make developments deviate from how the modelled relationships have developed historically.

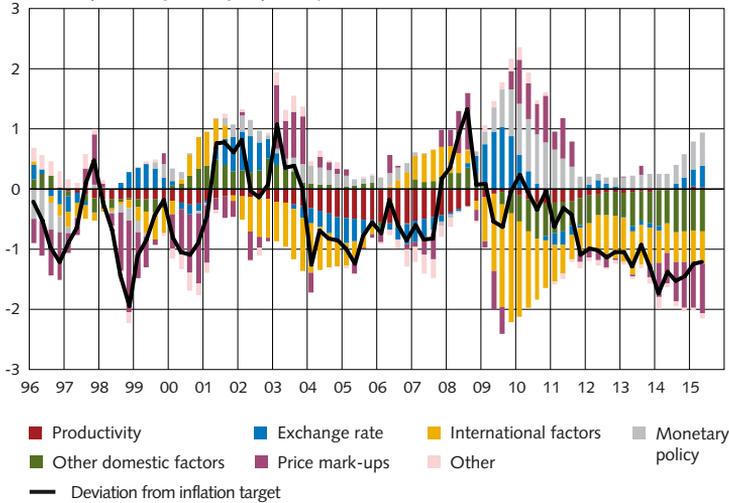
The shocks thus say something about why the economy did not develop in accordance with historical correlations. Ramses contains a large number of shocks, each of which has a unique effect on the economy. Although some of the shocks are more closely linked to fluctuations in some of the variables included in the model, usually each variable – interest rate, exchange rate, growth, inflation and so on – will be explained by a number of different shocks acting together.

Figure 2 shows one such analysis of the quarterly, annual percentage change in CPIF inflation, that is, inflation excluding the effects of interest rate changes as discussed above. More precisely, it is the reasons for CPIF inflation deviating from 2 per cent, according to Ramses, that are illustrated in the figure. An account of all of the individual shocks would be difficult to overview, so to make the analysis easier, the shocks have been grouped and each group has been allocated a particular colour. In a particular quarter (groups of) shocks have contributed to different extents to pushing up inflation – those above the zero mark – while other have contributed to pushing down inflation – those below. The net outcome of the different shocks, which is then CPIF inflation's deviation from 2 per cent, is illustrated by the black line in the figure.¹⁰

¹⁰ See Adolfson, Laséen, Christiano, Trabandt and Walentin (2013) for details regarding the different shocks. A more intuitive description and deeper analysis of the shocks that, according to Ramses, were important for the developments of inflation in 2010-2015 can be found in Andersson, Corbo and Löff (2015).

Figure 2. Contribution to the CPIF from different shocks in the Riksbank's macro model Ramses

Annual percentage change, quarterly data



Note. The figure illustrates developments in terms of CPIF inflation's deviation from two per cent. CPIF inflation is not a real-time series in this case, which means that developments here differ somewhat from Figure 1 for the period 1996-2004.
Sources: Statistics Sweden and own calculations

The period 1996-2000: price mark-ups, monetary policy, international developments and productivity

Figure 1 showed that inflation excluding the effects of interest rate changes was at a level just below 3 per cent in 1994-1995. In 1996, inflation then fell to below 2 per cent and apart from a temporary peak during the second half of 1997, inflation was low until the start of 2001. The model analysis in Figure 2 indicates that the explanation for the weak inflation up to 1998 can mainly be attributed to shocks to *monetary policy* (grey columns) and companies' *price mark-ups* (purple columns). However, *international developments* (yellow columns) and, during a short period, shocks to the *exchange rate* (blue columns) contributed to holding back inflation. From 1998, the shocks to price mark-ups continued to be an important factor and weaker international developments than normal took on a larger role. At the same time, *productivity* shocks (red columns) become a minor but persistent factor behind the low inflation.¹¹

It is important to note that the columns in Figure 2 capture changes that cannot be explained by the relationships that normally govern how different variable move according to the model. Monetary policy, for example, is explained in Ramses by a simple policy rule,

¹¹ The group "other" (pink columns) largely consists of what the model interprets as measurement errors, which are changes in inflation that are difficult to combine with the developments in other variables according to the correlations in the model. As shown in Figure 2, the contribution from this group may be relatively large in some quarters, but the contributions are usually small.

where the interest rate is basically determined by inflation and resource utilisation in the economy. If the interest rate has been lower or higher than implied by the policy rule, that is, if it has been more expansionary or tighter than normal, the model interprets this to be a shock to monetary policy. During 1996, and to some extent also 1998/1999, a tighter monetary policy than normal thus contributed to holding back inflation, according to Ramses.

As Figure 2 also shows, the shocks to company price mark-ups (purple columns) were the single most important explanation for inflation being pushed down during the second half of the 1990s. In the model, the price of a product is set at the cost of producing an additional unit of the product plus a mark-up. The size of the mark-up is determined by, for instance, how much competition there is on the market in which the company is active as well as by demand. The mark-ups will vary over time, depending on changes in the companies' costs and in demand for their products. During the second half of the 1990s, prices thus increased unusually slowly given cost developments, which Ramses captures as shocks to the price mark-ups. In this context it is important to point out that shocks to the price mark-ups can also capture changes in inflation that are due to factors that are not explicitly included in the model (more on this later).

The period 2001-2003: exchange rate, monetary policy, price mark-ups and other domestic factors

During 2001, inflation rose to a relatively high level. It did fall temporarily in 2002, but over the period 2001-2003 as whole CPIF inflation was on average above 2 per cent. As Figure 2 shows, the turn to high inflation is initially due to a large positive contribution from *international developments*, but this soon turns into a large negative contribution. Instead, it is primarily shocks to the *exchange rate, monetary policy* and other *domestic factors* (green columns) that contribute to keeping up inflation 2001-2002, while major effects of shocks to *price mark-ups* push up inflation in 2003. During this period, an increasingly expansionary monetary policy (according to the simple policy rule) contributed to pushing up inflation, while disruptions to other domestic factors that affect companies' cost pressures and demand for their products also contributed to pushing up prices. At the same time, the krona weakened relatively substantially compared to how it normally changes according to the model, and this contributed to higher inflation.

The large positive effect of the shocks to price mark-ups in 2003 might be an example of a change in inflation that is driven by a factor that is not included in the model. In 2003, energy prices rose considerably and they are not modelled explicitly in Ramses. Changes in energy prices affect companies' production costs and these costs are included in the model. However, changes in energy prices also have a direct effect on consumer prices through prices on fuel and heating, and this effect on inflation may instead be interpreted by the

model as a shock to the price mark-ups. It has been shown that the direct contribution from energy prices to CPIF inflation periodically covaries closely with the contribution to inflation from the price mark-ups in Ramses.¹²

The period 2004-2007: productivity, international developments and the exchange rate

At the beginning of 2004, inflation fell substantially and remained at a low level until the end of 2007. As Figure 2 shows, Ramses mainly links this to an unusually strong growth in *productivity*. Productivity shocks did contribute to dampening inflation in previous years, but during a period in the mid-2000s, this contribution increased and became considerably larger than before. Shocks to the *exchange rate* and, at the beginning of the period, *international developments*, contributed to the low inflation from 2004 and onwards. In individual quarters there are also negative contributions from shocks to the *price mark-ups*.

Productivity can be measured in different ways. Labour productivity measures production per work input, that is, the number of working hours or the number of people employed. The fact that labour productivity has risen can be due to an increase in the efficiency of the employees, or to investments in more or better machinery. Total factor productivity (TFP) is a measure of production in relation to the input of *all* production factors, not just labour. TFP increases are often associated with technological development or organisational improvements which mean that more can be produced with the same quantity of production factors. It is shocks to the TFP that are illustrated in the red columns in Figure 2. In other words, unusually large increases in production given the input of labour and capital contributed to holding back production costs and thereby price increases in the mid-2000s.

*The period 2008-2015: international developments, domestic demand and price mark-ups*¹³

From the end of 2007, inflation rose markedly and in autumn 2008 it was at a record-high level, seen over the entire inflation-targeting period. Ramses explains the upturn primarily with contributions from *international developments*, unusually high *price mark-ups* and also other shocks that pushed up *domestic demand* and *cost pressures*, despite productivity still being unusually high and holding back cost increases.

When Sweden then was hit for real by the financial crisis from autumn 2008, this rapidly turned around and both international developments and domestic demand contributed substantially to subduing inflation. However, according to the model this was counteracted by an unusually weak exchange rate, expansionary monetary policy and high price

¹² See Andersson, Corbo and Löf (2015).

¹³ A more detailed Ramses analysis of inflation over the past five years can be found in Andersson, Corbo and Löf (2015). Note that the grouping of the different shocks is slightly different there. The groups called "domestic cost pressures" and "domestic demand" in that article have been combined into one single group called "other domestic factors" in this article. However, the shocks to productivity have been removed from the group "domestic cost pressures" and are reported separately here.

mark-ups, which in principle balanced the large negative shocks. CPIF inflation therefore remained close to 2 per cent.

Towards the end of 2011, CPIF inflation fell to around 1 per cent and remained there until the end of 2013, when it declined somewhat further. After that, inflation rose towards 1 per cent again. As shown in Figure 2, the explanation for this given by the model is that negative contributions from the weak *international developments* and *domestic demand* have continued to dampen inflation, while the positive contributions from, for instance, the exchange rate, monetary policy and price mark-ups have not been as large as before. On the contrary, unusually low *price mark-ups* have pushed down inflation to a relatively large degree the past two years.

FACTORS THAT HAVE AFFECTED INFLATION ACCORDING TO THE RIKSBANK'S REPORTS

After the review of Ramses' explanation of the forces driving inflation over the past two decades, follows a description of the main explanations highlighted by the Riksbank in its Inflation Reports and Monetary Policy Reports. There are several reasons why such a description may be interesting. To begin with, it gives a more detailed picture of developments during this period than the model analysis. It is also interesting to compare how well this picture coincides with Ramses' interpretation.¹⁴ The model analysis is made with "the benefit of hindsight", that is, with the information on developments during the period that we have available now (including revised statistics). The Riksbank's reports during this period, on the other hand, provide a real-time description of developments, where the driving forces behind the low inflation rate are identified as new statistics and results from new analyses become available.

It is important to note that the description of the driving forces behind the low inflation described in this section is the Riksbank's *interpretation* of developments in the economy – an interpretation that is not necessarily entirely correct. It is not always easy in real time to identify with certainty the underlying trends and driving forces in the economy.¹⁵ The fact is that uncertainty regarding changes in trends and long-term connections is something that often recurs in the reports during the period. The aim has been that the description below, in addition to summarising the underlying driving forces, should also to some extent reflect this.

¹⁴ The Riksbank's explanation of developments in real time has of course been influenced by the Ramses analysis made during the period, that is, from around 2004/2005 when the model was first used in policy work. However, the early version of Ramses differs considerably from the current version.

¹⁵ However, the Riksbank's interpretation probably does not differ very much from those made by other institutions during the period.

The period 1996-1997: increased confidence in economic policy and lower “inflation propensity”

The Riksbank's Inflation Reports from 1996 explain the low inflationary pressures in the economy as being partly due to economic activity. During 1995, economic activity weakened in Sweden and abroad. Although it began to rise again in 1996, it was noted that household demand was still relatively subdued and that there was spare capacity in the economy. However, the main explanation given for the low inflationary pressures was falling interest expenditure and falling import prices as a result of the krona appreciation since the end of 1995. According to the Riksbank these two factors, falling interest rates and a stronger exchange rate, were essentially a positive development since it interpreted this as an expression of greater confidence in Swedish economy policy, which had been very low following the crisis in the early 1990s.

It was also noted that there was a more underlying trend, where companies' behaviour appeared to have changed in relation to the situation before the 1990s crisis. The inflation propensity, as it was called, appeared to have declined in the economy, which held back price increases. This was a recurring theme in the Inflation Reports published in 1996-1997 and there were discussions of the possible explanations for the decline in inflation propensity as well as how long this phenomenon might last.¹⁶

Given that the Riksbank cut the repo rate by almost 5 percentage points in 1996 (see Figure 1) and that market rates fell at the same time, it is not so strange that CPI inflation was pushed down by interest expenditure. What may appear odd, however, is that Ramses finds that monetary policy also contributed to holding back inflation *excluding* the effect on interest expenditure in 1996-1997. The large cuts in the repo rate were made with the opposite intention, that is, to counteract the slowdown in the economy and increase economic activity and thereby inflation.¹⁷ But Ramses' interpretation of developments is not so strange if one considers that the interest rate was still above 4 per cent at the end of 1996, despite the large cuts. Compared with the period on which the analysis in Ramses is based, that is, 1995-2014, this is a relatively high level given that underlying inflation was around 1 per cent. As inflation expectations had begun to stabilise around 2 per cent in 1996, the real repo rate was also relatively high.

The fact that the large cuts in the repo rate in 1996 began from just below 9 per cent – a high level compared to the rest of the period – was partly due to the Riksbank *raising* the repo rate in 1994-1995. This tightening and the fact that the cuts did not begin until 1996 was criticised in the monetary policy debate, partly because demand and inflationary

16 See, for instance, the article “Has the inflation process changed?” in *Inflation Report 1997:2*. This article is based on the analysis in Berg and Lundkvist (1997).

17 It was noted in Inflation Report 1996:3 that confidence in Sweden as a country with low inflation was being established in 1996, which contributed to creating the scope for monetary policy easing that was used over the year. “For the first time in recent decades a more expansionary monetary stance could accordingly be used to counter an international slowdown” (p. 25).

pressures were already held back by the consolidation in public finances.¹⁸ Moreover, the appreciation of the krona from the middle of 1995 together with weaker economic activity contributed to further dampening inflationary pressures. The Riksbank's view was that in autumn 1995 there were signs that inflation would overshoot the target and, additionally, inflation expectations and outcomes of wage negotiations in spring 1995 indicated that the credibility for the inflation target had not been fully established. The strengthening of confidence that did appear to have taken place made an impression in the sense that the repo rate was not raised further in autumn 1995, despite the assessment that the inflation target would be overshoot in a couple of years' time.¹⁹

The period 1998-2001: Asian financial crisis, low resource utilisation and deregulations

Towards the end of 1997, underlying inflation rose, which was largely explained by increases in indirect taxes and some administratively determined prices, such as apartment rents. In the middle of 1997, the so-called Asian financial crisis broke out, when a number of countries in South East Asia suffered problems with depreciating currencies and large capital outflows. The crisis deepened in 1998 and its consequences contributed to turbulence on the financial markets and weaker economic developments for a couple of years.

The Riksbank explained the relatively large fall in Swedish inflation in 1998 in its Inflation Reports as largely due to the effects of the Asian crisis. Prices of imported goods fell in 1998 as a result of weaker international demand in general and a decline in the oil price in the wake of the crisis in particular. The Inflation Reports show that CPI inflation in 1998-2000 was also held back by what were called "temporary effects", first of changes in indirect taxes and subsidies and then price changes linked to deregulation on various services markets.²⁰

During 1999, international economic activity began to improve somewhat and the price of crude oil rose substantially up to the end of 2000. This pushed up import prices through prices of petrol and domestic heating oil. However, the development of import prices on more processed goods remained subdued, which the Riksbank said could be partly due to tougher international competition than before. Resource utilisation in Sweden was still low. Moreover, the relationship between resource utilisation and inflation seemed to have changed, both in Sweden and abroad. The strong productivity growth in Sweden since the mid-1990s was also beginning to gain scope in the Inflation Reports and there were discussions of possible reasons for this.

18 The Riksdag Committee on Finance and the Government later stated that these cuts should have been made earlier and at a faster pace. See the Committee on Finance report 1998/99:FiU23 and appendix 5 to the 2001 Spring Budget Bill.

19 See Bäckström (2003), who also comments on the criticism levelled at the Riksbank.

20 For instance, there was a cut in tobacco tax in the middle of 1998, which had a dampening effect on CPI inflation up to the end of 1999 (as inflation measures the change in prices over 12 months). From the middle of 1999 onwards, prices of electricity and telecommunications services were held back, probably due to deregulation.

The period 2004-2007: strong productivity and low increases on prices of import goods

From 2001, inflation rose sharply. Supply shocks in the form of large price increases on oil, electricity, meat as well as fruit and vegetables contributed in various periods to pushing up CPI inflation. However, inflation rose even when these effects were excluded. From the Inflation Reports during the period it appears that the Riksbank was not completely sure why, but one hypothesis was that a relatively high level of resource utilisation in Sweden had led to companies being able to pass on their increased production costs to higher prices to a greater extent than before. Questions were also raised about the earlier view of the relationship between growth and inflation and how much it had actually changed.

At the beginning of 2004, inflation fell substantially and remained at a low level until the end of 2007. This rapid fall in inflation was partly due to prices being pushed up temporarily at the beginning of 2003 due to a spike in energy prices. The large upturn in energy prices in 2003 was also the reason why the Riksbank based its monetary policy that year on a measure of underlying inflation that excluded energy prices.

From the Inflation Reports published in the period 2004-2007 it is otherwise clear that strong productivity growth is one of the main explanations for the low inflation. Productivity, together with moderate wage increases, contributed to combining strong growth with low wage pressure. The Riksbank observed that the reasons for the rising trend in productivity since the mid-1990s were not entirely clear, which made it difficult, for instance, to determine how long this development would last. One sector that also aroused particular interest in the Inflation Reports was the retail trade, where food prices fell 2004-2005, something that was partly explained with reference to low-price supermarket chains establishing in Sweden leading to tougher competition.

The second main explanation for the low underlying inflation highlighted by the Riksbank during this period was the low increases in prices of imported goods. The oil price rose quickly at times, and contributed to pushing up import prices. But this was counteracted by a very subdued development in prices of other import goods. The Riksbank attributed this partly to increased international competition probably holding back price impulses more than previously in comparable economic conditions. Another possible explanation mentioned was that there may have been changes in the Swedish import pattern where imports from countries with relatively high prices were increasingly being replaced by imports from countries where prices were relatively low. This shift in import patterns would then contribute to reducing the prices paid by Swedish importers.

The krona exchange rate was also suggested as an explanation for the low import prices. The krona appreciated more or less constantly from 2002 and until the end of 2004, but during 2005 there was a turnaround, and the krona depreciated. However, it was pointed out in the Inflation Reports that it normally takes time before exchange rate changes affect domestic pricing. This indicated that the earlier strengthening of the exchange rate probably played a role in the lower increases in import prices in the years following 2004. Finally, it was also noted that the strong productivity and the low domestic cost pressures

not only held back price increases on domestic production, but also prices of import goods, as these are also affected by domestic costs for processing, distribution and so on.

The period 2008-2015: financial crisis, international recession and considerable uncertainty

From the end of 2007, inflation rose sharply and in summer 2008 it was at its highest level since 1993. Resource utilisation in the economy rose and the labour market became tighter, which was reflected in higher wage agreements than before. Altogether, this meant that cost pressures increased. The Riksbank's reports also show that another important reason for inflation rising was that food and energy prices increased substantially.

The situation changed in autumn 2008, when the problems on the financial markets, which had spread from the US mortgage market, worsened drastically. The international economic downturn deepened and world trade ground to a halt. This had a dramatic impact on the Swedish economy and GDP fell heavily in 2009, at the same time as unemployment rose. Inflation fell rapidly from the record levels, but despite the economic downturn, it remained relatively high and CPIF inflation was back above 2 per cent at the end of 2009.

Economic activity began to recover from summer 2009, albeit from a low level. During 2010, there was a strong recovery in Sweden and the positive development continued during the first half of 2011. However, over the summer and autumn the international financial markets were increasingly affected by uncertainty linked to the public finances situation in some euro area countries and the United States. This contributed to breaking off the international recovery and as a result the Swedish economy slowed down sharply at the end of the year. Economic activity was still weak in 2012 and the Swedish economy was increasingly affected by the low demand in the euro area during the second half of the year and this continued to hold back economic activity in Sweden under 2013 as well.

CPIF inflation fell from around 2 per cent to a level of around 1 per cent in 2011. It remained there until the middle of 2013, when it fell further. The low inflationary pressures were explained in the Riksbank's reports partly by low increases in the prices of imported goods, due to the weak international developments. Moreover, the krona had strengthened considerably in 2010, as economic developments in Sweden had been relatively stronger than those in other countries. This contributed to holding back import prices in the years following 2010.

With regard to domestic cost pressures, moderate wage increases combined with high productivity growth had contributed to a decline in unit labour costs in 2010. The increases in these costs were on a more normal level during the following years, but they then slowed again in 2013, which held back inflationary pressures. From 2012 and onwards, low increases in energy prices also contributed to pushing down inflation. A further factor emphasised in the Riksbank's reports was that companies appeared to be finding it unusually difficult, from an historical perspective, to raise their prices in line with cost

increases. The reasons for this could be the considerable uncertainty over international economic activity and the fact that companies perceived an increased competitive pressure.²¹

Summary: The driving forces behind inflation

Summarising the sections above on the factors contributing to the development in inflation during the period 1995-2015, a first observation is that the driving forces the Riksbank has highlighted in its reports during the period concur well with the driving forces identified by Ramses as important.

Of course, they do not concur completely. In addition to the fact that the model cannot for natural reasons capture all details of the economy, there are also other explanations. For instance, the reports reflect the Riksbank's views as developed in real time as new data was accessed and new analyses were made. The model, on the other hand, uses data for the entire inflation-targeting period and revised statistics.

Another difference is that the analysis in Ramses identifies factors that have made unusually large contributions to inflation in relation to normal patterns. The reports' explanations for the development of inflation on the other hand reflect both normal and abnormal factors. This can be an explanation as to why the reports highlight, for instance, cyclical developments and the exchange rate as important in certain periods, while Ramses does not. Economic activity or the exchange rate may then very well have contributed to, for example, pushing down inflation, but not to an unusual extent compared to how economic activity, the exchange rate, inflation and so on normally move together according to the model.

With regard to individual driving forces that have contributed to holding back inflation according to the Riksbank's reports, low price increases on imported goods have been a recurring factor. The explanation as to why import prices have been low has varied and it has not always been possible to identify this with any certainty. Periodically, the Riksbank has been able to clearly point to weak economic activity abroad and/or a strong krona. Sometimes, more "structural" causes have been emphasised, such as increased global price pressure as a result of tougher competition or changes in Swedish import patterns where goods to a larger degree are imported from countries with lower prices. The fact that international developments have been an important factor behind the development of inflation is supported by the analysis in Ramses, although according to the model results it is difficult to determine whether it is a question of "normal" cyclical effects or structural changes. Changes of the latter form can also be interpreted by the model as unusually low price mark-ups by companies.

According to Ramses, price mark-ups were the single most important factor behind the low inflation during the second half of the 1990s. Intuitively, this agrees well with the explanations in the Inflation Reports regarding cuts to indirect taxes and deregulation

²¹ See Andersson, Corbo and Löf (2015) for more details on the causes of the low inflation in recent years.

of various markets during this period. Such changes can affect price levels and thus temporarily affect inflation. As the shocks to price mark-ups in Ramses capture “abnormal” variations in inflation given the cost increases in the companies, they will probably capture these temporary changes.

It is also possible that the shocks to price mark-ups capture the reports’ explanations that are more about structural factors, such as a decline in inflation propensity and lower trade-off between resource utilisation and inflation – precisely because these are variations that cannot be explained by the normal relationship between these variables. However, one should bear in mind that the “normal” relationships in this case apply to different periods. What is described as normal in the Inflation Reports during the second half of the 1990s is based on data for the 1980s and early 1990s. What the model regards as normal, on the other hand, is based on data for the period 1995-2014. So the fact that the model identified unusually low price mark-ups at the end of the 1990s can be consistent with the reports’ explanation that the relationship between inflation and resource utilisation was abnormally weak at that time. However, the comparison is then with data for the period from 1995 onwards, rather than data for the period prior to 1995.²²

An important factor behind the low inflation that has been emphasised in the Riksbank’s reports is the unusually strong productivity. This explanation gains increasing scope in the reports from the end of the 1990s. Ramses also identifies unusually large productivity improvements having contributed to pushing down inflation since the end of the 1990s, but the model indicates that it was in the mid-2000s that productivity growth had greatest significance.

To some extent the difference may reflect the fact that the reports and the model focus on different measures of productivity. The growth in labour productivity that the reports focus on was stronger in the mid-1990s and showed a relatively high trend level up until the financial crisis. Analyses made during the period indicated that the strong development was initially driven by investment in new capital, largely information and communication technology, rather than TFP.²³ This situation changed at the start of the new millennium and it was then primarily TFP that was growing strongly, which concurs with the model’s results. The reasons for the strong TFP were unclear, but one possible explanation raised was that a gradual increase in the use of information technology had entailed efficiency gains in production. However, other possible explanations were also mentioned, such as increased international and domestic competition and other structural changes in the economy.

22 Note that this does not apply to the unusually small price mark-ups during the second half of the 1990s. In recent years when the Riksbank has highlighted unusually low price mark-ups as an important factor behind the low inflation, the period being analysed is in principle the same as the one on which the analysis in Ramses is based.

23 See, for instance, the article “Driving forces behind productivity” in *Monetary Policy Report* 2007:2.

Why was inflation lower than expected?

So far, the focus has been on describing the factors behind the development in inflation during the inflation-targeting period. As the section above showed, these factors have generally contributed to pushing down inflation. On average, inflation has thus been low. More specifically, it has been lower than the Riksbank's inflation target of 2 per cent. Opinions differ on what conclusions should be drawn from this regarding how well monetary policy has been conducted. But irrespective of this, one can note that the average CPI inflation rate would probably have been higher and closer to the target if monetary policy had been even more expansionary.²⁴

So why wasn't it? One way of answering this question is to start with the Riksbank's inflation forecasts. The material on which the Committee on Finance's annual assessments of monetary policy are based shows that the inflation forecasts have generally overestimated how high inflation would become. Given this, one can draw the conclusion that if the forecasts had been accurate, and the Riksbank had known that inflationary pressures would be so low, then monetary policy would probably have been more expansionary.

The Riksbank's explanations as to why inflation was overestimated were that it was surprised by factors that caused inflation to be lower than expected. The reports' descriptions of inflation identify a number of possible factors. But even if they have held back inflation during this period, it is not self-evident that they have also held back inflation *more* than the Riksbank was expecting. To investigate whether this is the case, one needs to analyse the Riksbank's assessments of these factors.

Based on the first part of this article, it is evident that surprisingly low import prices and an unexpectedly strong growth in productivity are two main candidates for factors that have caused the Riksbank to overestimate inflation. Moreover, the Riksbank has previously highlighted these particular factors as explanations for forecasting errors in the reports provided for the Committee on Finance's assessments.²⁵ The section below therefore describes in greater detail the Riksbank's forecasts for these variables.

THE RIKSBANK'S FORECASTS OF IMPORT PRICES

As described above, the inflation impulses from abroad were in focus right from the start of the inflation-targeting regime, often in connection with surprisingly low inflation outcomes. During, for instance, the first quarter of 1995, producer prices rose very sharply, which indicated an increase in inflationary pressures in the economy. However, the effect on consumer prices was unexpectedly weak and during the second half of 1995 CPI inflation fell and continued to fall heavily in 1996. As mentioned earlier, this was largely due to

²⁴ As we have seen, a lower policy rate means that CPI inflation is pushed *down* further in the short term. But over a good ten years, the stimulus effect of the lower interest rate, which thus contributes to pushing *up* inflation, should have dominated the direct effect.

²⁵ However, the reports give a somewhat limited picture, as the analysis contained in them focuses on developments three years at a time.

falling interest rates, but another contributing factor was that the krona appreciated, which led to lower prices on import goods.

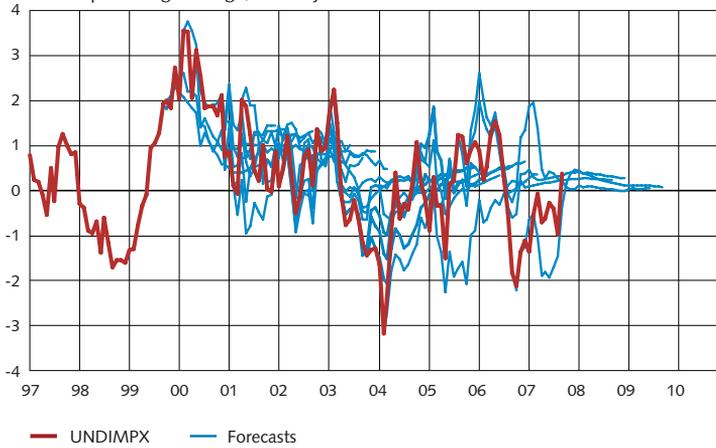
The interest in the contribution to inflation from import prices meant that it was desirable from an early stage for the Riksbank to illustrate how CPI inflation was affected by this component and to compare it with developments in price increases on domestically-produced goods and services. The Riksbank began to publish this type of breakdown in the Inflation Reports published in 1996, with CPI broken down into price increases on goods and services that were largely domestically-produced and goods and services that were largely imported (as well as an interest expenditure part). These two measures, eventually christened UNDINH and UNDIMPX, were given considerable scope in the Riksbank's analysis of inflation.²⁶ Forecasts of these variables were first published in the Inflation Reports issued in 1999, but in 2007 this stopped, which means that the analysis below applies to the period between these years.

UNDIMPX was somewhat overestimated in the longer run

Figure 3 shows the underlying measure of mainly imported goods and services, UNDIMPX, and the Riksbank's forecasts on different occasions. The figures show that although the Riksbank overestimated import prices in certain years, for instance, 2003, in other years they were underestimated and in some periods the outcomes were relatively close to the forecasts. In total, it is difficult to distinguish any systematic overestimation of the import prices. However, if one limits the analysis to the longer-run forecasts of UNDIMPX, the Riksbank overestimated developments by 0.6 percentage points on average.

²⁶ At the beginning, a measure called UNDINH was calculated by the Riksbank, but then Statistics Sweden took over this responsibility and the name was changed to UNDINH. The measure that reflected prices of imported consumer goods and services was calculated by the Riksbank itself given UND1(X) and UNDINH(X). After a while this measure was named UNDIMPX.

Figure 3. UNDIMPX, outcomes and forecasts
Annual percentage change, monthly data



Note. UNDIMPX refers to prices of mainly imported goods and services in CPIX (previously known as UND1X). The forecasts made up to the middle of 2005 were based on the assumption that the repo rate would be held constant during the forecast period. From the end of 2005 until the end of 2006, the forecasts were based on the assumption that the repo rate would follow market expectations of the repo rate, as reflected in market pricing. Sources: Statistics Sweden and the Riksbank

Larger overestimation of UNDIMPX excluding oil products

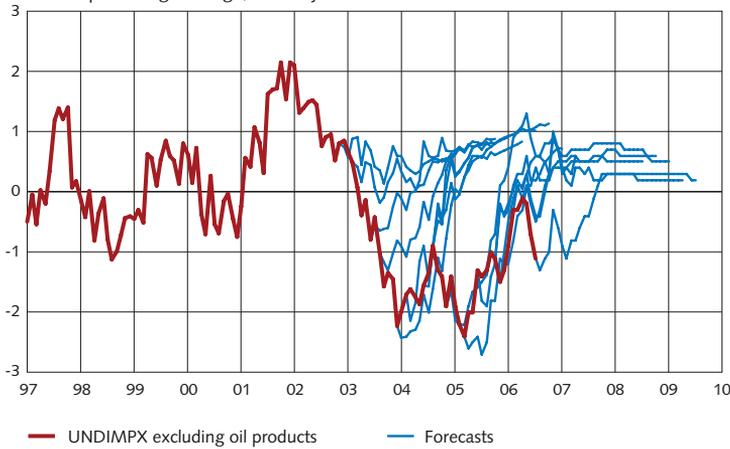
Given the picture of the forecasts for UNDIMPX given in Figure 3, it is perhaps difficult to understand the scope given to developments in import prices in the Riksbank’s reports during this period.²⁷ So why were surprisingly low import prices often raised as an important factor in the Riksbank’s communication during the period around the mid-2000s?

One way of illustrating why is to look more closely at the measure UNDIMPX excluding oil products. During 2003, the Riksbank changed the underlying measure of inflation on which monetary policy was based. As a result of energy prices fluctuating more than usual in winter 2002-2003, the measure was changed from the CPIX (then known as UND1X) to the CPIX excluding energy prices. For the same reason, the Riksbank also began making forecasts for UNDIMPX excluding prices of oil products.²⁸ The forecasts are shown in Figure 4 below together with the outcomes.

27 See also the results in Assarsson (2007), which indicate that the forecasting error for UNDIMPX may have been of importance for the Riksbank overestimating CPIX inflation in certain years, but not over the whole period.

28 Forecasts were also made of UNDINHx excluding electricity prices (which were considered to be mainly domestically generated). Forecasts of UNDIMPX and UNDINHx excluding energy prices were published regularly from 2004.

Figure 4. UNDIMPX excluding oil products, outcomes and forecasts
Annual percentage change, monthly data



Note. UNDIMPX refers to prices of mainly imported goods and services in CPIX (previously known as UND1X). The forecasts made up to the middle of 2005 were based on the assumption that the repo rate would be held constant during the forecast period. From the end of 2005 until the end of 2006, the forecasts were based on the assumption that the repo rate would follow market expectations of the repo rate, as reflected in market pricing. Sources: Statistics Sweden and the Riksbank

From the figure it is clear that the annual percentage change in UNDIMPX excluding oil products began to fall heavily in 2003 and at the beginning of 2004 it was around -2 per cent. Hence, import prices were by that time 2 per cent lower than in the same period the previous year. As the forecasts indicate, the Riksbank kept assuming that prices would relatively quickly return to more normal levels and begin rising again. But despite downward revisions to the forecasts, the increase in import prices excluding oil products continued to be surprisingly weak and it was not until the end of 2005 that prices began to show a trend towards more normal levels. However, this trend was broken in the middle of 2006 and the annual percentage change in UNDIMPX excluding oil products never rose above zero, that is, year on year prices of these goods and services fell continuously from the beginning of 2003 and onwards.

The Riksbank thus overestimated the development of import prices excluding oil over a relatively long period in the mid-2000s. But this was largely counteracted by oil price increases being unexpectedly high, which meant that the relatively large overestimation of the price increases on other import goods did not have the same impact on the UNDIMPX forecasts – the underestimation of the oil price “offset” the overestimation of the other import prices. Of course, the forecasting errors in themselves were not particularly

satisfactory and much of the Riksbank's analysis during this period was therefore aimed at the question of the surprisingly weak development in import prices.²⁹

It is debatable what significance the overestimation of other import goods had for the forecasts of inflation measured as the CPIX, which was the measure of inflation that primarily guided monetary policy in this period. At first glance, this may appear obvious. If the CPIX forecast was produced "bottom-up" via the forecasts for all sub-indexes, the forecasting error for UNDIMPX excluding oil ought to have been counteracted by the forecasting error for the oil price when all sub-indexes were totalled. The overestimation of import prices excluding oil should therefore not have had such great significance for the CPIX forecast and monetary policy.

There are arguments against this conclusion, however.³⁰ To begin with, monetary policy in 2003 and at the beginning of 2004 was expressly guided by CPIX *excluding* energy prices. With regard to the rest of the period, one can also note that the Riksbank's forecasts for import prices *including* oil, that is, UNDIMPX, actually overestimated developments 1½-2 years ahead, which was the relevant horizon for monetary policy. Monetary policy was thus determined on the basis of CPIX forecasts indicating that inflation would be higher two years ahead than what turned out to be the case. In part, this could reasonably have been due to overestimating inflationary pressures from other import prices as shown in Figure 4. So there is much to suggest that surprisingly low import prices were actually an important explanation for long-term inflationary pressures being overestimated by the Riksbank in the mid-2000s.

UNDIMPX was inadequate as a measure of inflation impulses from abroad

The basis for the reasoning in the previous section is that UNDIMPX actually reflects the development of import prices in a satisfactory manner. But right from the introduction of UNDINH and UNDIMPX, the Riksbank emphasised the inadequacies in these measures, for instance that it was not clear how the breakdown into imported and domestically-produced goods and services should be made. As the question of the development in import prices gained greater focus in the mid-2000s and became the subject of more in-depth analysis, these inadequacies were brought more and more to light. The Riksbank's conclusion was that the breakdown was too inadequate and did not sufficiently capture what was interesting here, namely distinguishing the impact of international factors on inflation in Sweden from the impact of domestic factors. At the beginning of 2007, these measures were therefore phased out of the Riksbank's communication.

29 See, for instance, the articles "The exchange rate and imported inflation" in *Inflation Report* 2004:2, "Oil prices and monetary policy" in *Inflation Report* 2004:3, "Recent developments in inflation" in *Inflation Report* 2005:1 and "Why are Swedish import prices so low?" in *Inflation Report* 2005:2. The material for assessing monetary policy published in the first reports each year during the period 2005-2007 summarises the analysis.

30 A general objection is that one should not draw too many conclusions based on the assumption that the CPIX forecast was automatically determined via the weighted sum of the forecasts for various sub-indexes. This was rather a process whereby the CPIX forecast as an aggregate and the forecasts for the various sub-indexes were produced simultaneously, that is, there was an equal element of "top-down" and "bottom-up".

Hansson and Johansson (2007) describe further details relating to the problems of the breakdown into imported and domestic inflation and the reasons why the Riksbank phased out UNDIMPX and UNDINHX. They show, for instance, that the import content in Swedish household consumption according to so-called input/output tables is less than the weight UNDIMPX had in the CPIX. UNDIMPX was thus not a good measure for analysing how much changes in import prices at the border actually influence Swedish consumer prices. Hansson and Johansson argue that it is more interesting to divide the CPIX up into price indexes for energy products, food, goods (excluding energy and food) and services. In their opinion, this kind of breakdown has several advantages, including the fact that there are similarities in pricing in the respective product groups. As there is a large import content in goods, particularly excluding energy and food, it is possible, for instance, that these prices are affected more directly by international factors than by developments in prices of services.

Given the significance that import prices had for the Riksbank's analysis ever since the inflation target was introduced, it may appear drastic to abandon the measure of prices of imported consumer goods and services without having any clear alternative. The significance of import prices for inflation in Sweden did not become less of a question after 2007. However, the need to illustrate the development in import prices in a pedagogical manner must be balanced against the deficiencies of this measure and how it may affect both analyses and communication.

One example is that the change of the UNDIMPX was often routinely termed "imported inflation" in the economic debate (which the Riksbank also contributed to sometimes), when one actually meant "change of prices of largely imported goods and services". This probably contributed to the UNDIMPX sometimes being interpreted as the part of inflation developments that monetary policy could not affect. As Hansson and Johansson point out, even if the UNDIMPX had only consisted of prices of imported goods and services, which was doubtful that it did, then this interpretation would not have been correct. Monetary policy affects the nominal exchange rate and thereby import prices at the border. Moreover, import goods are sold on the Swedish market and are therefore affected by Swedish conditions with regard to wages, distribution costs and so on and thereby also Swedish monetary policy.

One possible advantage of the Riksbank moving from UNDIMPX and UNDINHX towards a breakdown of the CPI like that advocated by Hansson and Johansson is that it may have contributed to a more nuanced discussion. In their article Hansson and Johansson show, for instance, that the development of the price index for goods excluding energy and food is very similar to the development of UNDIMPX excluding oil products, which is not so strange as they concern largely the same goods. Examining why the Riksbank overestimated the UNDIMPX excluding oil products is therefore in principle the same as examining why the prices of goods excluding energy and food was overestimated. One might think that the label shouldn't matter. But the analysis will probably be more unbiased if the starting point is that the increase in goods prices has been unusually weak rather

than that “imported inflation” has been unexpectedly low. For instance, it becomes more obvious that it is not merely factors that have affected prices at the border that can explain developments, but that domestic factors may also have affected cost pressures in the sectors that produce and distribute goods. One obvious factor is the strong productivity growth that was in focus during this period.

THE RIKSBANK’S FORECASTS OF PRODUCTIVITY

One of the main explanations that the Riksbank has previously mentioned with regard to overestimating inflation is that productivity has been unexpectedly strong. This meant that high growth in the economy was combined with surprisingly low cost pressures in companies and thus that inflationary pressures were surprisingly low. To gain an overall picture of the extent to which the Riksbank has overestimated productivity growth, an analysis of the Riksbank’s productivity assessments is provided below. The focus is on the period when the Riksbank particularly emphasised the strong productivity growth, that is, from around the end of the 1990s up to the financial crisis.

The analysis uses the forecasts for annual productivity growth, as there are no quarterly forecasts published for this prior to 2005.³¹ There is some information on the Riksbank’s assessment of future productivity growth in the reports published from the middle of 1997. The Riksbank has published quantified forecasts of productivity growth year on year since the Inflation Report 1999:4 and in the second and third reports for 1999 there are also discussions in the text that can be translated into quantified forecasts for individual years. Thus, the first forecasts in this material are those published in the Inflation Report 1999:2.

One complication is that different definitions of productivity growth have been forecast in different periods.³² In the diagrams in the following sections, the outcomes for different definitions have been matched against the corresponding forecasts. The outcomes are taken from the first published figure for each respective year, which is published when the National Accounts for the fourth quarter of a particular year are published. It is worth noting that the figure in this first release generally differed relatively substantially from the revised figures in subsequent releases. This is illustrated and discussed in greater detail in the section below.

31 Productivity refers throughout to labour productivity defined as real GDP divided by the number of hours worked or real value added at base price in the business sector divided by the number of hours worked in the business sector.

32 With effect from *Inflation Report* 1999:2 and up to and including *Inflation Report* 2002:4 the forecast for productivity growth referred to the total economy. After that, there was a changeover to forecasts for productivity growth in the business sector up to and including *Inflation Report* 2005:2. This was changed to calendar-adjusted productivity growth in the business sector with effect from *Inflation Report* 2005:3 and later to calendar-adjusted productivity growth in the total economy with effect from *Monetary Policy Report* 2007:1.

The Riksbank underestimated productivity during the first half of the 2000s

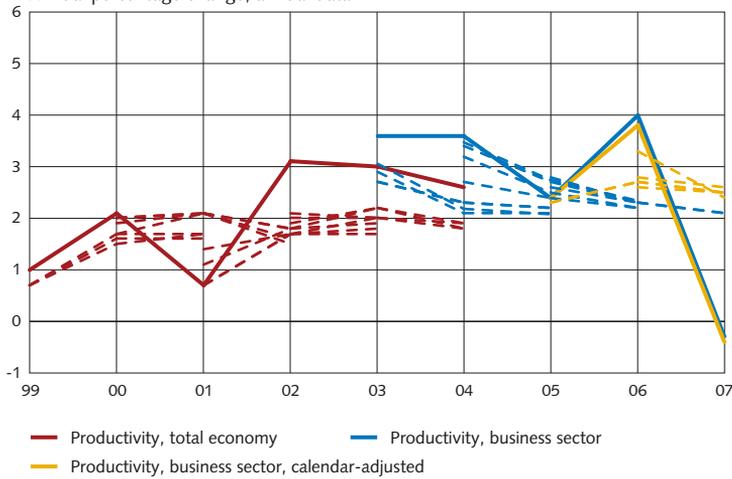
Although the Riksbank did not publish any quantified forecasts for productivity growth prior to 1999, the reports from the middle of 1997 contain descriptions of how it believed productivity would increase over the coming two years. The Riksbank noted that productivity had grown strongly and discussed in the reports how long this development was expected to last. The conclusion was that productivity growth would probably follow a cyclical pattern and gradually decline from the high level. But in the middle of 1998 and to some extent at the beginning of 1999, the Riksbank revised up its assessment of the average rate of productivity growth going forward. One justification was that the high outcomes reflected lasting improvements in productivity due to structural changes in the Swedish economy.

A picture of the Riksbank's assessment of productivity at this time is contained in the final Inflation Report of 1998. Here it was noted that productivity growth in the previous year was unusually high and the assessment was that developments in 1999-2000 would be on a par with the average productivity growth in 1990-1996, which was 1.7 per cent per year. This proved to be a good assessment, as the average in 1999-2000 according to the first outcomes was 1.6 per cent per year.³³

Figure 5 illustrates the first releases and forecasts for the different measures of productivity growth published by the Riksbank during the period 1999-2006. The unbroken lines illustrate the various outcomes. The broken lines show the forecasts at different times for the outcomes with the corresponding colours. As shown in the figure, the Riksbank in general underestimated productivity growth during the period prior to the financial crisis. The exceptions are 2001, when economic activity slowed down, which meant that productivity was weaker than expected, and 2005, when the forecast were on average close to the outcome. As expected, the largest errors generally apply to the forecasts made for developments two years ahead. But it is remarkable that the last forecast made for the current year, that is, when the figures for several of the year's quarters were known, in some cases underestimates the outcome for the whole year rather substantially. In the year 2002, for example, the underestimation is around 1 percentage point.

³³ Data revisions since then indicate, however, that the productivity statistics in real time underestimated the actual development by more than 1 percentage point.

Figure 5. Productivity, forecasts and outcomes
Annual percentage change, annual data



Note. The outcomes here are the first published figures for the respective years. The forecasts made up to the middle of 2005 were based on the assumption that the repo rate would be held constant during the forecast period. From the end of 2005 until the end of 2006, the forecasts were based on the assumption that the repo rate would follow market expectations of the repo rate, as reflected in market pricing.

Sources: Statistics Sweden, the Riksbank and own calculations

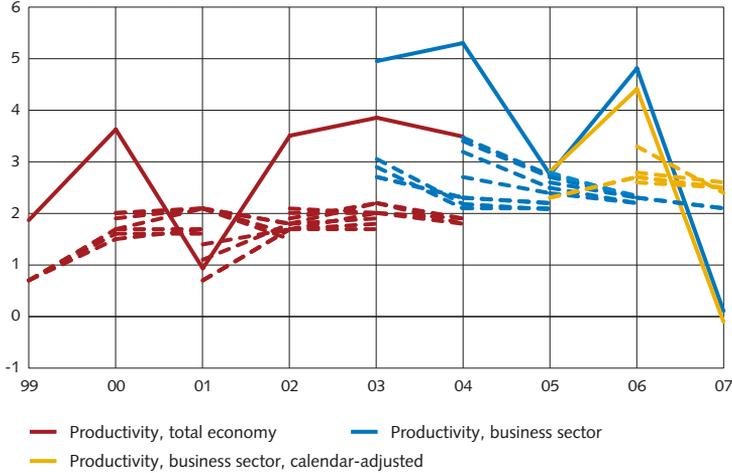
Productivity was stronger than the first figures indicated

Over a relatively long period in the early 2000s the Riksbank thus underestimated productivity growth. Productivity is an important component of unit labour costs – a measure of the companies' manufacturing costs linked to labour input. If productivity is high, less labour input is needed to manufacture a unit. When productivity increases without wages increasing correspondingly, the rate of increase in unit labour costs is lower. Stronger productivity than expected therefore probably contributed to cost developments being surprisingly weak and to inflationary pressures in the economy being overestimated.

Moreover, the first published figures for productivity growth do not provide the full picture with regard to how much inflationary pressures may have been overestimated. Unlike inflation statistics, which is rarely revised, productivity figures, which are based on National Accounts data, can be revised relatively substantially. It appears that the revisions during this period were considerable and that productivity growth was even higher than the first figures indicated. This is illustrated in Figure 6, which is identical to Figure 5 except that the outcomes now include the total revisions in the National Accounts up to the end of 2015. A comparison of Figures 5 and 6 shows that it is actually only forecasting errors for developments in 2001 and 2006 that do not change to any great extent when the forecasts are compared with the most recently published figures instead of the first published figures. For all the other years, the forecasting errors are much greater when the most recently published figures are used and developments in 2005 are now also underestimated in the forecasts.

It should be noted that Figure 6 cannot be used to evaluate the actual productivity forecasts. To evaluate them, one should try as far as possible to base the analysis on the information that was available when the forecasts were made, which does not include later revisions to the statistics. What Figure 6 illustrates is that the Riksbank's productivity forecasts may have contributed to cost pressures being overestimated in real time. But the cost pressures were even lower than the Riksbank, or for that matter any other forecaster, had reason to believe at that time.

Figure 6. Productivity, forecasts and revised outcomes
Annual percentage change, annual data



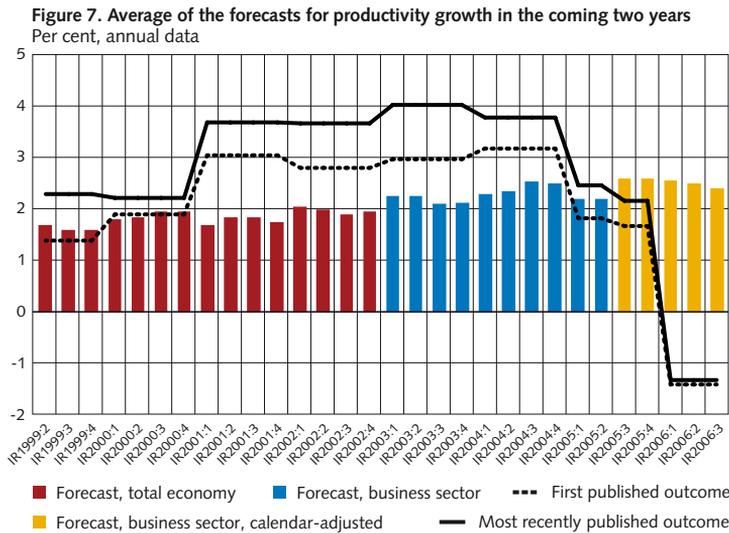
Note. The outcomes here are the revised figures for the respective years according to the most recent National Accounts. The forecasts made up to the middle of 2005 were based on the assumption that the repo rate would be held constant during the forecast period. From the end of 2005 until the end of 2006, the forecasts were based on the assumption that the repo rate would follow market expectations of the repo rate, as reflected in market pricing.

Sources: Statistics Sweden, the Riksbank and own calculations

The Riksbank's assessment of average productivity growth was gradually revised upwards

As illustrated above, the Riksbank underestimated productivity growth during the period 1999-2006. But this does not mean that productivity was missing from the analysis. As mentioned earlier, the Inflation Reports during this period on the contrary often contain discussions of productivity and to what extent the developments reflect lasting or temporary factors. The uncertainty of the assessment is often emphasised. One indication of this is that productivity was mentioned as a factor in the so-called risk outlook in almost 60 per cent of the reports between *Inflation Report 1999:2* and *Inflation Report 2006:3*. As the forecasts in Figure 5 illustrate, the Riksbank's assessment in general was that the high outcomes were largely due to temporary factors and that productivity growth would return to more normal levels. The assessment of this normal or average level changed somewhat during the period, however.

Figure 7 shows the average growth in productivity in the two coming years according to the forecasts made in the different reports. For instance, the first column shows the average of the forecasts for 2000 and 2001 (year $t+1$ and $t+2$) in the second report of 1999 (year t). Red columns apply to forecasts for productivity growth in the total economy, while blue and yellow columns apply to the corresponding figures for the business sector (where yellow is calendar-adjusted growth). As the figure shows, there was a gradual upward adjustment of the average until the end of year 2000, before it fell somewhat, probably as a result of the weaker outcomes in 2001. In 2002, the average rose again and was then adjusted upwards gradually until the end of 2004. The average forecast for productivity growth in the business sector was then around 2.5 per cent per year. As a contrast, the lines in the figure illustrate what the outcomes were, according to the first published figures and according to the most recently published statistics. Once again, it is very clear that the forecasts made up to 2005 underestimated developments.



Note. The columns illustrate the average productivity growth over the coming two years, that is year $t+1$ and $t+2$, according to the forecast published in reports year t . The broken line is the first published figures for the respective year, while the unbroken line is the outcome according to the most recent National Accounts. The forecasts made up to the middle of 2005 were based on the assumption that the repo rate would be held constant during the forecast period. From the end of 2005 until the end of 2006, the forecasts were based on the assumption that the repo rate would follow market expectations of the repo rate, as reflected in market pricing.

Sources: Statistics Sweden, the Riksbank and own calculations

Summary and concluding remarks

The purpose of this article has been to contribute to the discussion on the Riksbank's attainment of the inflation target by describing the driving forces behind inflation during the period 1995-2015. This was analysed in the first section with the aid of the Riksbank's macro model of the Swedish economy, Ramses. In the second section, the results of this analysis were compared with the Riksbank's explanations for the development of inflation as described in real time in the Riksbank's reports during the period.

Perhaps not so surprisingly, the conclusion is that different factors have driven developments to differing extents during the period. On the whole, the reports' descriptions concur well with the results of the model analysis with regard to identifying which factors are involved. However, there are some differences. The reports periodically highlight cyclical developments and the exchange rate to a greater extent than the model. This can be partly explained by the model identifying factors whose contributions to inflation were higher than historical patterns would suggest which was not necessarily what the reports reflected.

As Ramses is of necessity a simplification of the economy, the model result is sometimes open to interpretation. One example of this is developments during the second half of the 1990s, when the model identifies unusually low price mark-ups in companies as the most important factor behind the low inflation. Intuitively, this concurs relatively well with what the reports during this period called a reduced "inflation propensity", that is, a change in the relationship between cost pressures and price increases that was linked to the decline in inflation expectations and the increased confidence in economic policy following the 1990s crisis. A period with abnormally weak links between increased cost pressures and price increases could be captured in the model as unusually small price mark-ups, but it is not possible to make such a connection with any certainty.

Among the factors contributing to pushing down inflation, the low price increases on imported goods have been a recurring factor discussed in the Riksbank's reports. Periodically, it has been possible to link this to weak international economic activity and/or a strong krona. But sometimes the causes have not been as clear and the reports have also highlighted more structural explanations, such as increased global competition and changes in Swedish import patterns, where goods to a larger degree are imported from countries with lower prices. The model results generally support the picture that international developments, sometimes combined with the exchange rate, have been an important factor behind the low inflation. But it is difficult to distinguish potential structural changes from other possible explanations.

Productivity is also an important explanatory factor for the low inflation. It is also difficult to identify with any certainty the causes behind its development, and the Riksbank's reports during the period often contain discussions of these and how long the strong growth in productivity is expected to last. The model analysis also shows that productivity contributed to a large extent to pushing down inflation around the mid-2000s,

but based on this it is not possible to say whether the unusually strong TFP development was a result of earlier deregulation, increased competition, greater use of IT or some other factor included in the discussions.

The concluding part of the article analysed import prices and productivity further, examining to what extent developments in these variable surprised the Riksbank. They have previously been highlighted as two of the most important reasons for inflation being overestimated in the Riksbank's forecasts. With regard to the forecasts for import prices excluding oil products, there was a clear overestimation of how high the price increases would become around the mid-2000s. This overestimation was counterbalanced to some extent by oil price increases being underestimated. But much suggests that surprisingly low import prices were an important explanation for inflationary pressures at longer horizons being overestimated by the Riksbank. However, this conclusion is based on what has turned out to be an uncertain assumption that the measure of import prices on which the Riksbank based its forecasts actually reflected developments in import prices satisfactorily. During the 2000s, productivity growth was also much higher than the Riksbank's forecasts, which probably contributed to inflationary pressures in the economy being overestimated. Later revisions to the National Accounts also indicate that inflationary pressures were actually even lower than there was reason to believe at the time.

In conclusion, the main purpose of this article has been to provide a base that can be used to broaden a discussion that often starts out from a single figure – an average for inflation is of course significant, but it does not tell the whole story. In this context it is worth pointing out that the Riksbank's aim is to bring inflation back to 2 per cent when it deviates from the target. This should *implicitly* mean that the average inflation rate is 2 per cent. But one of the conditions necessary for this to apply is that inflation over time is pushed up and down symmetrically by unexpected factors that cause it to deviate from the target.

What can be said in this perspective about the period 1995-2015? When the inflation target was introduced, many people probably took it for granted that twenty years would be enough time for such symmetry to arise. With hindsight, this does not appear to be the case. One might of course interpret the driving forces behind inflation in different ways, but on an overall level the factors that have held inflation back have dominated during this period. To some extent, these have been factors that can be linked to traditional fluctuations in economic activity. But at least according to the Riksbank's reports these have to a great extent also been factors of a more structural nature in the sense that they have changed earlier "normal" relationships, if not permanently then at least for a long period of time. This has contributed to pushing down inflation to a surprisingly large degree.

However, this description is also open to criticism. How many years in a row is it acceptable to be surprised by strong productivity, for example? If reality changes, one must be prepared to also change the map to be able to orientate oneself. This is certainly a good point. But at the same time it is important to remember that this is a genuine difficulty for monetary policy, where the decisions are largely based on forecasts. Which changes are

temporary and which are more lasting? And, if so, how lasting? To what extent should monetary policy be adapted?³⁴

Deliberations of this type often show up in the Riksbank's reports published 1995-2015. With hindsight, it sometimes makes for frustrating reading. But if one tries to follow developments in real time, how the analysis struggles to grasp and understand the driving forces behind the changes in the economy and their potential effects, one also gains a feeling for how difficult this is in practice. It is important to remember this in the discussions of the monetary policy framework. There is nothing to indicate that the economic environment following the financial crisis would be easier to analyse and predict than the period before – compare, for instance, the current debate on “secular stagnation” or the effects of digitalisation on the economy. A necessary starting point for the discussions on the Riksbank's target attainment, possible changes to the monetary policy framework and what one wishes to achieve with them is that one has realistic expectations of what monetary policy can actually achieve.

34 According to Faust and Leeper (2015) the macro economy is best described as marked by “disparate confounding dynamics”, where inflation and other macroeconomic variables vary in ways that make it difficult to identify normal fluctuations in economic activity and to formulate appropriate monetary policy. The picture of developments in 1995-2015 painted by the Riksbank's reports fits this description well in many ways.

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The effects of monetary policy on interest rates

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In this article, we analyse the transmission mechanism for monetary policy in Sweden by studying how different interest rates in the economy move when the repo rate is adjusted. In our analysis, we note that most interest rates covary with the repo rate. This relationship is clearest for shorter market rates, which is a consequence of that the Riksbank can use the repo rate to control the very shortest interest rates in the economy. Longer market rates, which are affected by the development of international interest rates and various risk premiums to a greater extent, also show relatively high covariation with the repo rate. The repo rate also has a close relationship with interest rates for households and companies. Our analysis demonstrates that these interest rates are normally adjusted in line with repo rate adjustments.

Introduction

Using its monetary policy, the Riksbank is able to influence the economy through several different channels. One important channel lies through various interest rates in the economy, both interest rates determined on financial markets and interest rates faced by households and companies in the form, for example, of interest rates for mortgages. The Riksbank's most important instrument for governing these interest rates is the repo rate. For example, when the repo rate is cut, both market rates and end rates for households and companies usually also drop. When mortgage rates fall, those households with mortgages have more money left for other purposes and may then choose to consume a greater amount of other goods and services. In addition, the lower interest rates make it cheaper to borrow and less advantageous to save, which also leads households to consume more. In a similar way, lower interest rates make it cheaper for companies to invest. A lower repo rate thus stimulates demand in the economy, eventually leading to prices being raised and the rate of inflation thereby rising. The way that monetary policy affects the economy is usually called the monetary policy transmission mechanism. Understanding this mechanism is an important part in decision-making for both central banks and participants on the financial markets.¹

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1 For a complete description of the transmission mechanism, see Sveriges Riksbank (2009).

In this article, we examine more closely the way in which different interest rates are affected by changes to the repo rate. We start by describing the theoretical relationship between the repo rate and other interest rates in the economy by explaining how repo rate changes spread to different financial markets and how different participants may act. We go on to examine how the repo rate and different interest rates in the economy have covaried in recent years. Finally, we make a quantitative analysis of how different interest rates change in conjunction with monetary policy decisions and use these results to study the effects of the monetary policy decision from March 2015.

We will demonstrate that most interest rates in the economy follow the repo rate relatively well. The link is clearest for interest rates with short maturities but also interest rates with longer maturities are adjusted when the repo rate changes. We will also demonstrate that there is a clear link between the repo rate and the interest rates faced by households and companies. Our studies show that these interest rates fluctuate approximately in line with changes to the repo rate.

How monetary policy affects the general level of interest rates

The repo rate is the Riksbank's primary monetary policy instrument. Using the repo rate, the Riksbank is able to steer the interest rate on the overnight market, which is to say the interest rate for loans between banks from one day to the next. The Riksbank can also use its forecast of the repo rate to give a clear signal of what the overnight rate may be in the period ahead. Using these two tools, the Riksbank can also influence other interest rates in the economy.²

SWEDISH MONETARY POLICY

As the repo rate forms the starting point for this analysis, in this section we will first briefly describe Swedish monetary policy in recent decades.

Since January 1993, the Riksbank has had the target of achieving stable prices, which has been described as a rate of inflation of 2 per cent, measured as the annual percentage change in the Consumer Price Index (CPI). This decision was taken after the transition to a floating exchange rate at the end of 1992, when the fixed krona exchange rate could no longer be defended. Since the Riksbank introduced its inflation target, the rate of inflation has been significantly lower than before, which has also led to a lower repo rate. A relatively long period of stable growth combined with low inflation was noted until the middle of the first decade of this century.³ This period came to an end when the global financial crisis broke out in 2008. Like many other central banks, the Riksbank cut its policy rate to close to zero during the financial crisis. Since then, many central banks have maintained a low policy rate due to a weak recovery and the dampened development of

² For a more detailed description of the framework for the implementation of monetary policy, see, for example, Sveriges Riksbank (2011).

³ See, for example, *Ingves (2015)*.

inflation. The Riksbank raised the repo rate to 2 per cent in 2010-2011, when the economy recovered strongly but then started to cut the repo rate again towards the end of 2011 when the economic outlook for the euro area deteriorated and inflationary pressures dropped. Since February 2015, the repo rate has been negative and, in addition, the Riksbank has made its monetary policy even more expansionary through the purchase of government bonds.⁴

HOW DOES THE RIKSBANK CONTROL THE INTEREST RATES?

The market for balancing liquidity overnight – also known as the overnight market – is the market in which banks manage temporary surpluses and deficits in their liquidity in Swedish kronor. The need for an overnight market arises due to the payments in Swedish kronor handled by the banks every day. Payments in Swedish kronor between banks are made via transfers between their accounts in the Riksbank's payment system RIX. The Riksbank sets the terms and conditions for the banks' deposits and loans through these accounts. The interest rate the banks pay or receive on their accounts in RIX forms the so-called interest-rate corridor, which is linked to the repo rate.

At the end of every day, the banks must consider how to fund their deficit or deposit their surplus. For the sake of simplicity, let take, as an example, a bank with a liquidity surplus that must be deposited. The bank will then have several different alternatives. The first alternative is to deposit the money in its account in RIX at the repo rate minus 0.75 percentage points.⁵ However, the bank can probably receive a higher interest rate by lending the money overnight to another bank that has a deficit and that would instead have had to borrow in RIX at the repo rate plus 0.75 percentage points. The banks then agree on an interest rate closer to the repo rate, and it is this rate that forms the overnight rate. The bank could also choose to lend money for longer maturities, say three months. Slightly simplified, it is more advantageous for the bank to lend the money for three months if it is expected to give a higher risk-adjusted return than if the money is regularly deposited overnight for three months. Demand for this kind of investment will then increase and its pricing will be adjusted until the expected risk-adjusted return is the same for both alternatives.⁶ Consequently, the interbank rate with a three-month maturity should be equivalent to the expected average overnight rate over the given period adjusted for credit

4 For more information on the Riksbank's complementary measures, see, for example, the Monetary Policy Report from February and Economic Commentaries nos. 11, 12 and 13 (2015).

5 In addition to depositing or borrowing money in RIX, the Riksbank offers weekly transactions at a rate equal to the repo rate. If the banking system has a deficit towards the Riksbank, this is met by the execution of a repo transaction by the Riksbank (which is to say the Riksbank purchases securities). If the banking system instead needs to deposit, the Riksbank issues Riksbank Certificates. At present, the banking system as a whole needs to deposit money in the Riksbank. The Riksbank also implements fine-tuning operations every day to stabilise the overnight rate. This is achieved by the bank system as a whole being able to borrow or deposit in the Riksbank, normally at the repo rate plus/minus 0.1 of a percentage point, depending on whether there is an overall surplus or deficit towards the Riksbank at the end of the day. As a result, the overnight rate is kept inside a band that is narrower than the interest-rate corridor.

6 The relationship between price and rate for a bond is such that, when the price rises, the expected yield falls and thus so does the rate.

and liquidity risks. This is in line with the so-called expectations hypothesis, which, put briefly, says that longer interest rates are determined by expectations of the future short rate. If the Riksbank, by using the repo rate and the repo rate path, can influence the market's view of the overnight rate in the coming period, it can also largely steer the three-month interbank rate.

The Riksbank can also affect other to short-term rates applied to other participants, such as repos, deposit and lending rates and treasury bills.⁷ In addition, banks and other participants have the possibility of depositing the money in various types of security, such as government, mortgage and corporate bonds. According to the expectations hypothesis, the price and thereby the yield of these securities should also be adjusted so that the risk-adjusted yields for the various types of asset are the same. This means that, if the rate on the interbank market should fall, for example, it will become more attractive to invest in the other asset types, all other factors being equal. The price of the other assets will then increase, meaning that the rate will fall, until the participants again regard the various alternatives as equally attractive.

This reasoning can also be applied to longer maturities. That is to say that the risk-adjusted yield on an asset with a maturity of, for example, one year should correspond to the expected risk-adjusted yield on an asset that is reinvested every third month at a rate with a maturity of three months. The difference in the rate between different asset types with the same maturity should then reflect different risk profiles for the different asset types, such as credit and liquidity risks, for example. By steering the current overnight rate between the banks and signalling its future level, the Riksbank can, to a certain extent, steer most nominal interest rates in the economy (see Figure 1).

Figure 1. The transmission mechanism – from the repo rate to interest rates for households and companies



LONGER INTEREST RATES ARE INFLUENCED BY SEVERAL FACTORS

The longer we come from the overnight rate in both maturity and asset type, the more the asset's price is affected by an increasing number of factors that the Riksbank cannot influence. Prices for assets with longer maturities are largely governed by international developments, which means that Swedish market rates with longer maturities follow the international interest rate situation to a large extent. The primary reason for this is that Sweden, which is a small, open economy, is affected by global economic activity and monetary policy. In the long run, this means that Swedish interest rates tend to covary

⁷ An example of a repo is when an actor needs a specific security for a relatively short period of time and borrows this from another participant in return for money. The party borrowing the security then pays interest on it in proportion to the repo rate.

with foreign interest rates. In addition, over the long term, interest rates both in Sweden and abroad can be expected to return to the level of interest rates prevailing in a normal economic situation.

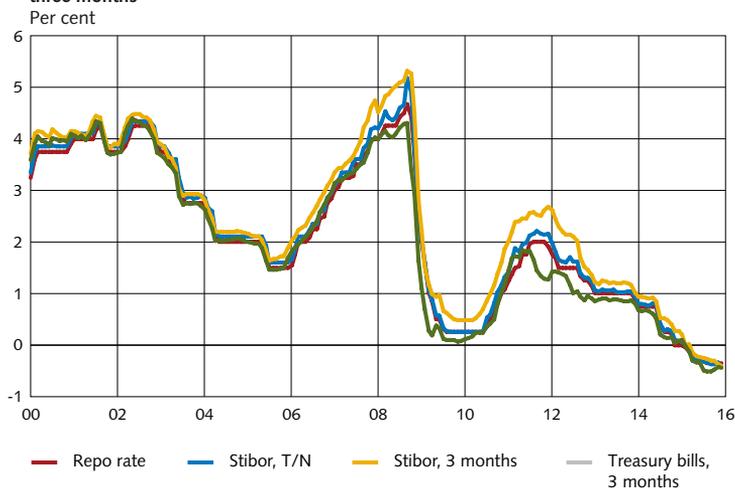
As most of the interest-bearing assets and liabilities held by Swedish households and companies are bank-related, it is also important to understand how fluctuations in market rates impact on the banks' deposit and lending rates to households and companies. Like other interest rates in the economy, the banks' deposit and lending rates should be influenced by changes in the repo rate and repo rate path. The competition between the banks should result in changes in market rates and thus changes in the banks' funding costs also having an impact on end customers such as companies and households.

MOST INTEREST RATES COVARY WITH THE REPO RATE

A first step in analysing how the repo rate affects the interest rate situation in Sweden is to carry out a study of how different interest rates have historically covaried with the repo rate. Figure 2 shows the repo rate, together with the interbank rate Stibor with two different maturities, T/N and three-month, and the rate for a three-month treasury bill. T/N stands for tomorrow/next, which is the overnight rate the banks offer each other on loans from tomorrow until the next day. It is the shortest rate available in official statistics.⁸ Stibor with a maturity of three months is the interest rate that the banks offer each other for investments three months ahead, while the treasury bill represents the interest rate that the government pays for its short-term borrowing with a maturity of three months. In Figure 2, we can see that these interest rates follow each other fairly well. Since 2000, the correlation between the repo rate and Stibor T/N has been almost 1 and, for three-month interest rates, the correlation lies between 0.97 and 0.98 (see Table 1). It is also worth noting that the gap between the interbank rates, above all those for three months, and the repo rate increased during the financial crisis of 2008-2009 before then becoming entrenched on a slightly higher level for a longer period. But this gap has closed again recently. The widening gap between the interest rates during the crisis can be explained by increased uncertainty on the interbank market, which reduced liquidity and led the banks to demand a higher premium for lending money to each other. However, calculations of correlation indicate that the correlation between the interest rates has not changed notably since the financial crisis (see Table 1) All in all, the first stage of the monetary policy transmission mechanism thus seems to work well, as the short-term interest rates largely follow the repo rate.

8 The Riksbank's payment system RIX contains transaction data for the actual overnight rate from 2007. For a more detailed description of this data, see, among others, Sveriges Riksbank (2011). In general, Stibor T/N has moved close to the overnight rate but has, in periods, demonstrated a slightly higher level of volatility.

Figure 2. Repo rate, rate for Stibor T/N and three months, and rate for treasury bills three months



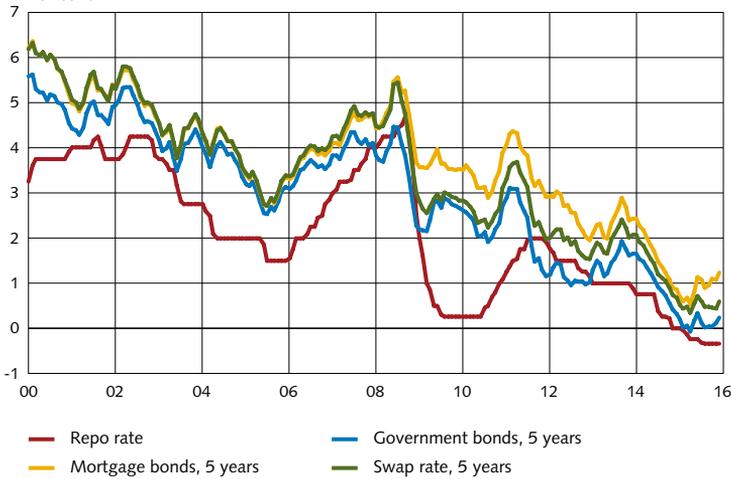
Sources: Thomson Reuters and the Riksbank

Interest rates with longer maturities do not have such a strong connection to the repo rate. Figure 3 shows the repo rate together with the rate for a five-year government bond, a mortgage bond and a swap rate with an equivalent maturity.⁹ It can also be seen in this illustration that the different rates follow each other, but that the covariation is not as close as it is for rate with shorter maturities, which is also reflected in the correlation. Since 2000, the repo rate and the longer rates have had a correlation of between 0.54 and 0.70 (see Table 1). This is to be expected, as rates with a longer maturity are steered by the expected future repo rate to a greater extent than they are by the current repo rate. In addition, rates with longer maturities are affected by premiums that compensate for the uncertainty surrounding the future level of the repo rate. As Sweden is a small and open economy, these rates also follow the level of interest rates abroad.

As we have previously discussed, the difference in interest rates between different asset types with the same maturity should only be due to the difference in risk from asset to asset. As we see in Figure 3, interest rates with five-year maturities follow each other well, but the difference between them varies slightly over time. This is clearest for the period during the financial crisis that started in 2008. During this period, there was great uncertainty over the situation in the Swedish banking sector, as illustrated by the larger gap between mortgage bonds and the government and swap rate. The gap has since closed and is now at approximately the same level as prior to the financial crisis. However, calculations of correlation indicate that the correlation with the repo rate has decreased slightly since 2008 (see Table 1).

⁹ A swap is a derivative instrument whereby two parties agree to exchange interest rate flows over a predetermined period. Usually, a fixed interest rate is exchanged for a variable interest rate and, in this contract, the fixed interest rate that the parties have agreed upon forms a swap rate.

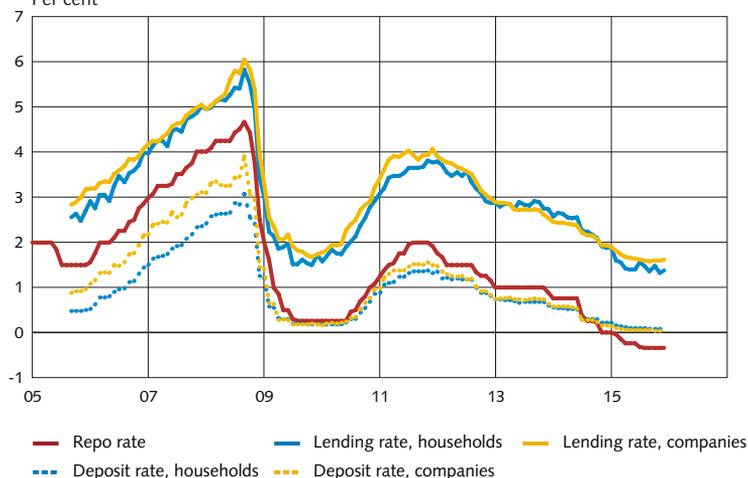
Figure 3. Rates for five-year government bonds, mortgage bonds and swaps
Per cent



Sources: Thomson Reuters and the Riksbank

Finally, we can study how well deposit and lending rates to households and companies follow the repo rate. Figure 4 shows the repo rate and the average deposit and lending rate for households and non-financial corporations respectively since 2005. These rates also seem to follow the repo rate closely and, since 2005, the correlation has been close to 1 for all rates (see Table 1). However, a shift is visible in the diagram in conjunction with the financial crisis, as the difference between the repo rate and the deposit rate decreased, at the same time as the difference between the lending rate and the repo rate increased. This is because the banks have wished to avoid negative deposit rates and consequently did not cut rates when the repo rate approached zero. As a relatively large part of the banks' funding comes from deposits, we deem that this has also had a certain effect on lending rates since the banks want to maintain their margins. However, the correlation with the repo rate has not decreased since 2008.

Figure 4. Repo rate and deposit and lending rates for households and companies
Per cent



Sources: Thomson Reuters and the Riksbank

Table 1. Correlation between the repo rate and various interest rates in the economy

	JAN 2000–SEPT 2015	JAN 2008–SEPT 2015
Stibor, T/N	0.99	0.99
Stibor, 3 months	0.98	0.98
Treasury bill, 3 months	0.97	0.96
Government bond yield, 5 years	0.54	0.42
Mortgage bond yield, 5 years	0.61	0.50
Swap rate, 5 years	0.70	0.67
Lending rate, household ¹	0.96	0.96
Lending rate, corporate ¹	0.98	0.98
Deposit rate, household ¹	0.99	0.99
Deposit rate, corporate ¹	0.99	0.99

Note. The correlation has been calculated using series adjusted for a linear trend.
1. Monthly data since 30 September 2005.

Quantitative analysis of how the repo rate affects the general level of interest rates

As the analysis shows, there is a clear covariation between the repo rate and other interest rates. The relationship is stronger for shorter rates than it is for longer rates. However, using only the covariation between the interest rates, it is not possible to draw the conclusion that it is the repo rate that steers the other rates. The covariation could, in principle, have other explanations. Consequently, to develop our analysis, we take the step of studying how interest rates react in conjunction with a repo rate decision. We do this by using a regression analysis, in which we estimate how repo rate changes affect other interest rates in the economy. In this section, we start by explaining the model we use. We then describe

the data used and thereafter report our results. Finally, we use these results to analyse interest rate movements in conjunction with the monetary policy decision from March 2015.

MARKET RATES SHOULD ONLY REACT TO UNEXPECTED REPO RATE CHANGES

As we have described previously, monetary policy influences the general level of interest rates partly via changes to the repo rate, but also by steering expectations of future monetary policy. In theory, financial markets are forward-looking, which means that all available information should be reflected in the asset price. This hypothesis also says that market rates should continually be adjusted when expectations of future monetary policy are changed, for example with the publication of new data. This constant adjustment of financial markets makes it difficult to capture the effects of monetary policy on financial instruments. However, one way may be to examine fluctuations in conjunction with a monetary policy decision. In theory, then, market rates should only be adjusted if the decision was unexpected, while expected decisions should already be reflected in the price. A central stage of our analysis will thereby be to distinguish between expected and unexpected repo rate changes.

In many studies, the effects of monetary policy on the economy are studied by using monthly or quarterly data, as higher frequency macroeconomic statistics are not available. However, pricing on financial markets is adjusted constantly. To separate the effects of monetary policy from other events that also influence pricing on financial markets, we use daily data. To do this, we study the daily changes in various interest rates for the days on which monetary policy decisions are published.

MONETARY POLICY EXPECTATIONS CAN BE MEASURED BY USING 'STINA' CONTRACTS

Studies made on data from the United States and elsewhere show that it is difficult to capture the effect of monetary policy on other interest rates if expected and unexpected interest rate adjustments cannot be separated. Unlike earlier studies, Kuttner (2001), for example, shows that US monetary policy has a significant effect on different interest rates in the economy when expected and unexpected policy rate adjustments are separated. However, to do this, it must be possible to measure monetary policy expectations, even though they are not directly observable. For example, Kuttner uses forward contracts for the US policy rate as an instrument to measure expectations of the US policy rate.

There are two main methods that can be used to measure expectations for the repo rate – the pricing of financial derivatives and survey-based expectations. The Swedish equivalent of the instruments used by Kuttner are RIBA futures (Riksbank futures), which are forward contracts with the repo rate as an underlying asset¹⁰. However, using these instruments to

10 A RIBA is a type of forward contract whereby two parties agree on an interest rate at a point in the future. The time interval and the price (interest rate) in the contract are determined when the contract is entered into and will depend to a great extent on the counterparties' interest rate expectations. RIBA contracts refer to future repo rate levels.

measure monetary policy expectations in Sweden is not without problems. These contracts have only existed since 2009 and the maturity of the shortest available contract is three months, which means that it often covers several monetary policy meetings.

To measure monetary policy expectations, we instead use another derivative contract traded on the Swedish fixed-income market, a so-called interest rate swap. An interest rate swap can, for example, be used by a company that has a variable-rate loan, but which wishes to avoid uncertainty as regards possible future interest rate changes. The company may then enter into an agreement with another party that undertakes to pay the company's variable interest rate, in exchange for which the company pays an agreed fixed interest rate for the period covered by the agreement.

The swap contract with the shortest maturities is called the Stina contract (Stockholm Tomorrow Next Interbank Average) and exists with maturities ranging from one month to one year. A Stina contract is an agreement to pay or receive the difference between a fixed interest rate and a variable interest rate, with the Stibor T/N as underlying asset. The contract thus does not reflect direct expectations of the repo rate, which may be a problem as Stibor T/N is linked with a certain risk premium that can vary over time. However, in Figure 3, we can see that these interest rates mostly follow each other well¹¹. In this study, we will therefore use the Stina contract with a maturity of one month to measure the monetary policy expectations ahead of a monetary policy decision.

An alternative to market-based expectations is provided by questionnaire-based surveys, in which market actors are asked what they expect the repo rate to be following the next monetary policy meeting. The greatest advantage of such surveys is that they are simple and directly reflect market participants' expectations. But there are also certain disadvantages. These include the surveys normally being carried out some time before the monetary policy meeting, meaning that expectations may have changed by the time the meeting takes place. In addition, surveys have difficulty capturing probabilities for different outcomes, as the respondents probably state their mode forecasts but not the level of uncertainty linked with them. This is to say that, if the respondent, for example, cannot decide between a repo rate adjustment and an unchanged rate but finally chooses one, this choice would be a mode forecast and would be included in the survey.

11 Another favourable characteristic of Stina contracts is that they do not have any co-called counterparty risk, as OMX stands as guarantor, which is to say that there is no risk linked to the counterparty to the agreement failing to fulfil its commitments - OMX assumes these commitments in that case. Neither do Stina contracts have any credit risk, as settlement occurs on final payment day, which is to say that the parties make no initial payment but rather that the difference between the variable and fixed interest rates is calculated on payment date, after which payment is made. These characteristics should lead to low risk premiums in Stina listings.

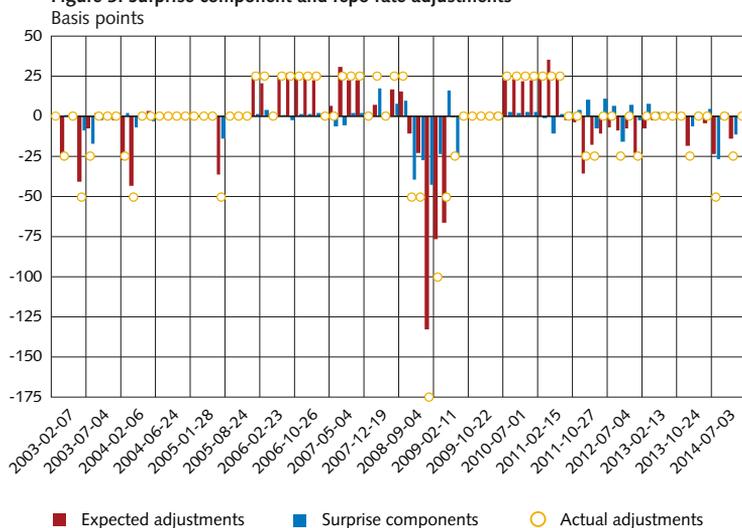
HOW CAN EXPECTED AND UNEXPECTED REPO RATE ADJUSTMENTS BE DIFFERENTIATED?

As we have already mentioned, Stina contracts have Stibor T/N as underlying asset and, normally, these interest rates lie close to each other but can, in certain periods, separate. As the difference varies over time, this can lead to the measure of expectations becoming misleading when longer time horizons are examined. To avoid this, we calculate the surprise component as the difference in the Stina contract over a short period before and after the repo rate decision.¹² The Stina contract reflects an average of the expected interest rate over the coming month. However, as the new repo rate is implemented on the first Wednesday after the monetary policy decision, the number of days that the new repo rate level affects the contract will vary from announcement to announcement. Consequently, we must also take account of the number of days that the prevailing repo rate and the new repo rate each affect the current contract (see the appendix for calculations). The expected repo rate adjustment is then calculated as the difference between the repo rate adjustment and the surprise component.

In Figure 5, we see the calculated components for the monetary policy decisions between 2003 and 2014. The red bars show expected repo rate adjustments, the blue bars the surprise components and the yellow circles the actual repo rate adjustments. The diagram shows, for example, that the interest rate increases the Riksbank made in 2006-2007 were largely expected by market participants. In contrast, during the financial crisis of 2008-2009, the Riksbank, on several occasions, cut the repo rate beyond what the market participants had expected, which is shown by the blue bars. The Riksbank has also surprised the financial markets on a couple of recent occasions. Among other things, the financial markets expected the Riksbank to cut the repo rate by 25 basis points at the monetary policy meeting in July 2014, but the Riksbank instead decided to cut the repo rate by 50 basis points on this occasion.

¹² The adjustment is measured between 09.15 and 12.15.

Figure 5. Surprise component and repo rate adjustments



Sources: Thomson Reuters and the Riksbank

ECONOMETRIC MODEL THAT CAPTURES INTEREST RATE MOVEMENTS IN CONJUNCTION WITH EXPECTED AND UNEXPECTED REPO RATE ADJUSTMENTS

To measure how repo rate adjustments affect the general level of interest rates, we use a simple econometric model in which we estimate how different interest rates are affected by a repo rate decision. See Equation 1.

$$(1) \quad \Delta R_t^i = \beta_1^i \Delta \tilde{r}_t^{expected} + \beta_2^i \Delta \tilde{r}_t^{unexpected} + \beta_3^i \Delta R_t^* + \varepsilon_t^i$$

In the model, we include both the expected and unexpected adjustments to the repo rate, $\Delta \tilde{r}_t^{expected}$ and $\Delta \tilde{r}_t^{unexpected}$. The hypothesis is that the market rates only react to unexpected decisions. This means that the estimated coefficients for expected repo rate decisions, β_1^i , should be small and insignificant. In addition, we include a foreign variable, ΔR_t^* , which is an aggregate of the government bond rates in Germany, the United States, Norway and the United Kingdom. The aim of the variable is to capture the link between longer market rates in Sweden and international interest rates. The weights are taken from the competitiveness-weighted index KIX. The variable is only deemed to have an effect on market rates with longer maturities and is thus only included in estimates of bond rates with maturities exceeding one year.¹³ The maturity of the foreign interest rate corresponds to the bond rate that is estimated for Sweden. The model is estimated using OLS.

¹³ If it is included in the estimates for the shorter interest rates, the coefficient is not significant.

DESCRIPTION OF DATA

We use data from 2003, which is the period for which data for the Stina contract is available. As we described earlier, the surprise component for the repo rate is calculated as the difference in the Stina rate shortly before and shortly after the publication of the repo rate decision. To estimate the model, data is used up until and including the monetary policy meeting in December 2014. One reason that we do not use data from 2015 is that, since February 2015, the Riksbank has employed alternative monetary policy measures in the form of government security purchases. Monetary policy in 2015 thereby differs, to some extent, from that conducted in the period 2003 to 2014. There are, of course, both advantages and disadvantages in including the later period in our estimations, but, as our main focus is on studying how repo rate adjustments affect other interest rates, we choose to exclude the period.¹⁴

The interest rates included in the quantitative analysis are those that we have studied in Figures 2-4, which is to say the rate on the three-month Stibor and a treasury bill, a five-year government bond rate, mortgage bond rate and swap rate, and the average deposit and lending rate for households and non-financial companies. To extend the analysis and capture any differences between maturities, we also include a two-year and a ten-year government bond yield in our analysis. For bond yields, we use zero coupon yields with fixed maturities which are interpolated with the assistance of the extended Nelson-Siegel method.¹⁵

Financial market statistics for deposit and lending rates for households and companies are only available as an average on a monthly basis. To capture the total effects of the monetary policy decision, the change in these rates is calculated as the difference between the average rate in the month before the repo rate decision and the month after the decision, which is the change over two months. Our assessment is that a part of the effect of monetary policy is missed when only the current month is examined, as the average for the month is also affected by the rate that applied prior to the decision. One disadvantage of using a longer window is that interest rates may have been affected by other factors and that we may thereby over- or underestimate the effects of monetary policy. For companies, we study interest rates for new loans and, for households, we use the interest rate for new mortgages. To a certain extent, interest rates for mortgages are also available on a daily basis in the form of the banks' listed mortgage rates. These normally give a good indication of how interest rates in financial market statistics are developing, but differ, to a degree, as the rates are reported before any interest discounts. Estimates based on these interest rates are included in the appendix.

As we have described earlier, there are advantages in using models with daily data, as it reduces the risk that effects on interest rates that are due to other factors are included. The disadvantage of more high-frequency data is that it is difficult to say whether the effects

¹⁴ For a more in-depth description of how purchases of government securities are deemed to have affected the economy, see, for example, Economic Commentaries nos. 11, 12 and 13 (2015).

¹⁵ For more information, see Svensson (1995).

will be persistent and effects that only arise over the longer term may not be captured. One method for extending the analysis in the model we use in this article is to study the change over a number of days. Consequently, in the appendix, we report results from estimates in which interest rate adjustments have been calculated as the difference between the interest rate on the day before a repo rate decision and the rate four days after the decision.

ADJUSTMENTS TO THE REPO RATE AFFECT OTHER INTEREST RATES

In Table 2, we see the result of the regression analysis. We can see that adjustments of the repo rate affect other interest rates in the Swedish economy. The coefficients for unexpected repo rate decisions are positive and significant for all interest rates. For longer market rates, the coefficients for expected repo rate decisions are also small and not significantly separated from zero. This corresponds with the hypothesis that market rates should only react to new information.

Table 2. One day's change in interest rates due to repo rate adjustments according to equation 1

	EXPECTED	UNEXPECTED	KIX RATE	R ²
Stibor, 3 months	0.35 (0.04)***	0.77 (0.09)***		0.77
Treasury bill, 3 months	0.17 (0.03)***	0.82 (0.06)***		0.83
Government bond yield, 2 years	-0.03 (0.03)	0.49 (0.08)***	0.38 (0.20)*	0.46
Government bond yield, 5 years	-0.01 (0.02)	0.32 (0.06)***	0.71 (0.13)***	0.52
Government bond yield, 10 years	-0.02 (0.02)	0.20 (0.05)***	0.82 (0.11)***	0.56
Mortgage bond yield, 5 years	0.02 (0.02)	0.39 (0.06)***	0.62 (0.14)***	0.56
Swap rate, 5 years	-0.03 (0.03)	0.34 (0.06)***	0.63 (0.14)***	0.45
Lending rate, household ¹	0.93 (0.08)***	1.28 (0.18)***		0.86
Lending rate, corporate ¹	0.88 (0.08)***	1.53 (0.20)***		0.84
Deposit rate, household ¹	0.62 (0.05)***	0.93 (0.12)***		0.86
Deposit rate, corporate ¹	0.76 (0.08)***	1.26 (0.18)***		0.82

Note. *** indicates significantly separated from zero on the 1-per cent level, * indicates significantly separated from zero on the 10-per cent level, standard deviation within parentheses.

1. Two months' change since 30 September 2005.

SHORT-TERM MARKET RATES MOVE IN LINE WITH REPO RATE ADJUSTMENTS

The upper lines in Table 2 report the impact of a repo rate adjustment on the three-month Stibor and three-month treasury bill. Both these rates are known as money market rates, which mean that they are short-term market rates. They should thus be priced on the basis of expectations of the repo rate over the next three months and expected monetary policy decisions should be reflected in the rate. However, in the table, we can see that expected repo rate adjustments also have a significant effect on these rates, particularly the Stibor rate. This is expected to rise by just over 3 basis points when the repo rate is expected to be raised by 10 basis points. The corresponding figure for the treasury bill is almost 2 basis points.

One explanation for why the parameter for expected repo rate adjustments is significant and relatively large for Stibor may be that this rate is not traded to a particularly large extent. Stibor is primarily a reference rate that the banks quote on a daily basis and, historically, there have been certain frictions on this market.¹⁶ This is partly linked to the shortage of liquidity for three-month maturities, but also to a lack of transparency when the banks determined the rate. However, this should be less of a problem after 2012, when the Riksbank carried out a comprehensive investigation of Stibor. The investigation revealed a number of deficiencies in the Stibor framework, which led the Riksbank to make recommendations on Stibor to the banks in the Swedish banking system. In a follow-up in 2014, the Riksbank made the assessment that the banks had fulfilled the recommendations.¹⁷ As regards the treasury bill, it is likely that the relatively low liquidity can provide an explanation for the expected repo rate adjustments seeming to have an effect.

The coefficients for expected repo rate adjustments are also clearly smaller than the coefficients for unexpected repo rate adjustments. For both Stibor and the treasury bill, the parameter is significantly separated from zero and the impact of an unexpected repo rate adjustment of 10 basis points is about 8 basis points. The interest rate level also seems to continue to be adjusted several days after the repo rate decision, as captured in Table A1 in the appendix, which shows the adjustment to the rates four days after the repo rate decision. For both Stibor and the treasury bill, the parameter for unexpected repo rate decisions is close to 1, which indicates that the shorter rates are adjusted approximately in line with the repo rate.

THE REPO RATE ALSO HAS AN EFFECT ON LONGER MARKET RATES

In Table 2, we can also see that estimates of long-term bond rates are in line with the hypothesis that only unexpected monetary policy decisions should influence the pricing of market rates. The parameters for expected repo rate decisions are small and not significantly separated from zero. In contrast, all rates react to unexpected decisions. We can also see that the effects of foreign interest rate fluctuations are significant to all rates, but only at the ten-per cent level for the two-year government bond yield. The table shows that unexpected repo rate decisions have a greater impact on rates with shorter maturities, while the opposite is true for the international interest rate fluctuations, where rates with longer maturities are affected more. The estimates show that the ten-year rate can be expected to rise by 2 basis points in the event of an unexpected repo rate rise of 10 basis points. Even if the effect may seem relatively minor, it is within the interval that similar studies indicate for US data. For example, Fawley and Neely (2014) have compiled a number of different studies made using US data, the result of which shows that the effects on a ten-year government rate vary from between 1 to 6 basis points, with the mean being between 3 and 4 basis points.

¹⁶ See Sveriges Riksbank (2012).

¹⁷ See Sveriges Riksbank (2014).

The impact also seems to be about the same for government bond yields, mortgage bond yields and swap rates with the same maturity. This indicates that repo rate adjustments do not have a major effect on the risk premium. The results in Table 2 are also supported by the results in Table A1 in the appendix, which shows how rates have changed four days after a decision. The coefficients are largely unchanged, which indicates that the effect of a changed repo rate is persistent.

ADJUSTMENTS OF THE REPO RATE HAVE A GREAT IMPACT IN INTEREST RATES TO HOUSEHOLDS AND COMPANIES

Finally, Table 2 shows that monetary policy has a significant effect on interest rates to households and companies. The analysis differs from the one we made for market rates in that the result is for monthly data and the change has been measured over two months. The coefficients for both expected and unexpected repo rate decisions are significant, but unexpected adjustments have a slightly greater impact. The estimates show that lending rates to households move approximately in line with repo rate adjustments. The coefficients indicate that interest rates are adjusted by 9 and 13 basis points respectively when there is a 10 basis point repo rate adjustment that is expected or unexpected. However, the standard error, which is reported within parenthesis in Table 2, shows that none of these parameters are significantly separated from 1, which indicates that lending rates to households are adjusted approximately the same as the repo rate.

In Table A2 in the appendix, we also present the results for listed mortgage rates, both for a three-month variable mortgage rate and for a fixed two-year mortgage rate. The results show that the listed mortgage rates only make marginal movements on the day that the repo rate decision is published. However, four days after the decision, the coefficients for expected and unexpected repo rate adjustments are in line with the results in Table 2. This supports the results obtained from monthly data and indicates that mortgage rates are adjusted more or less immediately after a repo rate decision.

Furthermore, in Table 2, we see that the impact on corporate lending rates is significant. The coefficient for unexpected repo rate changes is large, but, as with households, the standard error indicates that the parameter cannot be separated from 1. One explanation for the relatively large standard error in corporate rates in particular is that companies are a heterogeneous group and interest rates largely depend on which companies choose to borrow in the month in question. This means that there are generally larger fluctuations in interest rates for companies, which probably has an impact on our estimates. Finally, our results show that deposit rates for households and companies are also largely affected by the repo rate, and estimates suggest that most repo rate adjustments have an impact on deposit rates.

To sum up, the results show that different interest rates in the economy are strongly affected by adjustments to the repo rate. An expected increase of the repo rate by 25 basis points typically leads to short-term market rates and interest rates for households and companies rising more or less in step with the repo rate increase. The impact on longer

bond yields is slightly lower, but historical correlations indicate that a five-year government rate normally rises by almost 10 basis points, while a ten-year government rate typically rises by about 5 basis points. The initial reactions in interest rates also seem to persist a few days after the repo rate decision.

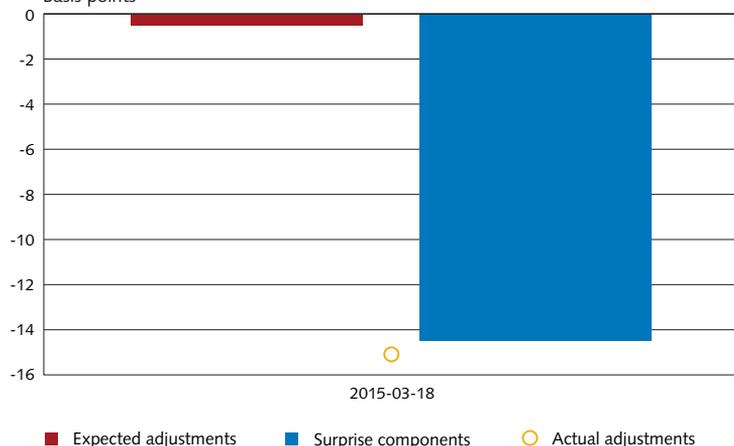
INTEREST RATE FLUCTUATIONS ARE LARGELY IN LINE WITH THE EXPECTATIONS OF THE MONETARY POLICY DECISION FROM MARCH 2015

In this article, we have studied the transmission from the repo rate to other rates in the economy. The quantitative analysis we have described in the article may provide support both for monetary policy decisions and for analysing the effects afterwards. In this section, we analyse a specific repo rate decision and study how interest rate fluctuations in conjunction with the decision relate to our results.

The decision we have chosen to study is the monetary policy decision from March 2015. The reason we choose to study this meeting in particular is partly because we wish to avoid the dates included in the estimates and because it was an unusual decision. Among other things, the Riksbank decided to act between ordinary meetings, which surprised the financial markets. In addition, the Riksbank acted both by cutting the repo rate and by increasing purchases of government bonds.

In March, the Riksbank cut the repo rate by 15 points to -0.25 per cent and extended purchases of government bonds from SEK 10 billion to SEK 40 billion. The Riksbank did this after the Executive Board signalled, at the monetary policy meeting in February, that it was prepared, if necessary, to make monetary policy more expansionary, even between ordinary monetary policy meetings. Despite this, the financial markets were surprised by the decision. In Figure 6, we see that only 0.5 basis points of the cut of 15 basis points were expected according to the pricing of the Stina contract.

Figure 6. Expected and unexpected change from the monetary policy meeting of March 2015
Basis points



Sources: Thomson Reuters and the Riksbank

We can use our estimated coefficients to study whether the fluctuations in various interest rates in March were in line with our results. In Figure 7, we have compiled the results for market rates. The red bars show expected movements due to the adjustments of the repo rate, the yellow bars show the fluctuations that can be explained by international developments and the blue bars show the movement that cannot be explained by the historical relationship. The yellow circles show the actual movements on publication day. As can be seen from the figure, the model can explain a relatively large part of the movements in all market rates.¹⁸ The Stibor rate fell by 12 basis points in conjunction with the decision, which was largely in line with what could be expected according to our results. The downturn in the rate for a three-month treasury bill was initially somewhat smaller than could have been expected. However, data indicates that four days after the monetary policy decision, the rate had fallen by 16 basis points, which indicates that the rate was adjusted in line with the repo rate.

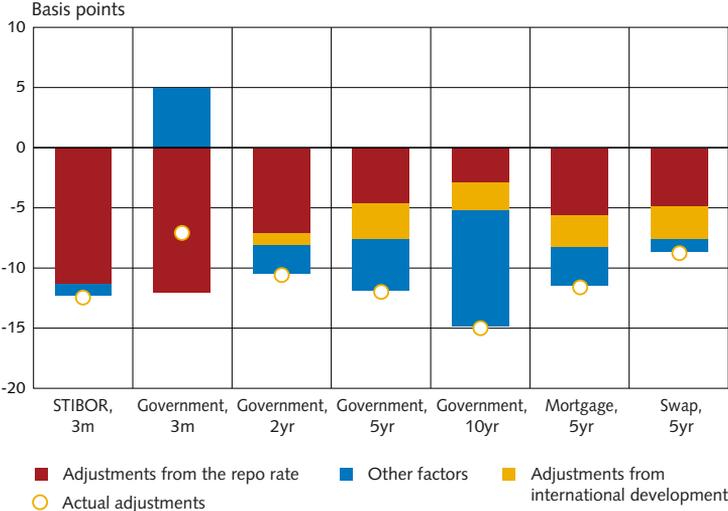
In conjunction with the decision, there were large movements in longer government bond yields in particular, where the ten-year rate fell by almost 15 basis points. The model can explain a certain part of this movement, but the reaction was greater than could have been expected given the adjustment of the repo rate and international interest rate movements. One explanation for the large movements in the ten-year rate in particular is probably that the Riksbank extended its purchases of government bonds from SEK 10 to 40 billion, at the same time as it increased the limit for the maturity of the bonds that it could purchase from 5 years to 25 years. With the decision in March, bonds with ten-year

¹⁸ The Stibor rate is determined every day between 10.30 and 11.00 through bidding. The monetary policy decision in March was published in the afternoon, which means that Stibor had already been determined at this point and, consequently, in this analysis, we use the change on the day after the monetary policy decision.

maturities were thereby also included in the Riksbank’s purchases, which probably made the rate fall further.

The five-year government rate is judged to have been affected by the Riksbank’s announcement of government bond purchases. This is because a relatively large part of the downturn is captured by the variable “other factors”, which can be interpreted as the effect of the Riksbank’s extended purchases. We also see that the five-year mortgage rate and the swap rate fell to about the same extent.

Figure 7. Movements in market rates in conjunction with the monetary policy decision in March 2015

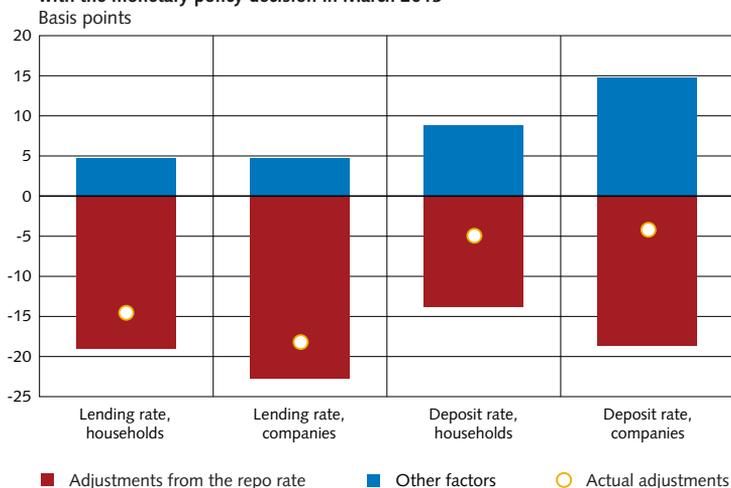


Sources: Thomson Reuters and the Riksbank

Figure 8 illustrates the change in interest rates for households and companies, where the yellow circles show the actual change from February to April. According to our point estimate, lending rates to households should have fallen slightly more than they did. However, in March and April, the lending rate to households fell by 15 basis points, which was in line with the repo rate cut in March. At the same time, the lending rate to companies fell by more than 15 basis points, which was also slightly less than expected according to our point estimate, but was in line with our assessment that a change in the repo rate should have an impact on interest rates for households and companies close to 1. All in all, lending rates to households and companies thus seem to have fallen in line with expectations. This also means that, in principle, the repo rate cut had the same impact as normal, even though the repo rate was negative to start with.

We deem the limited movements in deposit rates to be a consequence of deposit rates already having been close to zero at the time of the decision (see Figure 5) and the banks, so far, choosing not to let deposit rates for households and most corporate customers become negative even though the repo rate had been cut.

Figure 8. Movements in interest rates to households and companies in conjunction with the monetary policy decision in March 2015



Sources: Thomson Reuters and the Riksbank

Conclusions

In this article, we have studied the effects of monetary policy on the general level of interest rates. We have done this both descriptively, by studying how different interest rates have moved in relation to the repo rate historically, and quantitatively, by employing a model to estimate the initial effects on different interest rates in conjunction with a repo rate decision. Our analysis indicates that changes in the repo rate influence other interest rates in the economy. The impact is greatest on short-term interest rates, but a clear relationship can also be seen for longer-term interest rates.

The descriptive analysis shows that short-term market rates have a high level of covariation with the repo rate. The quantitative study supports this analysis, but shows that it takes a few days for interest rates to adjust to unexpected repo rate adjustments. In addition, certain interest rates also react to expected adjustments of the repo rate, contrary to the hypothesis that market rates should continually be adjusted in response to new information and that expected repo rate adjustments should thus already be priced. One explanation for this could be that liquidity and trade in these rates is relatively low, meaning that the adjustment takes place slightly more slowly than expected.

The covariation between the repo rate and the longer market rates is slightly lower than it is for the short-term rates, which can be explained by the longer rates also being steered by factors such as expectations of the future repo rate, credit and maturity premiums and the development of financial markets abroad. The descriptive analysis nevertheless shows a relatively high level of covariation with the repo rate and the correlation between

the repo rate and a five-year government rate is about 0.5. The quantitative study also shows that unexpected repo rate adjustments have a significant effect on longer market rates and the effect also persists a few days after the monetary policy decision. Neither do longer market rates react to expected repo rate adjustments. The results indicate similar movements in a government bond yield, mortgage bond yield and swap rate with the same maturity, which indicates that adjustments of the repo rate do not affect the risk premium. Our estimates for government bond yields with different maturities also confirm that the impact of adjustments to the repo rate decreases with maturity and, instead, international developments become of greater significance.

Finally, our analysis shows that the repo rate has a close relationship with interest rates for households and companies. The estimates in our quantitative analysis demonstrates that interest rates are normally adjusted in line with repo rate adjustments. In addition, when we study the effects of the monetary policy decision from March 2015, we can also note that the impact on lending rates for households and companies was the same as previously, even though the repo rate was negative to start with. This means that the impact of the repo rate adjustment was not significantly changed by the fact that the repo rate was already negative. On the other hand, we note less of an impact on deposit rates, which we deem depends on the banks so far having wished to avoid introducing negative deposit rates for households and most corporate customers.

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Appendix

CALCULATING MONETARY POLICY EXPECTATIONS BY USING 'STINA' CONTRACTS

Equation 1 shows how the surprise component is calculated, where t represents publication date, τ_1 is the number of days the contract has run before the implementation of the new repo rate¹⁹ and τ_2 is the number of days left of the contract's maturity after the implementation of the new repo rate. The expected repo rate adjustment is then calculated as the difference between the actual adjustment of the repo rate and the surprise component (see equation 2).

$$(1) \quad \Delta \tilde{r}_t^{unexpected} \approx \frac{[r_t^{Stina} - r_{t-1}^{Stina}](\tau_1 + \tau_2) - \Delta r_t^{repo}}{\tau_2 - 1}$$

$$(2) \quad \Delta \tilde{r}_t^{expected} = \Delta r_t^{repo} - \Delta \tilde{r}_t^{unexpected}$$

Table A1. Change in interest rates due to repo rate adjustments, 4 days after repo rate decision

	$t_4 - t_1$			
	EXPECTED	UNEXPECTED	KIX RATE	R ²
Stibor, 3 months	0.40 (0.04)***	0.90 (0.09)***		0.83
Treasury bill, 3 months	0.22 (0.03)***	1.02 (0.08)***		0.82
Government bond yield, 2 years	-0.06 (0.04)	0.52 (0.10)***	0.82 (0.11)***	0.47
Government bond yield, 5 years	-0.05 (0.03)	0.29 (0.08)***	0.76 (0.06)***	0.65
Government bond yield, 10 years	-0.09 (0.03)***	0.17 (0.06)***	0.84 (0.05)***	0.77
Mortgage bond yield, 5 years	-0.07 (0.05)	0.53 (0.12)***	0.58 (0.10)***	0.33
Swap rate, 5 years	-0.10 (0.04)***	0.32 (0.09)***	0.77 (0.08)***	0.58

Note. *** indicates significantly separated from zero on the 1-per cent level, ** indicates significance on the 5-per cent level, * indicates significance on the 10-per cent level, standard deviation within parentheses.

Table A2. Change in listed mortgage rates due to repo rate adjustments, daily change and 4 days after repo rate decision

	$t_0 - t_1$			$t_4 - t_1$		
	EXPECTED	UNEXPECTED	R ²	EXPECTED	UNEXPECTED	R ²
Mortgage rate, 3 months	0.08 (0.01)***	0.01 (0.03)	0.37	0.62 (0.05)***	0.87 (0.11)***	0.85
Mortgage rate, 2 years	0.04 (0.01)***	0.05 (0.02)**	0.32	0.16 (0.04)***	0.67 (0.10)***	0.57

Note. *** indicates significantly separated from zero on the 1-per cent level, ** indicates significance on the 5-per cent level, * indicates significance on the 10-per cent level, standard deviation within parentheses.

19 A Stina contract traded on day t corresponds to the expected interest rate on the Stibor T/N rate from day $t+2$ until the contract matures. Implementation day is the first Wednesday after publication date.

Basel III – what and why?

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The global financial crisis that began in 2007 has led many countries to tighten the regulation of banks. In most cases, these changes follow the strengthening of international regulatory standards set by the Basel Committee. In this article, I explain what the Basel Committee is, the background to the stricter standards, what these standards mean and why they are important for Sweden and Swedish banks.

Issues addressed in the article

Following the international financial crisis that started in 2007, many countries have introduced tighter regulations for banks. A large part of these national regulatory changes have been initiated and coordinated by global agreements on more stringent regulations. The new global regulatory standards for banks mean stricter requirements for banks' capital adequacy and new requirements for banks' liquidity positions. Most of these regulatory changes follow from global agreements at the so-called Basel Committee, which has dominated global standard-setting for banking regulation following the crisis. There may hence be a need to study a number of issues more closely.

1. What is the Basel Committee?
2. Why do banks need special regulation?
3. Why were the old regulations insufficient?
4. What are the greatest differences between the old and new regulations?
5. What remains to be done?
6. What do the new regulations mean for Sweden?

In this article, I will try to answer these questions one by one.

What is the Basel Committee?

The aim of the Basel Committee on Banking Supervision, normally referred to as just the Basel Committee, is to promote global financial stability by improving and harmonising both bank regulation and the supervision of banks. Another purpose is to promote banks' sound risk management practises. The committee achieves this by being the main

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standard-setter for global banking rules and by being a forum for cooperation on banking supervisory matters.¹

The members of the Basel Committee are central banks and supervisory authorities from most of the countries with large financial sectors. The membership also reflects a desire for geographical diversity among the members. As of February 2016, 27 countries and the EU are represented in the Basel Committee.² Formally, the committee reports to a group called Governors and Heads of Supervision (GHoS), which, in turn, consists of the central bank governors and heads of supervision of the member countries.

Among other things, the Basel Committee develops minimum standards for banking regulations. Countries are therefore free to implement stricter rules in their countries but not rules that are less strict. The committee also develops guidelines and sound practices for how banks and supervisory authorities should behave. These guidelines and sound practices are not as binding as standards but nevertheless indicate what the committee thinks that banks and authorities should adhere to or what it considers to be appropriate behaviour.

The committee normally meets four times a year and has about thirty sub-groups that discuss various supervision issues or draft new regulatory proposals. In addition, the Bank for International Settlements (BIS) provides a secretariat consisting of over 20 people.

Formally, the Basel Committee is not an authority or even a legal entity. It is an informal gathering of authorities that have decided to meet regularly to discuss regulatory and supervisory issues. The focus of the regulations is on "internationally active banks", or to be precise: banking groups. Despite this, the committee lacks clear definitions of what is meant by both "internationally active" and "banks". The definitions therefore vary from country to country, but, in most cases, it is still fairly clear which institutions are included. All members of the Basel Committee are committed to promoting financial stability as well as to implementing and applying BCBS standards in their respective countries. All agreements must be implemented into each country's national legislation in order to become valid. Formally, therefore, the Basel Committee has no power. Instead, formal decisions are taken by each country's legislative authority. In certain countries, this power has been partially

1 See Basel Committee on Banking Supervision (2013a) which contains the Basel Committee's charter.

2 Basel Committee members are central banks and supervisory authorities from 27 countries. Argentina, Australia, Belgium, Brazil, Canada, China, the EU (represented by the ECB and the Single Supervisory Mechanism (SSM)), France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Luxemburg, Mexico, the Netherlands, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. A number of observers also participate. The Bank for International Settlements (BIS), Chile, the European Banking Authority (EBA), the European Commission, the United Arab Emirates, the International Monetary Fund (IMF), Malaysia and the Basel Consultative Group. The latter is a Basel Committee group in which central banks and supervisory authorities from a number of other countries are represented. Originally, the Basel Committee consisted of the G10 countries plus a few other countries with large financial sectors. The membership has gradually been expanded, and the aim has been to a) include countries with substantial financial sectors and b) achieve a globally coverage in the membership. The most recent major expansion occurred in 2009, when firstly Australia, Brazil, India, China, Mexico, Russia and South Korea, and then Argentina, Indonesia, Saudi Arabia, South Africa and Turkey became members, see Basel Committee on Banking Supervision (2009a) and Basel Committee on Banking Supervision (2009b). In 2014, the EU and the Single Supervisory Mechanism (SSM) along with Indonesia's supervisory authority became full members while Chile, United Arab Emirates and Malaysia were adopted as observers.

delegated to supervisory authorities. However, in practice, the committee is the central global standard-setter and, as all members are expected to comply with the agreements concluded, the committee plays a significant role for global banking regulations.

THE BASEL COMMITTEE'S DECISION-MAKING

Before the Basel Committee reaches an agreement on new rules, a great deal of time is devoted to extensive and prolonged preparatory work. Normally, the Basel Committee tasks a sub-group to discuss and draft a proposal. Much of the practical decision-making therefore takes place in the committee's sub-groups. In more controversial issues, the committee itself provides guidance on how the sub-group should move forward. This work can take a couple of years. When there is a more concrete proposal for new standards, the proposal is sent out for a public consultation in which banks, interest groups, authorities and others may comment on and criticise the proposals. This is an important part of the work of ensuring that the proposals have the intended effect. Another important aspect of the decision-making process is to collect and analyse underlying data from banks and other institutions in order to study the consequences of different proposals more closely. Normally, the analyses are based on data from over 200 banks across the whole world. The sample includes the largest banks, but data from smaller banks are also included. The committee does not take decisions on regulatory matters until it has considered consultation responses and analysed the consequences with the assistance of data from the banks.

Decisions at the Basel Committee are based on consensus and are not taken on the basis of a vote. This means that all members must accept, or at least tolerate, the proposal if it is to be an agreement. At the same time, all members are well aware of the importance of global agreements in this area. Consequently, if most other members can accept an agreement, individual members will be reluctant to oppose it, even if they are not entirely satisfied with all its components. In principle, therefore, a single country seldom blocks an agreement, and especially if it is a small country like Sweden. However, it is important that all members can accept and defend the agreements they have accepted as these regulations are to be implemented in national legislation later on. If a country absolutely refuses to implement a regulation, there is no higher instance to which the other countries can appeal. Decision-making through consensus creates a special negotiating climate in the committee, with a focus on convincing others and reaching a compromise, rather than clarifying differences of opinion. In major issues, the Basel Committee's decisions are normally endorsed by the Governors and Heads of Supervision (GHoS), while politically highly-sensitive matters concerning levels and so on are, in practice, decided by the GHoS, following preparation by the Basel Committee and its sub-groups.

FROM BASEL REGULATIONS TO SWEDISH REGULATIONS

As Sweden is an EU country, Basel agreements are normally implemented through EU law before being introduced in Sweden. The EU's legislative process starts with the European Commission submitting a legislative proposal. In the financial markets area, the various EU Member States' ministries of finance (ultimately the Council of the European Union) then negotiate to reach a joint position. In parallel, the legislative proposal is discussed by the European Parliament. For it to pass into EU law, the proposal must be approved by both the Council of the European Union and the European Parliament. EU laws can be enacted either in the form of an EU regulation or an EU directive. An EU regulation becomes directly applicable in all Member States whereas an EU directive assumes that the Member States will implement the regulations into national law. This means that, if it is an EU directive, the regulations must be adopted into Swedish legislation, as decided by the Riksdag (the Swedish parliament) or other statute, for example regulations decided by the Government or a public authority.

Banking regulations often contain technical details that are not easily formulated in an EU regulation or an EU directive. This means that EU regulations and EU directives are often complemented by more detailed rules. Directives and regulations are therefore often complemented by guidelines determined by the European Banking Authority (EBA) or by so-called delegated acts or implementing acts determined by the Commission.

BASEL IS NOT JUST ABOUT RULES

Over the last five years, the Basel Committee has not just taken decisions on a number of new rules but also evaluated how each country has implemented the regulatory framework. These evaluations are performed by staff from other central banks and supervisory authorities and then published.³ Any deviations are highlighted and, in many cases, countries have already adjusted their legislation and their rules before the evaluations have been completed to ensure that their own rules correspond to the Basel framework. These public evaluations have hence put pressure on the countries to implement the regulatory frameworks as they were intended. They have also reduced the differences between the banking regulations of the various countries. In a few cases, differences remain, however. The EU, for example, has not implemented all parts of the Basel III agreement and deviates on a few minor points. The evaluations highlight such differences.

The Basel Committee's regulatory framework for banks has been developed gradually. Several of the original ideas and concepts are still topical. The various frameworks that are discussed, Basel I, Basel II, Basel 2.5 and Basel III are gradual refinements of one regulatory framework, rather than entirely new independent regulatory frameworks. In order to understand the current regulatory framework and the discussions being pursued, it is therefore important to look at the issues from a historical perspective. Consequently, in the next section, I present an overview of the Basel Committee's history.

³ In Basel terminology, these evaluations are called Regulatory Consistency Assessment Programmes (RCAP).

THE HISTORY OF THE BASEL COMMITTEE⁴

The Basel Committee was set up in 1974 to improve global financial stability by creating a forum for cooperation between countries on banking supervisory issues. When the Bretton Woods system of foreign exchange rates ended in 1973⁵, significant currency risks arose among certain internationally active banks. In June 1974, for example, the West German supervisory authority revoked the banking license of the German bank Herstatt when it was discovered that its foreign exchange exposures were three times greater than its capital. For similar reasons, the US bank Franklin National Bank of New York was forced to close later the same year. In both cases, this led to significant losses for banks in other countries with shocks propagating through the financial system. It became obvious that something had to be done to reduce such risks. The central bank governors in the G10 countries⁶ therefore decided at the end of 1974 to create a committee that would later be called the Basel Committee.

Focus on supervision

The initial purpose of the committee was to ensure that all internationally active banks were under supervision and that the supervision was sufficient and consistent across borders. The first agreement, **the Concordat**, was concluded as early as 1975 and stipulated principles for the supervision of banks' foreign branches.⁷ The principles were updated and extended in 1983⁸ and 1990⁹. In 1992, they were redesigned and became minimum standards for the supervision of internationally active banks.¹⁰ In the mid-1990s, the Basel Committee cooperated with a group known as Offshore Group of Banking Supervisors to further develop principles for how supervisory authorities should cooperate on the supervision of banks active in several countries.¹¹ Since then, this document has been recognised by 140 countries around the world and has hence become the standard for cooperation between supervisory authorities in home and host countries.

At the same time, the Basel Committee developed basic principles for how supervision should be conducted more generally. These are usually called the Basel Core Principles. The first version of these basic principles for effective banking supervision was adopted in September 1997,¹² and was then successively reviewed and updated in 2006¹³ and

4 This description has been inspired by the Basel Committee on Banking Supervision (2105d) which contains a slightly longer description of the history of the Basel Committee. Goodhart (2011) contains an even more detailed description of the history of the Basel Committee up until 1997.

5 The Bretton Woods system was a monetary system with fixed foreign exchange rates linked to gold. The system was the basis for exchange rates among the world's most important currencies from 1945 to 1973.

6 The G10 countries comprised Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

7 See Basel Committee on Banking Supervision (1975).

8 See Basel Committee on Banking Supervision (1983).

9 See Basel Committee on Banking Supervision (1990).

10 See Basel Committee on Banking Supervision (1992).

11 See Basel Committee on Banking Supervision (1996c).

12 See Basel Committee on Banking Supervision (1997).

13 See Basel Committee on Banking Supervision (2006).

2012¹⁴. These core principles are also used by the International Monetary Fund (IMF) and the World Bank when they evaluate the financial systems of various countries. They have thereby taken on a significance far beyond the member countries of the Basel Committee.

Focus on regulation as well – Basel I

As early as the beginning of the 1980s, it became clear that the Basel Committee could not just focus purely on supervisory issues. Crises in Latin America at the start of the 1980s strengthened unease that the banks' capital adequacy was insufficient and that this could create contagion effects in other countries. There was therefore an increased need to establish certain minimum standards for internationally-active banks' capital adequacy. In the mid-1980s, the Basel Committee therefore started work on reaching an agreement on certain minimum levels for capital adequacy. Its aim was to strengthen the stability of the international banking system and to reduce the competitive advantages that arose when requirements for the banks' capital adequacy differed from country to country. After a public consultation of the proposal an agreement was reached in July 1988,¹⁵ of what is normally referred to as **Basel I** or "**the Accord**". In somewhat simplified terms, the Basel I accord stipulated that banks should have capital equal to at least 8 per cent, adjusted for the risk of the exposure (see below).

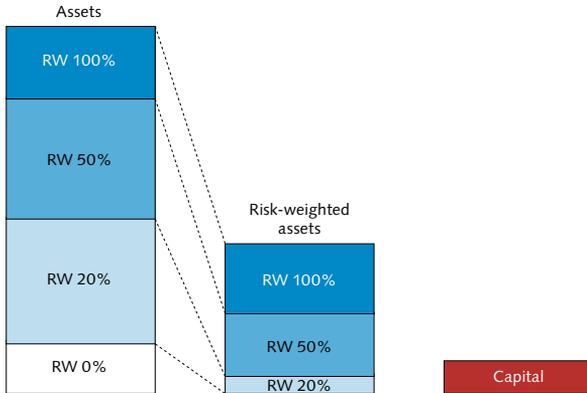
Basel I assumes that the credit risk inherent in a bank's exposure varies depending on the type of exposure and therefore capital requirements need to be risk-adjusted. The risk adjustment was made by categorising the bank's credit risk into one of four different risk classes.¹⁶ The exposures with the highest risk (for example corporate lending) were given 100 per cent as a risk weight. Slightly less risky exposures (for example mortgages) were given 50 per cent as a risk weight. Certain other exposures (for example interbank lending) were given 20 per cent as a risk weight and the safest exposures (for example certain government securities) were given 0 per cent as a risk weight. Risk-weighted assets were calculated by multiplying the risk weights by the size of the exposures. Under the agreement, internationally active banks – in order to cover the credit risks – were required to have equity amounting to at least 8 per cent of their risk-weighted assets (see also Figure 1). The same basic idea of risk weights still remains today. A risk weight of 100 per cent implies, in other words, that a bank must cover the exposure with 8 per cent capital, while the remaining 92 per cent can be borrowed from depositors or from the markets. A risk-weight of 50 per cent implies that the capital requirement is 4 per cent of the size of the exposure. Under the agreement, the countries should implement the new capital requirement rules by the end of December 1992.

14 See Basel Committee on Banking Supervision (2012a).

15 See Basel Committee on Banking Supervision (1988).

16 There were actually five risk classes. In addition to those listed, there was one set at 10 per cent, but it was hardly used, so I will ignore it in this article.

Figure 1. Risk-weighted assets



RW = Risk weight

From the start, the idea was that the minimum regulatory framework should evolve over time, as the financial sector is constantly developing and changing. The first fine-tuning took place in November 1992 when the Basel Committee specified the definitions of banks' loss allocations and provisions for future losses in more detail.¹⁷ Further fine-tuning of how the banks could calculate the net amount of various counterparty exposures occurred in April 1995¹⁸ and April 1996¹⁹.

At the same time, the Basel Committee was working to cover more risks. Banks are not just exposed to credit risks, that is, the risk of borrowers not being able or willing to pay them back in full and on time. Another major risk is market risk, which is the risk that the market price of an asset may vary. If a bank buys and sells an asset, it may make a loss in this trading. In January 1996, therefore, an agreement was reached on how market risks (for example on exposures to foreign exchange, fixed income instruments, equities, commodities and derivatives) would have to be covered by capital. This agreement was known as the **Market Risk Amendment**²⁰. The regulations for market risk were then adjusted in 1997 and 2005.²¹

The Market Risk Amendment thus meant that the Basel Committee had made a conceptual distinction between the banking book, where traditional credit risks were assessed and covered by capital, and the trading book, where market risks were assessed and covered by capital. The new Market Risk Amendment also meant that banks were allowed, for the first time and under certain strict conditions, to use their own internal models for estimating their risks and hence the capital they need to hold.

17 See Basel Committee on Banking Supervision (1991).

18 See Basel Committee on Banking Supervision (1995).

19 See Basel Committee on Banking Supervision (1996b).

20 See Basel Committee on Banking Supervision (1996a).

21 See Basel Committee on Banking Supervision (2005). As part of Basel III, the committee decided in January 2016 to amend the market risk regulations (see Basel Committee on Banking Supervision (2016b)). I will return to this issue on page 85.

Basel II

Towards the end of the 1990s and in the early 2000s, it became increasingly clear that the existing credit risk categories did not fully reflect the risks taken by banks. The rules in Basel I implied that all corporate lending was given a risk weight of 100 per cent regardless of the risk in the exposure to the company. The bank therefore needed the same amount of capital for all its corporate lending, regardless of whether it was an established company with a stable cash flow or a new start-up on an uncertain market. Similarly, all mortgages were given a risk weight of 50 per cent regardless of the risk associated with the borrower. Neither was any differentiation made between mortgage holders who were highly likely to repay on time and those who imposed a larger risk on the bank. The Basel Committee concluded that better risk adjustment was needed in capital adequacy calculations and therefore drafted a new version of the regulatory framework. The **Basel II** accord was concluded in June 2004, after six years of intensive efforts.²² Member countries should implement the new framework by the end of 2006. Fine-tunings and extensions to market risk and operational risks followed in 2005²³ and in June 2006, a more comprehensive Basel II regulatory framework was published.²⁴ As a result of Basel II, the regulatory framework became more risk-sensitive but also more complex. While the Basel I accord consists of 30 pages in total, the Basel II text is no less than 347 pages. The trade-off between risk sensitivity and simplicity is something that the Basel Committee has wrestled with ever since.

Basel II comprises three pillars: **Pillar 1** is the quantitative minimum capital requirements that must exist by law. The capital requirements cover credit risks, market risks and operational risks. Each area includes *standardised approaches* that legally stipulate the risk weights that should be used for different types of exposure and thereby how much capital is required. The standardised approaches could be said to be a refinement of Basel I. In addition, there are *internal models*, where the banks themselves may estimate certain parameters if they have enough data and obtain the approval of the supervisory authority. For market risk, the banks can make use of their internal models to measure Value at Risk (VaR).²⁵ For operational risks, the capital requirement depends on the size of the bank and on the bank's previous operational losses.²⁶ For credit risk, there are two different internal models, the Foundation Internal-Ratings-Based approach (F-IRB) and the Advanced Internal-Ratings-Based approach (A-IRB).

22 See Basel Committee on Banking Supervision (2004a).

23 See Basel Committee on Banking Supervision (2005).

24 See Basel Committee on Banking Supervision (2006a).

25 Value at Risk (VaR) is a measure of the market risk inherent in an investment. A VaR of 95 per cent for 10 days is the maximum amount the bank risks losing during a 10-day period with a probability of 5 per cent.

26 Operational risks include legal risks and fraud risks, among others.

In both IRB methods, the risk is measured in four main dimensions:

1. probability of default - **PD**,
2. loss given default - **LGD**,
3. exposure at default - **EAD**, and
4. maturity - **M**.

For a given M, the expected loss is calculated by multiplying $PD \times LGD \times EAD$. The purpose of capital is to cover any unexpected losses. The bank should cover the expected losses via fees and its pricing. By calculating the expected losses as above and given certain distributional assumptions of the losses as specified in the Basel II regulations, the bank can calculate *unexpected* losses. In the foundation IRB, the bank may estimate PD, but LGD and EAD are stipulated in the regulation for each exposure class. In the advanced IRB, the bank may also estimate LGD and EAD.

Since the internal models generally lead to lower capital requirements for the banks, a floor was also introduced into the Basel II accord. This means that the banks' risk weights may not decrease too much when the banks use internal models. The floor is set so that the banks' risk-weighted assets should not be permitted to fall below 80 per cent of what they would have been under the Basel I model. The Basel II floor was originally intended to be temporary but has not been abolished and still remains in place, although some countries no longer apply it.

Pillar 2 complements the minimum requirements under Pillar 1 with individual requirements for each individual bank that are based on the supervisory authority's evaluation of the bank's aggregate risks. The supervisory authority is to consider all risks, including those that are not covered by the rules in Pillar 1. It may be a question of more qualitative issues such as legal risks, strategic risks, reputational risks, corporate governance issues or how effective the bank's internal risk reporting system is, but also specific risks such as the interest rate risk in the banking book. The last of these risks is linked to what happens with the bank's earnings, balance sheet and risks if the general interest rate changes. Under Pillar 2, the supervisory authority can place additional capital requirements on the bank to cover such risks. These capital requirements will then be specific to the individual bank and not affect other banks.

Pillar 3 contains detailed requirements for the risks and exposures the bank must make public. The aim is ultimately to reduce the asymmetric information so that market participants can better estimate the bank's risks. This subjects the banks to market discipline. The Pillar 3 requirements stem from the fact that it is difficult for an outsider to estimate a bank's risk. The Basel Committee wants to reduce the informational disadvantage of market participants by tightening the requirements on what the banks must communicate to the market.

Compared with Basel I, Basel II also placed much tougher demands on supervisory authorities. They were obliged to acquire both detailed knowledge of the banks' internal models. They were also forced to learn to assess and approve such models. Their need

to coordinate the work of approving such models with supervisory authorities in other countries also increased as many banks have subsidiaries in other countries and the models are in many cases used in several countries.

When the global financial crisis broke out in 2007-2008, the Basel II framework was completely new. However, the crisis made it necessary to fundamentally revise the Basel regulatory framework, paving the way for Basel III. I will return to Basel III later on, but, to fully understand Basel III, it is necessary to first briefly repeat why banks are special and why they need to be regulated more than other companies.

Why do banks need special regulation?

There are several reasons why banks need special regulations. Firstly, banking entails specific liquidity risks. Secondly, banks are particularly important for the real economy. By being the actual channel for the large majority of payments, they are vital to almost all other financial activity. Thirdly, experience tells us that bank crises have high economic costs. The external effects of bank crises are considerable. Fourthly, and as a consequence of the first arguments, it may be difficult for the government to allow large banks to fail as they may be systemically important. The banks and market participant naturally know this, which means that the banks sometimes count on implicit guarantees from the government. This, in turn, distorts the banks' incentives. Consequently, banks are likely to take greater risks in their operations than they otherwise would. If so, this will also lead to higher risks in the economy as a whole. I discuss these four arguments in more detail in the following sections.

BANKS HAVE SPECIAL LIQUIDITY RISKS

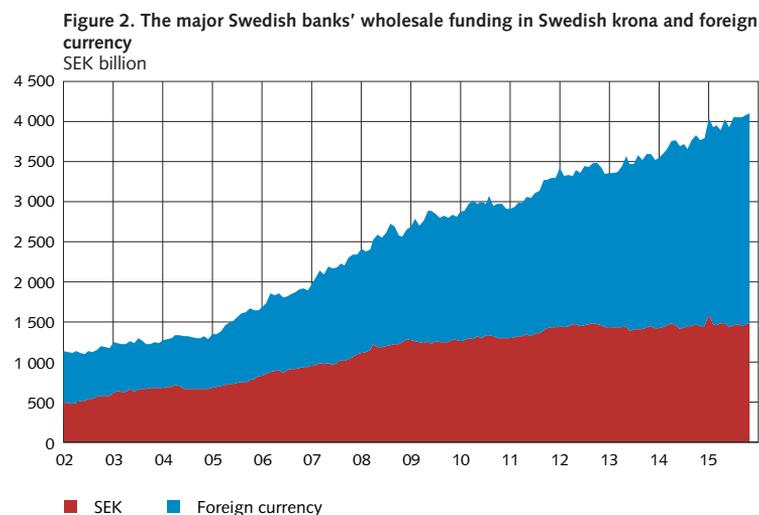
A traditional bank receives deposits from companies and the general public. These include, for example, the wage and savings accounts of private individuals, as well as the liquid funds of companies. These are reported as liabilities for the bank. At the same time, the bank lends funds to other companies and households. These loans, in the form of mortgages and corporate loans, are reported as assets for the bank.

The vast majority of the deposits are immediately accessible to the companies and households that have deposited the funds and, in addition, are expressed in nominal terms. The depositor can use the funds directly and a deposit of SEK 100 will be worth SEK 100 (plus any interest), regardless of how the bank has invested the assets. As most depositors also use these funds to make their payments, they want them to be nominally determined and not dependent on the value of the bank's assets. To make their payments, most people prefer to have a bank account rather than an account with a money-market mutual fund, the value of which may fluctuate both upwards and downwards. At the same time, the bank's lending is long-term. This difference between, on the one hand, the bank's short-term and nominally determined deposits (liabilities) and, on the other, its long-term lending of funds (assets) creates special liquidity risks for the bank. If all

depositors want to withdraw money at the same time, the bank will have problems, as it risks not having enough liquid funds. When the deposits are nominally determined, those who wish to withdraw funds first may take out the full amount whereas those who come last risk getting nothing. When the depositors realise this, so-called bank runs may occur, as everyone wants to withdraw their money at the same time, preferably before everybody else. Simply a rumour that the bank is in trouble might be sufficient for depositors to want to withdraw their money before others do.²⁷ As the bank's lending is long-term, the bank cannot demand mortgage holders and companies to pay back at short notice. The bank thereby risks liquidity problems.

One way of reducing such problems is to introduce a deposit guarantee.²⁸ Although deposit guarantees have been introduced in most countries, bank runs have nevertheless occurred in recent years.²⁹ This suggests that deposit guarantees reduce, but not necessarily completely eliminate, the problem of bank runs. In addition, deposit guarantees can create moral hazard problems. The deposit guarantee reduces the incentives of depositors to monitor the risks of the bank. The deposit guarantees needed to reduce the risk of bank runs thereby, in turn, reinforce the government's need to control the risk-taking by banks.

The major Swedish banks³⁰ obtain funding not only via deposits from the general public and companies. For several years, much of their funding has come from market participants, often abroad. It is mostly foreign mutual funds and other professional investors who lend to Swedish banks. Figure 2 illustrates this by showing that significant and growing amounts of the banks' wholesale funding originates abroad.



27 See Diamond and Dybvig (1983).

28 Most countries have also introduced a deposit guarantee that compensates the depositor up to a certain proportion of the deposit, should the bank fail. In Sweden, the depositor is covered for up to the equivalent of EUR 100,000.

29 One example is the British bank Northern Rock, which was subject to a bank run in September 2007.

30 The concept of "the major Swedish banks" is used in this article to denote the banking groups Nordea, SEB, Svenska Handelsbanken and Swedbank.

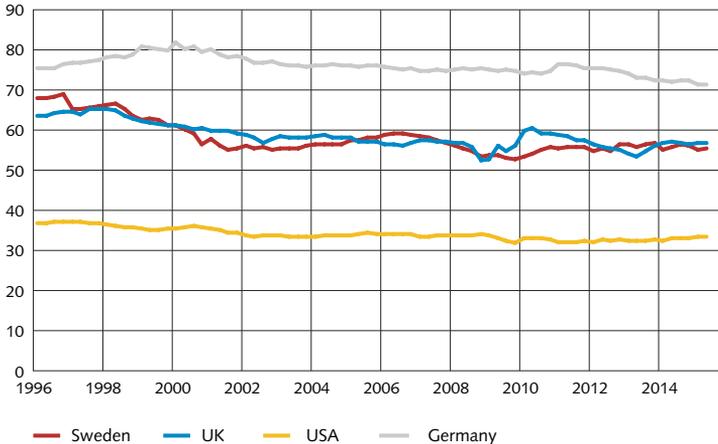
Even if providers of wholesale funding cannot withdraw their money exactly when they wish, the problem of bank runs is not absent with this type of funding. The banks need to renew this borrowing on a regular basis and the funding can quickly disappear if they do not have a high level of confidence among these foreign investors. This part of the banks' funding is not covered by deposit guarantees, either.

BANKS ARE IMPORTANT TO THE REAL ECONOMY

Banks are key players in processing payments and supplying credit to the economy. When Swedish banks pay each other, the transaction takes place via the Riksbank's payment system RIX. About SEK 430 billion kronor pass through this system on an average bank day.³¹ This means that an amount equal to the entire annual Swedish GDP passes through RIX in less than two weeks. If one of the major banks were to have serious problems, the effects, even on the same day, could therefore be dramatic for the other banks and ultimately for the entire Swedish economy. There are obviously contingency routines and other security arrangements to avoid such effects but this still indicates the importance of banks for the economy.

Banks are responsible for a large share of the lending that takes place in the economy. Among EU Member States, banks are responsible for around 55-80 per cent of total lending, (see Figure 3).³² If major banks fail, this may therefore have a major impact on lending and other financial services in the economy.

Figure 3. The banks' share of total lending in a selection of countries
Per cent



Source: BIS "Credit to the non-financial sector", see www.bis.org/statistics/totcredit.htm

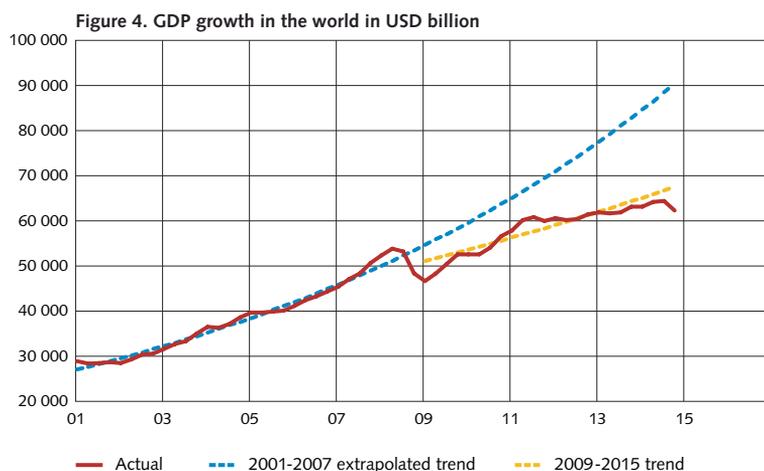
31 For more data, see, for example, Sveriges Riksbank (2015a), page 23.

32 The level of bank credit provision is lower in some countries, for example the United States, where companies obtain funding via market borrowing to a larger extent. Furthermore, it is not easy to estimate total lending in the economy. There are a number of issues with definitions, for example, how the funding of different subsidiaries in corporate groups should be considered. Is it lending or just internal transactions? If these internal transactions are excluded from total lending, the banks' share of total lending in Sweden rises to about 80 per cent.

BANK CRISES HAVE HIGH ECONOMIC COSTS

Financial crises have occurred for many hundreds of years.³³ Modern banks have a slightly shorter history but bank crises have nevertheless been a regular occurrence over the last 200 years. Common to these crises has been that they have also come at a major cost to the real economy.³⁴

Figure 4 shows how the global financial crisis 2007-2010 affected the development of GDP in the world. The red line shows actual GDP growth in a large number of countries. The broken blue line shows a trend based on data from 2001 to 2007, which has been extrapolated. Expressed in different terms, it could be said that, if GDP had developed in the same way post-2007 as it did during the period 2001 to 2007, average GDP would have followed the broken blue line. The broken yellow line instead represents the trend after the global financial crisis in 2007-2010. Even though GDP fluctuates somewhat over time, the figure is rather striking.



Note. The figure is based on seasonally-adjusted quarterly GDP data in USD billion (where up-to-date currency rates have been used) from the following countries: Argentina, Belgium, Brazil, Canada, China, France, Germany, Hong Kong, India, Italy, Japan, Korea, Luxemburg, Mexico, the Netherlands, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

Source: BIS³⁵

The figure indicates three things. Firstly, the global financial crisis led to a heavy fall in GDP. Secondly, the GDP fall has been permanent insofar as the economy has not recovered from this following the crisis. The trend of the GDP level is considerably above the actual outcome after the crisis. Thirdly, average GDP growth is clearly lower in the aftermath of the crisis. Currently, GDP is thirty per cent lower than if growth had continued in

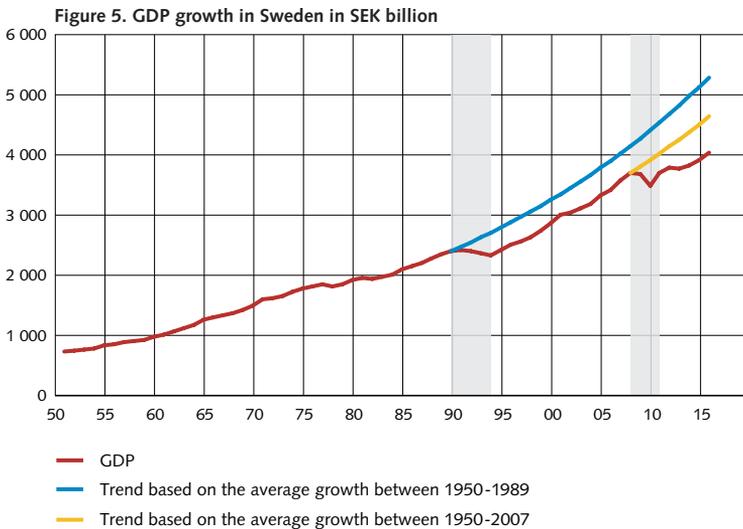
33 See Reinhart and Rogoff (2009).

34 See, for example Basel Committee on Banking Supervision (2010a), Basel Committee on Banking Supervision (2010b) and Haldane (2010).

35 See Basel Committee on Banking Supervision (2015e).

accordance with the earlier trend. For the countries included in the figure, the aggregate loss in GDP since the crisis amounts to more than SEK 700,000 billion (or USD 76 trillion). In many countries, unemployment also increased dramatically during the crisis and it has proven difficult to reduce it to previous levels. The prolonged nature of the crisis heightens the risk of those who are unemployed becoming so permanently, which further increases the long-term costs of the crisis both for society as a whole and for the individuals affected.

The development of GDP in Sweden in conjunction with the banking crisis in Figure 5 also appears clear. The red line shows the GDP outcome. The blue line shows the trend based on data from 1950-1989 and the yellow line the trend based on data from 1950-2007.³⁶



Note: The grey areas indicate the two financial crises.
Sources: National Institute of Economic Research and Sveriges Riksbank

Figure 5 clearly shows that Sweden has gone through two bank crises: 1990-1994 and 2008-2011. During both crises, GDP fell sharply and the economy has not recovered sufficiently afterwards to compensate for the fall. Even if the trend, in Sweden's case, is not lower than before, the post-crisis level is lower than indicated by previous trends. These crises thus brought about a permanent loss for the economy. It is also interesting to note that the two stock market crashes in 1987 and 2000 do not leave any noticeable impression on the GDP curve. It is only the two banking crises that create these large falls in GDP. No other events affect GDP anything like as much.

³⁶ The high economic growth in the 1950s and 1960s certainly affects the calculation of the trend in an upward direction, but, even if the calculations were started in 1970, similar results would be obtained, assuming an allowance can be made for more sophisticated calculations, such as with a linear-quadratic trend line. However, the important point here is not how the trend has been calculated, but that the data only shows two clear breaks in GDP outcome and both of these coincide with the two financial crises Sweden has experienced during this period.

IMPLICIT GOVERNMENT GUARANTEES

As certain banks are so important to the real economy, there have been several historical cases in which governments have been forced to employ various rescue measures in a crisis.³⁷ Allowing a loss-making bank to go bankrupt in a disorderly manner may sometimes lead to unacceptable economic costs. In times of financial crisis, governments therefore may be forced to implement rescue measures or bail-outs, that usually lead to the major loss-making banks surviving in some form or other. This creates what are known as implicit guarantees from the government to the major banks.

The fact that certain banks and market participants expect the government to support banks in a crisis reduces the major banks' incentive to build up their own buffers that would reduce the likelihood of a banking crisis. If the banks have large buffers in terms of extra capital and liquidity, it means that the expected return on equity, and thus shareholder dividend, risks being lower.³⁸ If the banks take greater risks, they can also increase revenue. The fact that the banks expect government rescue measures in times of crisis therefore intensifies the likelihood of them increasing their risk-taking, as they believe that the government will intervene and take some of the losses if there are problems. If all goes well, the bank (and its shareholders) share the profit. If there are credit losses, the government picks up the tab. This behaviour is normally referred to as a moral hazard problem. If any other type of company had been involved, the government would probably just have let it go bankrupt in the normal manner. Bankruptcy in such cases would have led to debt holders having to foot the bill. If debt holders know that they risk having to pay for losses if the company enters bankruptcy, this will give them an incentive to monitor the company's risks. As the consequences of a major bank entering bankruptcy can be so serious for the economy and market participants believe that the government may intervene with rescue measures, the disciplinary effect that lenders have on a normal company is weakened.

All in all, these four arguments mean that there is clear economic justification for the state to ensure that banks have sufficient capital and liquidity to reduce the risk of bank crises. If banks were entirely unregulated, their buffers would be smaller than economically optimal, given their key role in the financial system. All countries therefore place larger and more far-reaching regulations on their banks than on other companies. The question is how these regulations should be formulated and if they, for example, need to be tightened.

Why were the old regulations insufficient?³⁹

When the financial crisis broke out in 2007, the Basel Committee had just adopted the Basel II framework. Most of the Basel Committee's member countries had implemented the new rules, but they had not yet come into force everywhere. The United States, for example,

³⁷ See also Llewellyn (1999).

³⁸ According to Modigliani and Miller (1958), the cost of a company's funding is independent of the source of funding. However, in practice, tax differences and other factors mean that funding via equity capital is more expensive than funding via liabilities.

³⁹ This section is inspired by the Basel Committee on Banking Supervision (2015e).

had yet to implement them. As is clear from Figure 4, the global financial crisis was deep and costly for many countries. It was therefore obvious to leading decision-makers that the existing regulatory framework was insufficient and needed to be tightened.⁴⁰

There were a number of problems that Basel II did not address:

1. The banks' capital buffers were too small to be able to withstand the pressures that arose during the crisis.
2. Indebtedness was too high in the financial system and the banks' capital levels were inadequate to cover the risks arising due to this indebtedness.
3. Credit growth was too high and the pricing of risk too low.
4. Systemic and contagion risks turned out to be greater than had been believed. Many financial institutions were too dependent on each other and had far too similar exposures. So, when a bank encountered problems, these quickly spread to other banks, which created systemic problems.
5. When external credit rating agencies simultaneously reduced many banks' credit ratings, procyclical effects arose.⁴¹
6. The banks had inadequate liquidity buffers and, at the same time, took too high liquidity risks.
7. Many new financial instruments had become so complex that neither banks, market participants nor supervisory authorities realised the true extent of these risks.

All in all, these problems exacerbated the crisis and led to many market participants losing confidence in banks. In addition, distrust quickly spread to other parts of the financial sector and to the real economy. As we have seen in Figures 4 and 5, this led to considerable losses in economic activity and a sharp falls in GDP.

What are the greatest differences between the old and new regulations?

As a direct consequence of the global financial crisis, the Basel Committee agreed, in July 2009, on a modified regulatory framework for the trading book, which includes exposures stemming from securities a bank has and intends to trade in. This modified regulatory framework is normally referred to as **Basel 2.5**.⁴² The aim of Basel 2.5 was to quickly rectify some of the risks that had become clear during the global financial crisis, when the capital calculated to cover the exposures in trading book was not sufficient to cover the losses emanating from the trading book. The tighter regulations meant that banks had to retain more capital for securitisation and complex exposures in the trading book. Those banks that were allowed to use internal models were also supposed to calculate a stressed variant of Value at Risk (VaR), in which they assumed that market volatility was greater

40 See, for example, the G20 leaders' statements from the summit meeting in April 2009, G20 (2009).

41 Procyclical effects occur when regulations reinforce fluctuations in the financial economy, see further on page 80.

42 See Basel Committee on Banking Supervision (2009c).

than previously assumed. The aim was partly to reduce the risk that the banks would underestimate their capital requirement and partly to reduce procyclicality.

Basel 2.5 was just a partial solution, however, and the Basel Committee realised that more needed to be done. Consequently, the committee began working on a larger reform package that has come to be known as Basel III. The new regulatory framework for capital requirements was adopted in December 2010 with a minor adjustment in June 2011.⁴³ Among other objectives, the aim of the revised regulatory framework is to:

- increase the quality and quantity of banks' capital,
- increase the risk capture,
- increase the banks' resilience by introducing capital buffers,
- reduce procyclicality in the regulatory framework,
- reduce systemic risks,
- ensure that banks have a minimum level of liquid funds,
- limit the difference in maturity between banks' assets and liabilities,
- limit banks' indebtedness and reduce dependence on their own models,
- limit banks' large exposures to individual counterparties,
- strengthen the regulations for exposures in the trading book.

The new standards will be phased in successively until 2019, and by 2023, the new standards should be fully operationalised. In the section below, I present the different components of the revised framework one by one.

INCREASE THE QUALITY AND QUANTITY OF BANKS' CAPITAL,

Capital can, in principle, be divided into three components, common equity Tier 1 capital (CET1), other Tier 1 capital and Tier 2 capital. Common equity Tier 1 capital (CET1) consists mostly of equity capital and retained earnings, and is the type of capital that covers losses in the best and easiest way. If the bank makes losses, this is the capital that first bears these losses. In contrast, defining Tier 1 and Tier 2 capital is less straightforward. In principle, it could be said that these forms of capital are hybrid instruments, which is to say a mixture between equity and classic debt instruments. Other Tier 1 capital can for instance be non-redeemable, non-cumulative preferred stock, if these fulfil certain conditions. Tier 2 capital mostly consists of longer-term subordinated debt, subject to certain conditions. Such subordinated debt instruments have a lower priority than other debts and cover losses in bankruptcy before other liabilities do. If the bank makes losses, the common equity Tier 1 is first used to cover the losses. If this is not enough, the bank uses other Tier 1 capital and, if this is not enough and the bank defaults, Tier 2 capital is used to cover the losses. At least this was the plan.

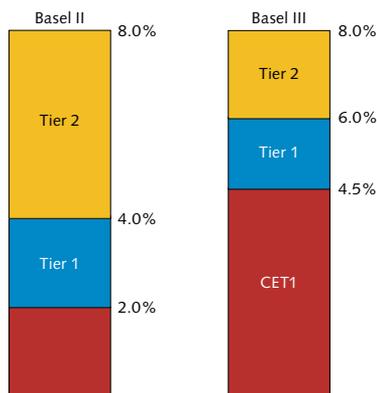
43 See Basel Committee on Banking Supervision (2011a)

During the financial crisis, many banks in different countries experienced a common problem. Some types of capital that were assumed to be loss-bearing did not cover losses the way they were intended to. Common equity Tier 1 covers losses, but, in several countries, the government was forced to intervene and cover the losses, while the owners of the hybrid instruments (both other Tier 1 capital and Tier 2 capital), in many cases, emerged from the crisis unscathed. In order to be included in the capital adequacy calculations, **stricter rules** have therefore been introduced for these forms of hybrid capital. They must, for example, automatically be converted into equity capital if the capital adequacy falls too far.

Basel III also involves a tightening of the **level of capital**. Total capital can consist of CET1 capital, Tier 1 capital and Tier 2 capital. In Basel II, there was a requirement for the bank to have at least 8 per cent total capital in relation to the risk-weighted assets. At the same time, at least four per cent of the bank's risk-weighted assets had to be in the form of CET1 capital and other Tier 1 capital. Of the total capital requirement, at least half could therefore consist of Tier 2 capital. In addition, somewhat simplified, at least half of the Tier 1 capital had to consist of CET1 capital. In practice, the bank could thus manage with two per cent CET1 capital. Under Basel III, the capital requirement level was raised so that at least 4.5 per cent of the risk-weighted assets has to be CET1 capital and at least six per cent Tier 1 capital.

In Figure 6, I show the differences in requirements for the banks' minimum requirements according to Basel II and Basel III. It is clear that the banks need to have more CET1 capital (the best kind of capital) under Basel III than under Basel II.

Figure 6 – Minimum capital requirements under Basel II and Basel III



In addition to the minimum requirements, Basel III also includes capital buffer requirements. I will return to this issue later on. The capital buffers mean an additional de facto increase of the banks' capital requirements.

INCREASE THE RISK CAPTURE

Another change introduced by Basel III is that the banks now need to have capital to cover more risks. As I mentioned previously, Basel 2.5 contained tighter regulations with regard to capital adequacy for holdings of securitisation⁴⁴ and complex exposures in the trading book. In Basel III, capital adequacy requirements have also been strengthened for exposures outside the balance sheet and certain securitisations and resecuritisations⁴⁵ for banks that securitise their portfolio. A larger proportion of the counterparty risks are also covered. An example is the introduction of capital requirements for the risk that credit ratings of the counterparty will be changed, the so called Credit Valuation Adjustment (CVA), i.e. the risk that the bank makes a loss due to market changes caused by a downgrading of the credit quality of the bank's counterparty.

INCREASE THE BANKS' RESILIENCE BY INTRODUCING CAPITAL BUFFERS

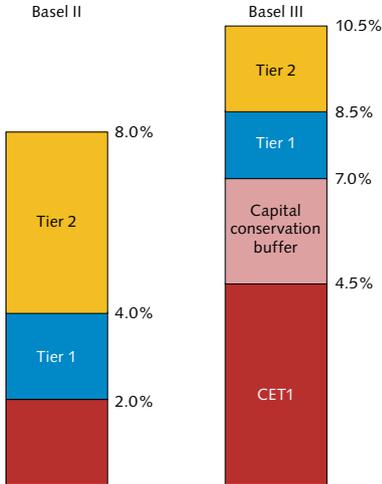
The global crisis proved that banks did not have adequate capital buffers above the minimum requirements. Furthermore, there were no harmonised requirements governing what would happen if the banks did not fulfil the requirements under Basel II. It was up to each individual country to specify the consequences. This meant that authorities sometimes submitted action plans too late and the banks were not quick enough to rectify a number of problems. In conjunction with the Basel III agreement, the Basel Committee took a first step towards specifying a common framework for what the consequences would be if a bank breaks the rules.

Basel III thus introduces a requirement that the banks are to have capital buffers over and above the minimum levels. The so-called capital conservation buffer amounts to 2.5 per cent of the risk-weighted assets and is added on top of the banks' minimum capital requirements (see Figure 7). In addition to the capital conservation buffer, Basel III also introduces a countercyclical buffer (see next section) and an extra buffer for globally systemically important banks (see section after that).

44 A securitisation means that the bank that has granted a number of loans restructures these loans and sells them to various investors.

45 A resecuritisation means that the bank restructures products that have already been securitised and securitises them again.

Figure 7. Capital requirements including the capital conservation buffer under Basel II and Basel III



All capital buffers must consist of CET1 capital. The three different buffers (the capital conservation buffer, the countercyclical capital buffer and the buffer for systemically-important banks) together form a joint total buffer. If the bank’s capital falls to a point where it fulfils the minimum requirements but not the requirement for the total buffer, the bank must retain part of its profits to build up capital. The bank cannot, in other words, use that part of the profit to distribute to shareholders or pay bonuses. The more the bank breaks the total buffer, the larger the proportion of the profit the bank must save and add to the capital.

REDUCE PROCYCLICALITY IN THE REGULATORY FRAMEWORK

The financial crisis also clearly showed that banks often react in a similar way. In good times, banks take on more risk and, in times of crisis, they often revalue exposures in the same way and see greater risks in them. There is a tendency for many banks to underestimate the risks in good times and overestimate them in bad times. In times of crisis, investors also become less willing to take on risk. This is usually termed increased risk aversion. All in all, these features may increase fluctuations in the economy. Therefore, the Basel Committee decided to introduce an explicit macroprudential dimension into Basel III. The traditional Basel regulatory framework focuses on the risks the banks take on and attempts to ensure that the banks have enough capital to cover these risks. The new macroprudential dimension of the regulatory framework instead focuses on the risks the bank *creates* for the wider economy. The greater the economic risks, the more capital the bank must have.

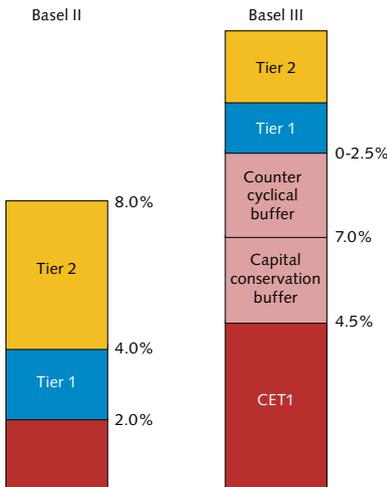
The Basel III agreement allows countries to introduce a countercyclical capital buffer. The idea is that the countercyclical buffer should build up banks’ resilience when times are good. When prices and lending are rising rapidly, the aggregate credit risks increase.

In this situation, the authorities can introduce requirements for the banks to increase their buffers. This increases the capital requirement and resilience among the banks. In addition, it may possibly contribute towards slowing down the upturn. When the credit cycle turns and credit losses grow, the idea is that the bank can use the buffer to cover losses and ensure that lending to the real sector does not fall too much. The idea is thus that the countercyclical buffer should vary over time, ensure that the banks have enough capital and counteract the cyclical tendencies in credit provisions by requiring banks to have more capital in good times and less in bad times.

As for other buffers, the countercyclical buffer must consist of CET1 capital and, in addition, there is a mandatory reciprocity. This means that if one bank is subject to the laws and supervision in Country A and the bank has an exposure to a counterparty in Country B, it is Country B's level for the countercyclical buffer that applies. It is therefore the country in which the exposure is located that determines how large the countercyclical buffer must be for that exposure and not the country in which the bank is located. The Basel III requirement means that Country A must recognise Country B's buffer up to a level of 2.5 per cent of the risk-weighted assets and apply it to its banks. The authorities in Country B may set a higher countercyclical buffer than 2.5 per cent and the authorities in Country A *may*, but are not obliged, to recognise these higher levels. The bank then calculates its total countercyclical buffer as a weighted average of its exposures to different countries with the countercyclical buffers that apply in these countries.⁴⁶

If the countercyclical buffer amounts to 2.5 per cent in all countries in which the bank is active, this means that the total buffer will be 2.5 per cent higher (see Figure 8).

Figure 8. Capital requirements including full countercyclical buffer under Basel II and Basel III



⁴⁶ Basel Committee on Banking Supervision (2011a) contains the regulatory framework itself while Basel Committee on Banking Supervision (2010d) contains further details on how banks are to calculate the countercyclical buffer.

Since most internationally active banks have exposures to many different countries and it is not particularly likely that the authorities in all these countries will simultaneously adopt a countercyclical buffer of 2.5 per cent, the effect on a bank will normally be much lower.

REDUCE SYSTEMIC RISKS

Another part of the package of macroprudential measures included in the Basel III agreement is tougher requirements for banks that generate the greatest systemic risks. Some banks are too large and systemically important to be allowed to fail. It is therefore important that they have larger buffers to reduce the likelihood of them failing. The Basel Committee has developed a model to estimate the size of the consequences if one of the world's largest banks fails. The idea is that if the consequences are significant, the likelihood of a bank failing must fall correspondingly so that the likelihood of failure times the consequence of failure is approximately the same for all banks.

About 30 banks in the world, including Nordea, have been designated as global systemically-important banks (G-SIBs). The Basel Committee has therefore decided that these banks should have an additional capital buffer of between 1 per cent and 2.5 per cent (potentially even more) of risk-weighted assets, in addition to their capital conservation buffer and any countercyclical buffer.⁴⁷ Just as for the other capital buffers, the Basel Committee has decided that the buffer should consist of CET1 capital.⁴⁸

In addition, the Basel Committee has drafted principles to guide countries that wish to nominate more banks as systemically important in each country, referred to as domestic systemically-important banks (D-SIBs).⁴⁹

ENSURE THAT BANKS HAVE A MINIMUM LEVEL OF LIQUID FUNDS

Another problem in the crisis was that banks did not have sufficient liquidity. The Basel Committee has therefore developed two liquidity requirements, a short-term requirement for a Liquidity Coverage Ratio (LCR) and a long-term requirement for a Net Stable Funding Ratio (NSFR).⁵⁰

The Liquidity Coverage Ratio (LCR) is aimed at reducing the risk that the bank encounters short-term liquidity problems. The idea is to ensure that banks have sufficient liquid assets to survive for a period of 30 days in a stressed scenario. The LCR is expressed as a ratio.

47 The Financial Stability Board (FSB) publishes the global list of systemically important banks in November every year. For the 2015 list, see Financial Stability Board (2015a).

48 The framework for global systemically important banks was adopted in November 2011, (see Basel Committee on Banking Supervision (2011b)) and updated in July 2013 (see Basel Committee on Banking Supervision (2013d)).

49 See Basel Committee on Banking Supervision (2012b).

50 Both the LCR and the NSFR were adopted in principle in December 2010 (see Basel Committee on Banking Supervision (2010c)). Fine-tunings and more detailed specifications of the LCR requirement were published in January 2013 (see Basel Committee on Banking Supervision (2013b)).

$$LCR = \frac{\textit{liquid assets}}{\textit{outflows during 30 days of stress} - \textit{inflows during 30 days of stress}}$$

The bank's liquid assets form the numerator. The denominator specifies the bank's estimated net outflow over a period of 30 days during the assumed liquidity stress, by taking expected outflows of liquid assets in stress over 30 days minus expected inflows of liquid assets in stress over 30 days. The requirement under the Basel regulatory framework is that the bank's LCR must be at least 100 per cent, which means that it must have liquid assets that are at least as large as the expected stressed net cash outflow over 30 days.

LIMIT THE DIFFERENCE IN MATURITY BETWEEN BANKS' ASSETS AND LIABILITIES

The other liquidity measure, the Net Stable Funding Ratio (NSFR), is aimed at what is usually called the banks' maturity transformation. In the section on the banks' liquidity risks on page 70, I explained that the banks have special liquidity risks, as the liability side on the balance sheet (which is to say mainly deposits and wholesale funding) is short-term and can rapidly disappear, while the asset side (which is to say mainly lending) is long-term, which means that the banks cannot demand it back at short notice. It could be said that the banks transform short-term borrowing into long-term lending. This maturity transformation is an important part of banking operations and serves a useful economic purpose. At the same time, it exposes banks to liquidity risks. The Basel Committee therefore assessed that this risk needed to be limited and introduced the Net Stable Funding Ratio (NSFR).

The NSFR is defined as the ratio between the bank's available stable funding and its required stable funding during a stressed scenario of one year.⁵¹

$$NSFR = \frac{\textit{available stable funding during one year}}{\textit{required stable funding during one year}}$$

Under the Basel regulatory framework, the banks must have an NSFR of at least 100 per cent. In simpler terms, banks must have sufficient stable funding 12 months ahead to cover its need for stable funding 12 months ahead.

LIMIT BANKS' INDEBTEDNESS AND REDUCE DEPENDENCE ON THEIR OWN MODELS

Another rule change in Basel III is the Basel Committee's decision to introduce a leverage ratio requirement.⁵² There are three main justifications for this requirement.

Firstly, it became obvious during the global financial crisis that certain banks did not have enough capital in relation to their total assets. Certain assets have low risk weights. Then only little capital is needed. However, during the crisis, some banks took on a very high

51 Refinements and more detailed specifications of the NSFR requirement were published in October 2014, see Basel Committee on Banking Supervision (2014d).

52 The leverage ratio requirement was first published in December 2010, see Basel Committee on Banking Supervision (2011a). Refinements to the exposure amount and a number of other clarifications were published in January 2014, see Basel Committee on Banking Supervision (2014a).

level of indebtedness. High indebtedness can be profitable for the bank, but also involves risks, not just for the bank but also from a more macroprudential perspective. As debt levels rise, the problems that need to be solved in a crisis also rise. Once the crisis has hit, the risk weights become virtually useless and it is the value of the assets that makes a difference.

Secondly, it is difficult to estimate the risk of certain assets. Often there is not enough data to estimate the risk in a sufficiently reliable way. Furthermore, in many cases banks' internal risk models are too complex to spot any weaknesses. The risk is therefore that the bank's model both has specification error and is based on too little data in order to correctly estimate the risks associated with various exposures. This is normally referred to as model risk.

Thirdly, banks must obtain permission from the supervisory authority to be able to use their own internal models to estimate the risk and thus the capital requirement of certain exposures. However, allowing banks to use internal models gives them incentives to underestimate their risks and thereby retain less capital than is economically desirable. Normally, it is more expensive for the bank to fund its operations with equity than with deposits or wholesale funding.⁵³ The incentive to estimate too low risk-weighted assets may undermine the bank's capital adequacy. As Martin Noréus, acting Director-General of Finansinspektionen noted in a speech: "At the same time, the banks have strong incentives to reduce the risk weights, to bring down the actual capital base, which ultimately increases the return on equity. The use of internal models gives the banks the opportunity to reduce their risk weights."⁵⁴

As a complement to the standard capital requirement, the Basel Committee has therefore decided to introduce a leverage ratio requirement. This requirement is not based on risk-weighted assets. Instead, the bank must have enough capital to cover total assets on the bank's balance sheet and certain off-balance sheet items.

$$\text{Leverage Ratio} = \frac{\textit{Tier 1 capital}}{\textit{total assets} + \textit{certain off balance sheet items}}$$

In January 2016, the Governors and Heads of Supervision (GHoS) decided that the leverage ratio requirement should be set at 3 per cent, but that the requirement should be set higher for the global systemically-important banks (G-SIBs).⁵⁵ The committee will determine in 2016 how much higher these requirements will be.

LIMIT BANKS' LARGE EXPOSURES TO INDIVIDUAL COUNTERPARTIES

Even before the crisis, most countries had introduced some form of limit on how much exposure banks would be permitted to have to individual counterparties or groups of

53 According to Modigliani and Miller (1958), the cost of a company's funding is independent of the source of funding. However, in practice, tax differences and other factors mean that funding via equity capital is more expensive than funding via liabilities.

54 See Noréus (2015).

55 See Basel Committee on Banking Supervision (2016a).

counterparties. There was no global regulatory framework for this, however, and the regulations varied from country to country.

In 2014, the Basel Committee therefore decided to introduce a harmonised regulatory framework for large exposures.⁵⁶ One assumption in the usual capital requirements is that a bank has a well-diversified portfolio of exposures. If the exposures become too large, the risk-weight system does not function as intended. It is also important that the individual exposures are not allowed to be so large as to jeopardise the bank's continued existence. Under the Basel Committee's regulatory framework, a bank is not allowed to have an exposure that exceeds 25 per cent of the bank's Tier 1 capital to an individual counterparty or group of connected clients. In this context, exposures to all companies in a group are, for example, counted as a group of connected clients, as a parent company often supports the subsidiaries when there are problems.

STRENGTHEN THE REGULATIONS FOR EXPOSURES IN THE TRADING BOOK

In 2007 and 2008, unease and volatility on the financial markets were high. It was then obvious that there were major weaknesses in how the banks were capitalising their market risks and exposures in the trading book. A number of acute measures were therefore decided upon in 2009 with the adoption of what is usually called Basel 2.5.⁵⁷ At the same time, the committee started a more overall review of the capital framework for market risk, which resulted in a decision at the start of 2016 on new standards for the trading book.⁵⁸

The new regulations, which are to be implemented into national legislations in January 2019, involve several changes. It will be more difficult for the banks to move exposures between the trading book and the banking book, making it more difficult for them to minimise capital adequacy by moving exposures to where capital adequacy is lowest. The banks will have to use a new model, expected shortfall, instead of Value at Risk (VaR) to estimate the risk in stressed situations. This means that greater consideration must be taken of extreme outcomes and the most unlikely events. The new regulations also take greater consideration of the effects of a deterioration of market liquidity. Subject to approval by the supervisor, the banks may use internal models for *parts* of their operations and need not use them for the entire trading book.

OTHER PROPOSALS

Following the global financial crisis, the Basel Committee and other policymakers have tightened other rules for the banks.

For example, the Basel Committee has harmonised and expanded the rules on what information the banks' are obliged to publish.⁵⁹ The purpose of these so-called **Pillar 3 requirements** is to make it easier for market participants to assess and compare different

56 See Basel Committee on Banking Supervision (2014b).

57 See Basel Committee on Banking Supervision (2009c).

58 See Basel Committee on Banking Supervision (2016b).

59 See Basel Committee on Banking Supervision (2015a).

banks, their capital, liquidity and risks. Work on developing the Pillar 3 requirements is still ongoing since all the rule changes and definitions have not yet been adopted, and the transparency requirements must be based on other regulations.

Furthermore, the Financial Stability Board (FSB)⁶⁰ agreed in November 2015⁶¹ on an additional, related and important regulatory framework, the introduction of rules concerning Total Loss-Absorbing Capacity (TLAC). The aim of this framework is to ensure that global systemically important banks do not only have sufficient capital but also debt instruments that can be written down or converted into equity if the bank encounters problems. Since these banks are systemically important, they cannot always fail without major negative economic consequences. This means, however, that those who have bought the banks' bonds have taken on less risk than in other companies. The implied guarantees are perceived as greatest for these banks, which means that there are expectations that the government will intervene and rescue the bank before the bondholders will need to cover the losses. This, in turn, means that the bondholders do not have the disciplining effect they should have on the bank to ensure that the bank's risk of default is limited. The idea of the TLAC is to ensure that the global systemically-important banks can continue to supply certain critical functions. It is also important to reinforce market discipline by stating in advance that some bondholders may need to bear losses. For example, the authorities may determine that the bonds are either written down, i.e. are given a lower value, or converted to capital, i.e. are allocated a greater risk if the bank becomes distressed. According to the TLAC requirement, banks must have this type of eligible bond, including total capital, amounting to at least 18 per cent of their risk-weighted assets, by 2022. In the same way as for the leverage ratio requirement, there is also a requirement that relates to total assets and off-balance sheet items. This TLAC minimum requirement is 6.75 per cent.

Agreeing globally on certain minimum requirements is not enough, however. It is also important for all countries to implement the regulatory frameworks in their national legislation. As I mentioned previously, the Basel Committee has therefore decided to evaluate how different countries have introduced the regulations into their legislation. These evaluations are performed by colleagues from other countries and a final report is published. This has put considerable pressure on countries to actually implement the rules in the same way, and hence increased the impact of the Basel Committee's agreements.

Another important area for the Basel Committee is promoting effective supervision of the rules. In September 2012, new revised core principles for effective banking supervision were adopted.⁶² These core principles of supervision are used by the IMF and the World Bank when they evaluate the financial systems of different countries and therefore have a bearing far beyond the Basel Committee's member countries. The Basel Committee has

60 The Financial Stability Board (FSB) is a member-driven organisation consisting of finance ministries, central banks and supervisory authorities mainly from G20 countries. The FSB's aim is to coordinate the work on developing and supporting the implementation of effective rules and effective supervision on an international level to promote global financial stability (see: www.fsb.org).

61 See Financial Stability Board (2015b).

62 See Basel Committee on Banking Supervision (2012a).

also drawn up principles for effective supervisory colleges⁶³, principles for effective risk-data aggregation and risk reporting,⁶⁴ guidelines for identifying and dealing with weak banks⁶⁵ and corporate governance principles for banks.⁶⁶

SUMMARY

In conclusion, Basel III has set clearer and stricter limits on how banks can pursue their operations. In addition to the specific limits set in the regulatory framework for large exposures, banks now need to find their optimal model for banking activities given four different quantitative restrictions:

- The risk-weighted capital requirement including the buffers that have been introduced,
- The leverage ratio requirement,
- The Liquidity Coverage Ratio (LCR), and
- The Net Stable Funding Ratio (NSFR)

The previous Basel II regulations only focused on the first of these measures. The Basel Committee's hope is that these more comprehensive rules will reduce the risk of financial crises in the future.

What remains to be done?

The regulations drawn up after the global financial crisis are not yet complete. A number of tasks remain.

One such task is to determine how large the **leverage ratio requirement** should be for the global systemically-important banks. The Basel Committee will establish this in 2016. In this context, the committee is also planning to determine how the Basel I floor should be replaced by a new floor. Instead of being based on Basel I, the intention is for the new floor to be based on the standardised methods for calculating credit risk and market risk. Exactly how this new floor will be designed and calibrated still remains to be decided.

In 2014 and 2015, the Basel Committee has also focused on analysing whether it should set stricter restrictions on the banks' internal models, by restricting the values of the parameters that the banks may estimate in their internal models for credit risk, such as PD, LGD and EAD. It is also possible that it will no longer be permitted to model certain types of exposure class using internal models. Instead, they would only be allowed to use standardised methods for these exposure classes. Exactly how these regulations will be designed is yet to be decided, but the Committee is expected to take a decision at the end of 2016.

63 See Basel Committee on Banking Supervision (2014c).

64 See Basel Committee on Banking Supervision (2013c).

65 See Basel Committee on Banking Supervision (2015b).

66 See Basel Committee on Banking Supervision (2015c).

Another issue under discussion in the Basel Committee is how banks' exposures to sovereigns and other public-sector entities should be managed. Today, the regulatory framework provides scope for supervisory authorities to in practice allow banks to use zero risk weights on their exposures to sovereigns and public-sector entities. Even in the regulatory framework for large exposures, there is an exemption for this type of exposure, which means that banks can have unlimited exposures to sovereigns and certain public-sector entities. As the global financial crisis clearly indicated that banks' government exposures were not risk-free, the Basel Committee has decided to review whether and how the regulatory framework needs to be changed. This review is performed in a careful, gradual and holistic manner. It is also unclear exactly when the review will be finished.

The Basel Committee is also currently drafting new regulations for the capital adequacy of operational risks. This will involve a total review of the calculation methods for these risks. The Basel Committee will probably not permit banks to use internal models for these risks. All banks will therefore be forced to use standardised approaches for the capital adequacy of their operational risks. The Basel Committee has not decided on these models yet, but plans to make a decision on the new regulations in 2016.

Another current issue concerns the principles for estimating interest risk in the banking book. Interest risk attempts to capture what will happen to the bank's earnings, assets, liabilities and risks if there is a change in the general level of interest rates. The Basel Committee has previously drawn up principles for how interest risk is to be assessed, but has left it up to national authorities to specify the details in the requirements.⁶⁷ At present, a review is being made of these principles, to ensure that the banks have sufficient capital adequacy for this risk and that the differences in how different countries apply the regulations are being reduced. The Basel Committee plans to take a decision on the new principles in 2016.

Finally, the Basel Committee will evaluate the effects of the new regulatory framework. Among other things, this means that the committee will provide assistance so that all countries implement the rules as intended. An important part of this is the country-specific evaluations. As the new framework is being phased in, these evaluations will also have to be followed up. Furthermore, the committee will have to examine whether the changes to the standards have had the desired effect.

What do the new regulations mean for Sweden?

Finally, it may be of interest to briefly highlight what these new regulatory frameworks mean for Sweden and for Swedish banks.

Firstly, the global financial crisis made it clear just how dependent Sweden is on the rest of the world. From a strictly Swedish perspective, it is therefore important that other countries adhere at least to the minimum standards set by the Basel Committee. This would limit the risk that financial stability problems emerge in other countries and then spill over

⁶⁷ See Basel Committee on Banking Supervision (2004b).

to Sweden and create problems here. The global financial crisis of 2007-2011 had a great impact on Sweden even if most of the problems did not originate in Sweden.

Secondly, it is important to note that the regulatory frameworks are minimum standards and the result of compromise. This means that the rules are not always ideal for all countries. Countries with special risks may need to deviate from them and introduce stricter regulations. We must therefore make our own assessment of what is needed to restrict the risks in the Swedish banking system. Sweden is a small, open economy with extensive foreign trade and large financial flows across its borders. This benefits welfare. However, it also means that the Swedish economy is more vulnerable to risks than are the economies of many other countries.

All in all, it is extremely important that we follow the international rules. To safeguard the competitiveness of Swedish banks and, ultimately, of the Swedish economy, there must be no doubt that Swedish authorities and banks are complying with the international regulatory standards.

There are four main reasons why major Swedish banks need more capital and better liquidity than banks in other countries.⁶⁸

Firstly, as clearly illustrated in Figure 2, the major Swedish banks are highly dependent on funding from abroad. This means that confidence among foreign investors is particularly important. If foreign investors' confidence in the major Swedish banks were to weaken and they were to withdraw or heavily reduce their funding, it would have rapid and far-reaching consequences for the Swedish banking system. It is therefore important that the major Swedish banks have sufficient capital and liquidity to maintain this confidence.

Secondly, Swedish banks are large in relation to the Swedish economy, with total assets equal to about 400 per cent of Sweden's total GDP. This means that any problems in the major Swedish banks would have a major impact on the Swedish economy. The same arguments used by the Basel Committee when it justified the higher capital requirements for systemically-important banks can be used in a Swedish context.

Thirdly, the Swedish banking market is concentrated. This means that the major Swedish banks have large exposures to one another, primarily through interbank loans and holdings of one another's covered bonds. Risks arising in a single bank can therefore easily spread to the other major banks.

Fourthly, and as a consequence of the three above reasons, market participants, banks and investors may perceive that the major Swedish banks have an implicit public sector guarantee. This also means that they can obtain cheaper funding than would otherwise have been the case. The implicit public sector guarantee thus risks leading to an incorrect pricing of credit. This can, in turn, lead to excessively high growth in credit and to the build-up of imbalances in the financial system. Furthermore, the implicit commitment for the public sector will be sizable as the major banks are so large. It is therefore even more important to have substantial and effective capital and liquidity buffers.

68 See Sveriges Riksbank, (2011).

It can certainly also be argued that the major Swedish banks have low risks and perhaps do not need so much more capital than banks in other countries. There are two arguments. First, the Swedish banks have historically had low loan losses. Second, Swedish banks have a large proportion of low-risk mortgage loans on their balance sheets. One problem with the first argument is that historical losses over a 30-40 year period, which is a normal timespan for the banks' internal models, may perhaps not provide a sufficient basis to estimate risks that seldom arise. Mortgage problems in countries such as Denmark, Ireland, the Netherlands and the United States have not always occurred that frequently. It is therefore possible that Swedish banks are underestimating the risks. One problem with the second argument is that loan losses emanating from mortgages are often correlated. If – and it must be emphasised that this is an *if* – Sweden experiences a significant fall in housing prices, this can reasonably be expected to impact a large number of mortgages at the same time. This could create significant economic problems, even if homeowners continue to repay their mortgages and therefore do not create direct loan losses for the banks. It is instead more likely that consumers will cut back on their consumption, which would create greater risks in the banks' corporate lending and for the real economy as a whole. Given the high correlation, such effects can be significant.

THE RIKSBANK'S RECOMMENDATIONS

All in all, the Riksbank has therefore assessed that the special circumstances that characterise the Swedish banks and the Swedish economy justify the introduction of stricter requirements for the Swedish banks than the international minimum regulations. Consequently, in its financial stability reports, the Riksbank has introduced a number of recommendations.⁶⁹ Some of the most important of these recommendations are that the four major banks should:

- have a risk-weighted capital requirement of at least 12 per cent (including capital conservation buffer and buffer for systemically-important institutions),
- fulfil the LCR not only in total but also separately in EUR and USD,⁷⁰
- fulfil the NSFR as soon as possible,
- have a leverage ratio of at least 5 per cent.

All this is aimed at promoting financial stability and reducing the risk of problems similar to those that affected Sweden during the two financial crises in 1990-1994 and 2007-2011, which entailed major substantial economic costs and which cost every citizen in Sweden many thousands of kronor.

⁶⁹ See Sveriges Riksbank (2015b).

⁷⁰ The Riksbank also wants the banks to have an LCR of at least 60 in Swedish kronor (SEK).

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Does the capital market create problems for the economy?

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Many economists have pointed out that there is reason to believe that returns required by companies in several countries have been far too high for a long period of time compared with the preferences of their owners, and that this has contributed to corporate investment being too low in relation to GDP. In that case, this is not compatible with a well-functioning capital market.

In my opinion, there is a major risk of the shortcomings in the analysis of the capital market's role in formulating fiscal and monetary policy contributing to economic policy becoming too expansionary across the globe. It also means that I consider current economic policy in several countries to be in conflict with long-term sustainable development. One reason may be that it has tried to adapt itself to unsustainable required returns. Overly expansionary economic policy, globally speaking, risks contributing to financial crises with greater unemployment and social unrest as a consequence. Regulation of the financial markets can reduce the risks of new crises, but monetary policy also has a responsibility to consider financial stability.

Appropriately designed fiscal policy, focusing on issues such as investment and industrial policy, could alleviate the effects of shortcomings in the capital market as well as relieve the pressure on monetary policy. But, for economic policy to have the intended effect and contribute to higher investment, the analysis that forms the basis of the policy should explicitly include the shortcomings in the capital market. People don't just react to measures. If the analysis is inadequate or people don't understand or respect it, the impact of the measures will be affected. Uncertainty and a lack of trust may then dominate their behaviour and it will be difficult to achieve a desirable development. A good analysis is a necessity in order to create the right conditions for sustainable and stable development.

The analysis does not therefore only affect policy design. It also provides a basis for information to the market about the shortcomings in the capital market, a solution to which is in many people's interest. More political economists, in partnership with business economists and behavioural scientists, should study how companies work in practice. It is important to analyse expectations and behaviours and discuss what is rational and compatible with long-term stability and to promote reform of the capital market so that it serves the interests of savers, borrowers and society as a whole.

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1. Time to study the capital market

Interest rates and inflation have fallen dramatically after the financial crisis at the end of 2008. Unemployment, which rose in conjunction with the crisis, is still high in several countries in the euro area, while it has fallen back in countries such as the United States, Germany and Sweden. Some central banks have introduced negative policy rates and purchased bonds to lower long-term interest rates. They have, in other words, pursued what is referred to as “unconventional monetary policy”, the aim of which is to increase the demand for goods and services and thereby inflation.

In 2015, stock markets have reached very high values but have since fallen back. They are influenced to a high degree by uncertainty regarding international economic development and prospects of achieving good growth. There is also unease and discussion regarding the risks on property markets and a general concern for what will happen to asset prices once interest rates return to more normal levels. This development has led to extensive changes in the global regulatory framework for banks in order to reduce the risks in financial companies and the risks of major shocks in the real economy in the future.

A question that can also be asked is whether monetary policy, with the current level of interest rates, will become too expansionary and thereby impose ‘too high’ demands for financial market regulation or changes to taxation. By this, I mean measures that may come into conflict with structural and distribution policy considerations. At the same time, there is concern that inflation will be below the set inflation target for a long time despite very low interest rates. An important question is whether low policy rates for a long time risk leading to permanently lower inflation, especially if the low interest rate is perceived as the central bank lowering the inflation target.¹ Borio, Erdem, Filardo and Hofmann (2015) argue, however, that low inflation or mild deflation is not so problematic for economic development.

In this article, I turn my focus on corporate investment and further develop the analysis of the causes of financial crises that I have published previously.² I discuss both levels of required returns and factors that contribute to returns varying in a microeconomic and business economics perspective. A central question is why companies often set financial targets for return on equity that are often between 15 and 20 per cent, that is, considerably higher than the investment funding costs.

A theme in the article is that too high required returns on equity in companies lead to their level of investment being too low and to capital formation in society not being in harmony with people’s valuations of the future. In that case, this is a market failure and may be a cause of financial crises and of the difficulties in achieving stable and sustainable growth. Financial crises can, in turn, lead to required returns rising further, which will exacerbate the problems. An increase in required returns during times of economic crisis, when uncertainty rises, can in itself be considered normal. But if economic policy tries to

1 See Jonson and Reslow (2015) for an empirical analysis that supports this view.

2 See Franzén (2005), (2009a), (2011a), (2011b), (2012b), (2013), (2014), (2015).

adapt itself to a non-sustainable level of returns, it may well contribute to the uncertainty. The article therefore analyses, to a certain extent, how economic policy can be adapted so that it considers the shortcomings in the capital market.

The article is part of a tradition in economics of questioning the efficiency of the capital market, a tradition that includes names such as Alfred Marshall, Arthur Pigou, John Maynard Keynes, Benjamin Graham, Andrew Haldane and Michael Sumner. They have highlighted the existence of short-sightedness in companies and on markets, and the fact that this distorts investment by putting too low a value on future revenue.³ Research has also indicated empirical support for the thesis that companies have very high required returns.⁴ Business economists have also discussed and expressed surprise at the high return targets. An important basis for this article is my own practical experience of being a member of the OMX Nasdaq board, as well as discussions with both private and state-sector business leaders.⁵

The article has common points of interest with studies that show how crises increase financial frictions, delay the return to trend development and lead to higher unemployment, lower wages and production. Hall (2015), for example, has analysed why corporate investment has fallen so much in the United States after the financial crisis, despite profits in relation to book equity having been high and returning quickly to high levels in the wake of the crisis, which is shown in Figure 1.⁶ The figure also shows that the returns of Swedish companies after the crisis year of 2009 rose to approximately the same level as before the crisis. Hall also notes that the difference between return on investment and the risk-free interest rate, known as the 'capital wedge', has increased significantly since the crisis and remained considerable in the United States, which can be seen in Figure 2. We can also see from the figure that the capital wedge has also grown substantially in Sweden and, in 2012, was on the same level as in the United States.⁷ Hall has demonstrated that this can be an explanation for why financial crises are so prolonged. He talks of this process in terms of inertias, costs for capital change and changes in perceived risk.⁸

3 See, for example, Haldane (2011a).

4 See section 2.

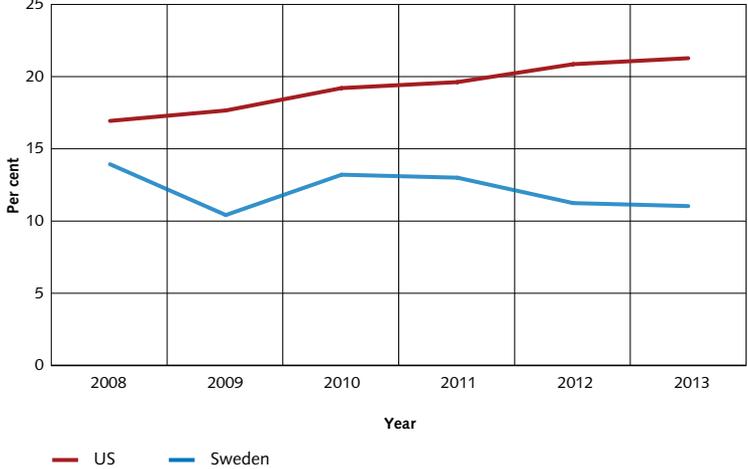
5 See Stenhammar (2012).

6 See also Hall (2011).

7 Due to how the capital wedge is calculated, it is not currently possible to calculate the series further than 2012.

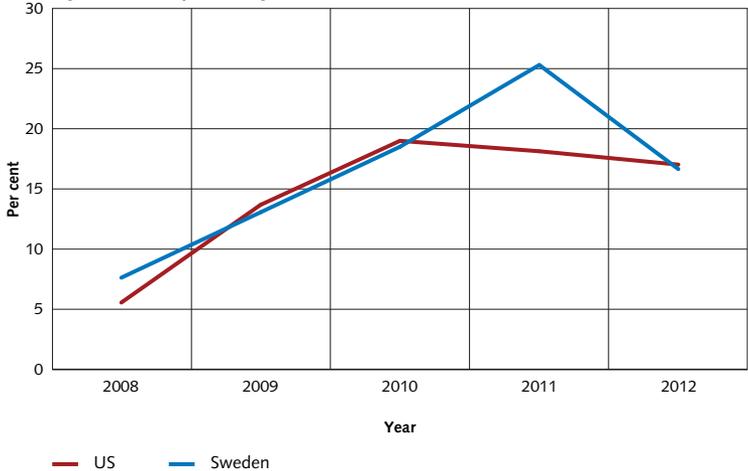
8 Other studies on the impact of financial crises are Kocherlakota (2013) and Christiano, Eichenbaum and Rebelo (2011).

Figure 1. Corporate profits in relation to the capital stock



Sources: US: Hall (2015). Sweden: Statistics Sweden; Own calculations

Figure 2. The capital wedge



Sources: US: Hall (2015); Measures that include adjustment costs ($\kappa=2$ in Halls Figure 11). Sweden: Statistics Sweden; Own calculations

If the variations in the capital wedge are significant for economic development, there is also reason to ask oneself whether or not the levels of the required returns are also significant. What will be the consequences if companies specify long-term targets for return on equity of around 15-20 per cent nominally? Can companies' targets even help to explain some of the increase in the capital wedge?

Section 2 of this article presents an overarching description of the role of companies on the capital market. Sections 3-6 present the background to companies' required returns and the effects of their behaviour. The consequences for economic policy are then

discussed along with suggestions for how the functioning of the capital market could be improved. Sections 7-9 analyse the consequences of an economic policy that tries to adapt itself to companies' excessively high required returns. This may contribute to future financial imbalances and cause serious problems in the real economy. Sections 10 and 11 discuss how monetary policy should be designed when it explicitly takes into account the inefficiency of the capital market. The objective of monetary policy should be flexible and give consideration to financial stability. Fiscal policy should focus on investment. The view on the privatisation of publicly owned companies may need to be reconsidered. The article stresses the need to improve the capital market. Political economists should, in partnership with business economists, take on the task of creating the conditions to improve the capital market by supplying information. This involves, for example, improving corporate governance so that financial targets are based on savers' – owners' – valuation of the future.

2. The role of companies on the capital market

The task of companies is to make investments that fulfil savers' required returns. Companies may obtain resources by reinvesting profits, issuing shares or borrowing money. These channels differ when it comes to risk, taxation, transaction costs, information requirements, etcetera. Since loans provide a more reliable flow of compensation to savers, the lending rate will be less than what savers require to buy shares.

If the capital market works well, companies adapt their equity and borrowing so that there is a difference between the lending rate and return on equity which compensates for the difference in risk between borrowed capital and equity. This difference varies and depends on the type of operations conducted by the company. The aim for companies is to maximise their net present value. It is hence not a question of maximising return on equity. The owners derive more benefit from the company getting a return of 10 per cent on a large amount of capital, than an enormous return on a small amount of capital. The task of companies is to make investments that fulfil the owners' – and ultimately the savers' – required returns.

The financial markets play a crucial role in achieving long-term viability and welfare in an economy. Haldane (2011a) notes that many theoretical and empirical studies have highlighted the welfare- and growth-promoting properties of the markets. Traditional macro-models used to analyse development, design economic policy and estimate its effects are more often than not based on corporate investment being determined in an effective market.

There are, however, several studies that point to problems on the capital market and to the need for changes in order for the financial markets to function well. They suggest that companies are too short-sighted in their investment decisions. By this, they mean that companies value future returns 'too low' and therefore focus far too much on short-term results.

Research has also indicated empirical support for the thesis that companies have unnecessarily high required returns. Neild (1964) ascertained in a study at company level that investment decisions expected full pay-back on investment in 3-5 years while the average length of an investment is 10 times longer. Haldane (2011a) notes that a business study as early as 1972 found that there were required returns of up to 25 per cent. A more contemporary study by PriceWaterhouseCoopers from 2011 asked managers on companies quoted on the FTSE-100 how they valued different return flows. According to Haldane, it indicated a discount rate in excess of 20 per cent.

Michael Mauboussin has pointed out that it is irrational to push up returns by maximising return on equity. "The goal of financial management, after all... is to maximize net present values."⁹ Mauboussin took part in a discussion published in the *Journal of Applied Corporate Finance*, which highlighted the need for business leaders to consider their required returns on investment and the fact that they mistakenly tend to believe that high required returns are in the shareholders' interest. Quite the reverse is true, in that they lead to low value growth. Barton and Wiseman (2014) found that fund managers don't act as owners should.

If required returns are too high, in that they don't take shareholders' interest into account, it is a question of market failure. A possible interpretation of the large increase in and level of the return gap shown in Figure 2 for the United States and Sweden is that it confirms the existence of a market failure. When saving in shares is institutionalised to a high degree, in the form of, for example, mutual funds, it is a question of determining the extent to which the chain of players, from saver to corporate investment, succeeds in conveying people's preferences.

Some studies have focused on how share prices are determined. Haldane (2011a), for example, starts with companies' dividends and share prices and ascertains that the stock market is short-sighted, in that dividend is currently valued higher than can be rationally expected. He also shows that there are signs that this myopia increased during the period 1995-2004, compared with 1985-1994.¹⁰

For this to be seen as a problem, one must assume that people want to be rational in the way the study defines rationality and that the irrational behaviour is the result of a lack of information and knowledge.

Even if the stock market were to function well in the way Haldane has tested, this is not enough to make sure that corporate investment is determined in accordance with the wishes of savers. Those who lead companies set targets for returns and dividends. These need not be in concordance with the preferences that can be identified on the stock market.

Studies of investment decisions and the results for the United States and Sweden in Figure 1 indicate, as mentioned above, that companies have very high required returns. The fact that there are companies who publicise financial targets of 15-20 per cent return on

⁹ From Briscoe, Clancy, Mauboussin, Hilal, Ostfeld, Chew and McCormack (2014).

¹⁰ See also Black and Frazer (2002).

equity when borrowing rates are much lower, is in itself a sign of a fundamental defect in the functioning of the capital market.

Long-term return on shares in real terms is around 7 per cent.¹¹ If one sees this as a measure of savers' required returns on equity, the gap to companies' financial targets can be seen as an indication of the market failure.

If companies don't act in accordance with these signals, but instead set higher targets for returns, it may lead to shareholders questioning the realism of these targets. This can, in turn, lead to savers allowing for a margin because companies' behaviour is not sustainable in the long term. The increased myopia in the stock market noted by Haldane could then be a sign of savers' scepticism about companies' ability to successfully achieve their financial targets having increased, which in turn heightens risk on the stock market.

The problems on the capital market need not, therefore, only depend on a certain type of player. This can be seen as an aggregate of people's perceptions of how the market should work and how it is actually perceived to work. If the market is dysfunctional, it will be difficult, based on prices on the stock market, to determine the underlying preferences of shareholders. Market players quite simply adapt their strategies so that they can survive a dysfunctional market. This includes the fact that there are market participants who are agents and whose remuneration is designed in a way that can reward a perspective that is more short-term than that of the actual saver. This may be a question of both fund managers and business leaders. If they, for example, think that the levels of return on equity are crucial to the market's valuation of the company, they will adapt their strategies accordingly.¹²

3. High required returns – background

3.1 HIGH DIVIDEND, SELF-FINANCING AND GROWTH

Let us now look at the factors that cause many companies to publicise financial targets with high rates of return on equity.

Companies have high ambitions as regards their dividends. This is an important reason for the high required returns. Often the aim is to distribute half the profit in dividend. Neither do they wish to turn to the stock exchange to ask for capital via new share issues. The stock exchange has become a place where money is dished out rather than where capital is obtained. During the period 2000-2008, dividends and cash purchases of companies from the Stockholm Stock Exchange amounted to SEK 1,007 billion while initial public offerings (IPOs) and new issues amounted to SEK 246 billion, that is, around a quarter of that figure. Of the IPOs during this period, the state's sale of Telia accounted for nearly a third.¹³ The US stock exchanges have also functioned more as dividend-payers than sources of capital.

¹¹ See, for example, Siegel (1999).

¹² Using Barclays as example, Davis (2016) shows how the market's fixation on return on equity resulted in doubtful values.

¹³ See Franzén (2009a).

Based on Federal Reserve statistics, Fox and Lorch (2014) mention that “Net issuance of corporate equity in the U.S. over the past decade has been negative \$287 billion, according to the Federal Reserve. That negative number would be much bigger if we left out financial institutions and their desperate fundraising in 2008 and 2009. Factor in dividend payments, and we find a multi-trillion-dollar transfer of cash from U.S. corporations to their shareholders over the past 10 years.”¹⁴

The greater the proportion of its profits a company distributes, the less remains for investment and even less will be the scope for allowing the company to grow with the market. By raising the profit, that is the return before dividend distribution, they try to create scope for investment and growth, despite having increased the dividend. Haldane (2011a) ascertains that, on average, dividend in relation to share price rose by two-thirds between the 1980s and the 1990s for shares quoted on the UK FTSE and US S & P.^{15, 16}

The option of allowing equity to grow without owners injecting new capital is described by the equation

$$(1) \quad v = REKFS \times (1-t) \times (1-u)$$

where v is the growth in equity after dividend payments (given an unchanged equity ratio),

$REKFS$ is return on equity before tax,

t is the tax on profit, $(1-t)$ is what remains of the profit after tax,

u is the share of the profit distributed in dividend, $(1-u)$ is what remains of the profit after dividend payments.

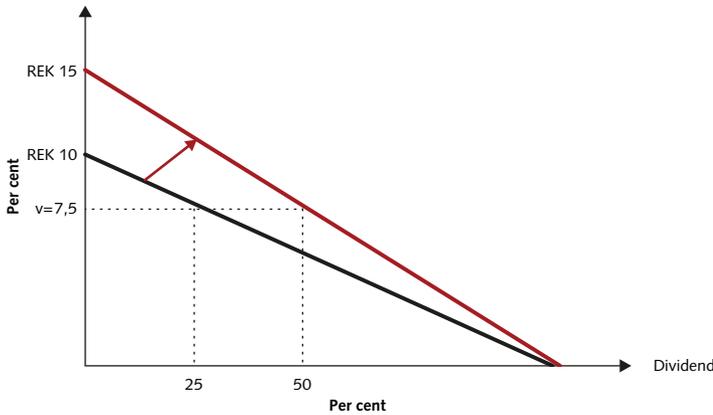
I disregard corporate tax and note that a higher dividend leads to a higher requirement for profitability. A simple example: A company has a profit of SEK 100 and pays out 25 per cent in dividend. It has SEK 75 left to use for growth. If the dividend is raised to 50 per cent, the company must make a profit of SEK 150 in order to grow at the same pace as before. An increase in profit of 50 per cent! This is shown in Figure 3, where return on equity needs to increase by between 10 and 15 per cent if growth in the company's equity is to remain unchanged at 7.5 per cent.

¹⁴ From Fox and Lorch (2012), page 2.

¹⁵ Haldane (2011) provides a brief overview of these issues.

¹⁶ There is no harm in periodically looking for new companies that have low dividend, especially when bubbles are building up. During the dot-com bubble, high liquidity led investors to search for companies who were 'burning capital' at a rapid rate. They had substantial deficits but high expected future profits, see Franzén (2009).

Figure 3. Increased dividend raises profit demands
 v = growth in equity; REK = return on equity



On an efficient capital market, as described in Section 2, the dividend should be based on the owners' required returns adjusted for the investment risk. Companies that have many projects that fulfil the owners' required returns reinvest their profits and/or issue new shares and grow. Those that don't have such good projects, distribute their profits instead.¹⁷

3.2 VISIONS OF RETURNS BECOME REQUIREMENTS

Johansson and Runsten (2005) have described how companies, at the start of the 1970s, set financial targets that were more like visions to start with and not targets that they necessarily believed were achievable. Developments on financial markets with specialised participants and analysts gradually led to targets being scrutinised to an ever-greater extent and requiring fulfilment. As a result, financial targets became more and more like guiding principles. Haldane and Madouros (2010) have made a similar observation regarding targets in the financial sector.

3.3 RETURNS AND INFLATION

During periods of high inflation, it is easier to fulfil a certain return target since the real required return is lower. Inflation has fallen, however, over the last few decades but required returns have not followed suit. Real required returns on equity have therefore risen at the same time as real interest rates have fallen!

¹⁷ One reason why dividends grew ever larger was probably that some companies had a tendency to grow into conglomerates, in which the original business idea became unclear.

3.4 BONUS AND RETURNS

Company leader compensation systems, designed as a part of corporate governance, also became linked to the fulfilment of return targets.¹⁸ This led to benchmarking also becoming a method for establishing financial targets. The targets started to steer the company's operations even more.¹⁹ Lazonick (2010) has described how this is part of a development towards 'financialisation' of the corporate environment which threatens growth.²⁰

3.5 BENCHMARKING AND HERD BEHAVIOUR

I experienced this tangibly when I was on the OMX board. Financial analysts were asked what they saw as a suitable target for OMX. OMX was a special company with a mixture of stock exchange and IT operations. There were no other companies with the same mixture. But the analysts deemed that X per cent of operations were like a certain type of company and Y per cent were similar to another type. The proposed target was based on what were normal targets for these types of company. By weighing this together with the organisation's participation rights, a target for OMX was proposed.

The major Swedish banks have acted in a similar way. Nordea established a target at the beginning of the 2000s of a minimum return of 15 per cent. Once this target was met, it was raised to 17 per cent. The target was later changed and became relative. The target was to have a higher than average rate of return.²¹ Until the financial crisis of 2008, all the major Swedish banks had set the same relative targets for return on equity. All of them were to have higher-than-average returns.²² The return fell in conjunction with the financial crisis. They are now talking about required returns in the same way as before the crisis.

When Sweden's pharmacies were privatised in 2009, the state was to set targets for the company that was to continue to be owned by the state, Apoteket AB. The target was at least 20 per cent with reference to the going rate on the market at that time. A similar reasoning lay behind the target of a 15 per cent return on equity that applied to Vattenfall for several years.

Herd behaviour on financial markets is sometimes discussed. This refers primarily to financial investors and fund managers, who behave like each other without having analysed the alternatives in any kind of detail. In my practical experience, I have noted similar herd behaviour in corporate boards, but then it is mostly referred to as 'benchmarking'.

18 See, for example, Klein (2005), Ownership Responsibility Manager at the Third AP Fund, "If the company has publicly communicated financial targets, these should be used in the first instance", onwards from page 8.

19 Since compensation to management executives was linked to the share value, these executives were keen to ensure that financial targets were in line with common thinking on the financial market.

20 See also Pozen (2014) for aspects of this.

21 See Nordea (2004).

22 See Franzén (2005).

3.6 RETURN ON CAPITAL EMPLOYED AND MARGINAL TARGETS

There are different ways of expressing return targets. Some companies have chosen to formulate targets for return on total capital employed, that is, borrowed capital and equity added together. Since the lending rate is normally lower than the return on equity, the numerical targets will be lower if they are expressed on the basis of equity. The important thing in this context is that behind the target for return on capital employed is an implicit requirement for return on equity which is higher than the one for capital employed.

Another type of target applies to profit margins on sold products. They can also be described as being derived from a target for return on equity. The margins are often set by management executives comparing them to their competitors and striving to ensure that they were at least as high as theirs. I have met people on the financial market who believe that such companies cannot be criticised for their return targets. They claim that it is just “normal benchmarking” in a market economy. The important thing for my reasoning is, however, to look at which return targets are implied by margin targets.

3.7 DIFFICULT TO ADJUST FINANCIAL TARGETS DOWNWARDS BUT EASY TO RAISE THEM

My experience also shows that it is difficult to adjust financial return targets downwards. This is seen as a weakness and there is concern that the stock market might react negatively if a company were to do so. Companies are also proud of having high financial targets. Stenhammar (2012) reasons in this way in his book “Det ordnar sig” [It’ll be alright]. “High returns are a measure of efficiency” and “companies that are not efficient get killed off. Company executives are never satisfied by setting moderate targets based on some kind of theoretical economic philosophy. This would be disastrous ... for Swedish business.”²³

The reasoning described above may be an explanation for why financial targets have remained high despite both inflation and interest rates falling back. I have met several people, however, who privately think that current required returns are unsustainable and poorly underpinned, but they can't see any way of adjusting them downwards. Certain players say that the company would then find it more difficult to borrow and that rating agencies “demand” high returns. Another problem can be that company leaders often receive bonuses based on returns, in the form of shares in the company, and that they therefore have a very short investment horizon.²⁴ Due to their considerable dependence on the share price, company executives don't wish to challenge the market.

Östman (2014) has shown that the gap between the organisation, company executive and owners has increased.²⁵ It is in this context that the targets for high returns on equity have emerged. “The concrete knowledge about manufacturing, marketing and products and the explicit room for manoeuvre had moved to lower levels than before – when group executives were at the helm ... with targets, measures and requirements.”²⁶

²³ Translated from Stenhammar (2012) page 373.

²⁴ From Edman, Fang and Lewellen (2013).

²⁵ See Östman (2014).

²⁶ From Östman (2014) page 185.

A professionalised financial function between owners and companies has also emerged. Owners have moved further and further away from companies' operations as a result of saving becoming increasingly institutionalised.

4. Return on capital employed, taxes, equity ratio and interest expenditure

Return on equity can be achieved by borrowing, which creates leverage and increases profitability, depending on at what rate the company can borrow. Equation (2) expresses this relationship

$$(2) \quad REKFS = \frac{1}{1-t} \times \left(RSYSS + (RSYSS - R_L) \times \frac{L}{EK} \right)$$

Where *REKFS* is return on equity before tax,
RSYSS is return on total capital employed,
R_L is the lending rate,
L is loan-financed capital and
EK is equity.

In this article, I disregard taxation of company profits and thereby assume that the tax is zero. But this does not mean that taxes are insignificant. Depending on how much tax the company pays, the required return before tax increases as the targets refer to net returns. The problems analysed in this article would therefore probably increase if the tax on companies' profits was part of the analysis. A broader analysis would also need to consider the fact that companies can reduce their tax in various ways, for example by channelling profits to tax havens.²⁷

Our return equation without tax on equity will then be

$$(3) \quad REK = RSYSS + (RSYSS - R_L) \times \frac{L}{EK}$$

4.1 LEVERAGE, EQUITY RATIOS AND LENDING RATES

When I have questioned high required returns, I have sometimes been criticised for not taking into account the fact that they can be achieved by borrowing and that this will be particularly profitable if interest rates are low. An active risk capitalist thought that it was easy to achieve high returns. It's just a question of finding a good business and then ensuring its funding. He therefore thought that it is easy to achieve a return of 25 per cent and above.²⁸

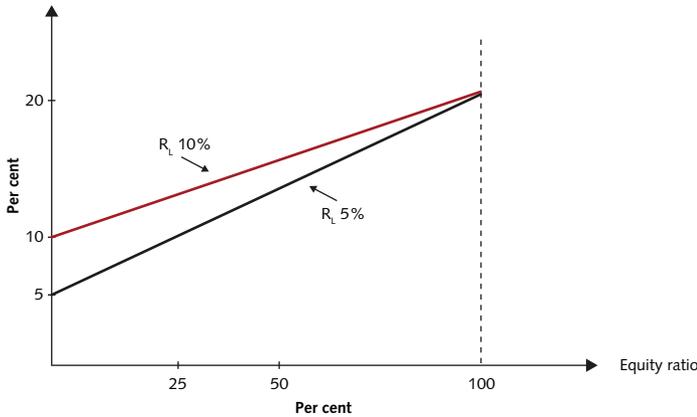
27 One reason for the proposed merger between Pfizer and Allergan may be the intention to move taxation to Ireland, which has a corporate taxation rate of 12.5 per cent, something pointed out by the Swedish business daily, *Dagens Industri* (23 November 2015).

28 On a well-functioning market, this is to be prevented since the risks rise with lower borrowing.

The last term in Equation (3) shows that the higher the borrowing is in relation to equity, the higher the return on equity will be on condition that the lending rate is lower than the return on capital employed. If equity is negligible and the leverage approaches infinity, only a marginal difference is needed between return on capital employed and the interest rate in order to achieve a very high return on capital employed.

Figure 4 shows the relationship between return on capital employed, equity ratio and interest rate level if the starting-point is a target for rate of return on equity of 20 per cent.

Figure 4. Lower equity ratio and lending rate (R_L) reduce the required rate of return on capital employed
Return on capital employed RS_{YSS}



It shows that a lowered borrowing rate can reduce the required returns on capital employed, which is the result of high required returns on equity.

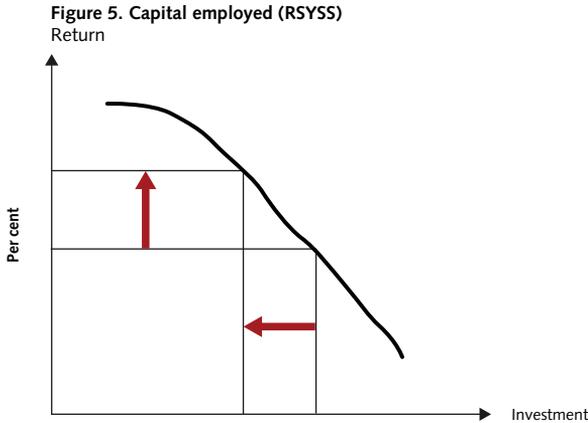
5. How do targets for returns on equity function?

Allow us to study how companies can behave in order to fulfil required returns on equity.

5.1 LESS INVESTMENT AND HIGHER PRODUCTIVITY

If companies have high required returns on their investment, they will choose investment that gives just such a high rate. Allow us to ignore differences in risk for the time being.

We assume that the higher the requirement for profitability is, the less investment there will be that fulfils the requirement. Figure 5 shows the volume of possible investment ordered by return – capital's productivity.



The higher the required return, the less investment will be made.

We can also ascertain that, everything else being equal, this effect will lead to a rise in the capital's productivity. This is the effect of eliminating investment with a lower return. A higher required return leads people to choose lower capital intensity. This means you get more employees per unit of equity. The productivity of the equity hence increases when investment decreases. Higher required returns on equity may look like the result of an increase in productivity. But high productivity may also be the result of too low a level of investment.

5.2 HIGHER BUSINESS RISK

Another way to search for high returns may be to choose higher-risk investment. TeliaSonera's activities in Uzbekistan²⁹ which resulted in legal disputes, etcetera, and Swedish banks' undertakings and losses in the Baltics in connection with the financial crisis may both be examples of this.³⁰ Another method that also heightens risk is to increase the leverage via higher borrowing and higher dividend payments and hence a reduced equity ratio. This is easier when there is strong optimism with regard to economic development and especially when it is created by bubbles on the asset market. Strömberg (2012) has pointed out that these problems also apply to the risk capital market. Too high required returns lead to higher risk-taking, which is expressed in terms of higher borrowing.³¹

5.3 SELL OFF OPERATIONS

One strategy in the same spirit is to sell off operations. This is attractive, since shareholders have lower required returns on their equity than companies' financial targets, given the valuation of profits made on the stock market. By selling operations to the stock market,

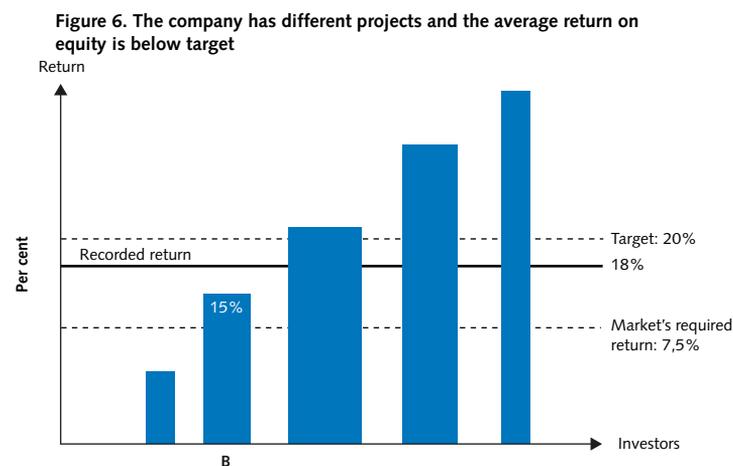
²⁹ See SVT (19 September 2012).

³⁰ See Larin and Bromander (2010).

³¹ See Per Strömberg (2012).

which pays more than the value recorded by the company, companies can raise their return on equity without it leading to any real improvement for the owners. It may even lead to disadvantages for the owners.

Allow us to assume that the company's required return is 20 per cent, while the stock market's required return is 7.5 per cent. The company reports a return of 18 per cent. Subsidiary operations that yield 5 and 15 per cent respectively have consequently dragged down the recorded return on equity below the set target. This is illustrated in Figure 6. The width of the bars is intended to reflect the volume of the various ongoing projects/ investment.

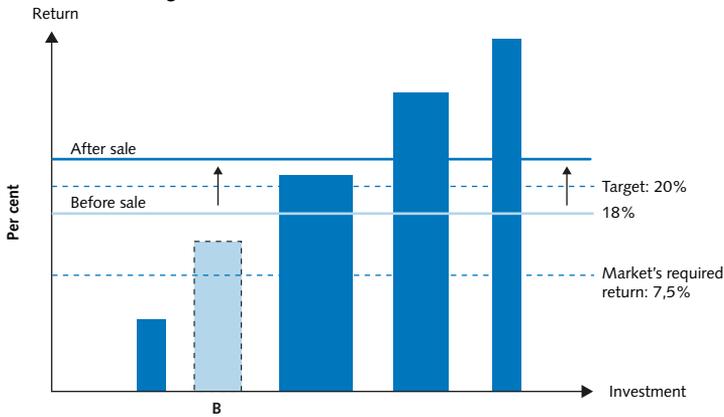


With these assumptions, stock market participants will, all else being equal, be willing to pay double the recorded equity for the operations depicted in bar B and which give a recorded return of 15 per cent. If the company sells off operations, it makes a capital gain. If this profit can then be distributed to shareholders, equity will decrease and the company can achieve its required return on the remaining equity (see Figure 7). But this means selling an operation that more than exceeds the owners' and the stock market's required return. No real improvement has occurred for the shareholders as a group. If we consider transaction costs and bonuses to executives, an unnecessary cost to the company arises.

If we take into account that there may be synergies between the various operations, this behaviour may lead to the return from the sold operations falling to the collective detriment of the owners.³²

³² I would especially like to thank Per Strömberg for this view.

Figure 7. Sale of Project B with a 15 per cent return increases the average so that the target is overshoot



5.4 AVOID ACQUISITIONS ON THE STOCK MARKET

There is another way of keeping up returns. And that is by avoiding mergers and acquisitions.

Stock market participants have lower required returns than the targets set by the companies. An acquisition leads to excess values being realised and returns fall when these are entered into the accounts. If a company acquires another on the stock market, it must pay a price that corresponds to the market's required return. The price is therefore set so that the return on the acquired company will be significantly lower than the return target set by the company itself. This means that the reported return falls if the acquired company is reported at purchase price. To return to the original levels for returns, rationalisations must be performed that correspond to the difference between the acquired company's market value and the amount the company would have been valued at if the market had, for example, had double the required return.

5.5 LOW RETURNS INCREASE INVESTMENT REQUIREMENTS

If a target for average return on equity is established, it will inevitably have consequences for the requirements for return on new equity – new investments.

The required return on new investments depends on the extent to which the company fulfils the rate of return target to start with, the scope of the investment and how quickly the company executive will achieve its target. If the return is far in excess of the target, one can afford to implement investments to a profitability that is under the set target. The average return can then still fulfil the target. If the return is instead lower than the target, new investment must exceed the target to boost average profitability. If, for example, current profitability is less than the target of 20 per cent, new investment must generate a return of over 20 per cent in order for the company to approach its established targets. This

is one explanation for why the major banks have increased their margins to come back to their return targets.³³

The relationship between the required return on new equity and the target is

$$(4) \quad REKNY - REKMAL = \frac{REKMAL - REKUT}{g}$$

where *REKNY* is the required return on new equity/projects,
REKMAL is the return target,
REKUT is the return in the current situation,
g is the pace at which equity is renewed during the period in which one wishes to achieve the target.

If equity increases by 25 per cent during the period in which the target is to be achieved and the return is 2 per cent below target initially, return on new equity must be 8 per cent of the long-term target. If the long-term target is 20 per cent, return on new equity must be 28 per cent.

The conclusion is that the implicit required return on investment increases in bad times, when outcomes are below target. This creates a kind of return multiplier which intensifies the struggle to cut costs and increases the required return on investment in times of low demand. If we consider the additional fact that lending rates often increase in such situations, the significance of this multiplier effect will be even greater.³⁴

As mentioned earlier, Hall (2015) has ascertained a dramatic rise in the capital wedge in the US after the financial crisis. One reason for this may therefore be that companies try to restore returns so that they achieve the financial targets.

5.6 QUARTERLY CAPITALISM

The higher the required return, the less the significance of profits that are far off in the future. This is most clear if we study the present value of future incomes. If the required return is 20 per cent, the present value of SEK 100 in 15 years is SEK 6. If the requirement is instead 5 per cent, the present value would be SEK 48. This means that the return in the period immediately ahead is more important when the company is formulating its strategies and short-sightedness increases the longer it takes to achieve the required return.

A government-appointed committee in the United Kingdom, headed by Professor John Kay, has studied the problems of short-sightedness and why it is difficult for companies to formulate long-term strategies.³⁵ This commission is very critical of the financial market's

³³ See Finansinspektionen (2015).

³⁴ Professor Jaen Geanakoplos (2010) has pointed to another psychological factor, namely variation in the willingness to take risks. In times of optimism, very little capital is needed to fund projects and investments. In times of pessimism, the converse is true. A lot of capital and a high equity ratio are required. In a recession, many are forced to sell assets to reduce their debt. This exaggerates the decline in asset prices.

³⁵ See Kay (2012). Kay does not discuss the issue of financial targets, however.

intermediaries who cost a great deal but whose contribution does not match their cost.³⁶ The commission emphasises the need for long-term owners who create the right conditions for a long-term industrial strategy.

However, a long-term strategy is achieved not only by owners retaining their shares for a long time. An owner with high required returns lacks a long-term strategy if financial targets reward short-sightedness. Long-term ownership instead presupposes that financial targets are formulated to value future incomes.

5.7 BOOK VALUES ARE ARBITRARY

The company's book value depends to a large extent on its history. If a company has grown without having acquired other companies, its book value depends on when the equity was obtained and the depreciations that have been carried out. Depreciations depend on accounting rules. This means that the profit in relation to the book value can be very high if the company has been reasonably successful. Let us assume that the book value only constitutes half of the company's market value. If the shares in such a company were to be purchased in cash, they would be entered into the accounts at their purchase value. The return on booked equity for the same corporate operations would thereby be cut in half. If own shares were instead used as payment, this effect can be counteracted.

By repurchasing shares, the company can reduce its book value and by doing so increase the return on its book equity. Such purchases have become common and are justified, for example, by the fact that the company is trying to manage its equity efficiently.

A conclusion to be drawn from this is that it is arbitrary and inappropriate for companies with different backgrounds and strategies to have the same targets for returns on book equity. The basis for benchmarking is therefore not particularly stable. Similarly, it is arbitrary to allow the historical rate of return on book value to be the guiding principle for the future.³⁷ If the company, as a result of its historical development, has a return on book equity of 20 per cent and uses this as a target for the future, it means that the target for new equity and new projects may be extremely high and not necessarily in line with the company's previous strategy.

5.8 EFFICIENCY AND RETURNS

Boards that set high required returns often do so because the company would otherwise not be run efficiently. If the board were to reduce the required return, it would be afraid that there would be less pressure on efficiency. Wages could rise more than it would like and the company executive could increase expenditure and pursue less profitable operations for its own personal satisfaction.

³⁶ See also Haldane, Brennan and Madouros (2010).

³⁷ Matts Ekman (2013), ex Deputy President and Chief Finance Officer at Vattenfall, took a low book value as an argument for setting a high return target. The equity was obtained a long time ago and therefore has a low value. He also argues that the target should not be affected by energy prices.

Return on equity is the result of many events and activities. The profit can be explained by the following equation

$$(5) \quad Profit = p \times q - A \times w - R_L \times L + others$$

where p is the price of the company's goods or services

q is the number of goods

A is the number of employees,

w is total wages to employees,

R_L is the lending rate,

L is the debt.

If the price of the goods were to rise as a result of a change in the exchange rate or if demand for the company's products were to rise, both the profit and thereby return on equity would increase. If the company's target is to achieve a certain return, the scope for bad deals and poor management of the company would increase. It may, for example, lead to the company devoting its time to building an empire instead of sound business activities. Work to render production more efficient can also be pursued less forcefully. Company boards can try to counteract this by increasing the return target and, by doing so, maintain the pressure for change in companies. But if the price rise, or exchange rate change, is not permanent and prices start to fall, required return on investment and a requirement for unplanned rationalisations will increase if the return target is not adjusted downwards.

One way of avoiding this is to set return targets that stretch over very long time periods. But it is difficult to determine what is temporary, cyclical and long-term. In addition, if bonuses to executives are related to the return for short periods, and the executive team's mandate is shorter than an entire economic cycle with potentially large price variations, the consequences of the targets will be even more debatable.

There may be situations when a company is very poorly managed and inefficient. During an efficiency drive, the company executive can increase the return on equity very dramatically. Problems arise if the company sees this as sustainable in the long term and whether it is described as a requirement from the owners and the cost of capital, as well as it not being possible to adjust the targets downwards. The conclusion is that the management of the company must be less rigid and rest on fundamental knowledge about the company's specific situation.³⁸ In such an environment, there is more scope for long-term industrial thinking, however.

³⁸ See Chartered Financial Analyst Institute (2006). See also Kruger, Landier and Thesmar (2011) who discuss the mistakes of using a uniform required return.

6. The return targets are not the cost of capital

It is difficult to establish what requirements savers have for long-term returns. Household savings are, to a large extent, institutionalised and can be found, for example, in large pension funds. In discussions on pension savings, one talks of entirely different returns than when it comes to companies' financial targets. In the Swedish public pension system, comparisons are often drawn with income indices that describe how the general income level has changed. Public pension funds have targets for returns on savings capital which are around 4 per cent after discounting for inflation.³⁹ Insurance companies in Sweden also talk about returns on pension savings that are significantly lower than companies' targets for return on equity.

A more direct way of examining the required returns of savers is to look at historical returns on shares. Such studies point to a very long-term return after inflation of around 7 per cent.⁴⁰ There are many problems associated with taking such measures as an expression of savers' preferences, especially if one questions the market's efficiency.⁴¹

6.1 LACK OF COMPETITION

Barriers to competition may be a reason to have high required returns. Company owners do not continue to produce until the marginal costs coincide with the price of the product or service. Instead, they allow "excess profits" to ensue. The difference between companies' required returns and the average requirements of savers can then be seen as a measure of monopolistic practices. It need not be a well-founded and sustainable strategy. The important thing is that companies seem to strive for and perhaps find pride in the belief that the company is unique insofar as it can attain a return that is higher than has been achieved historically. If one also considers the fact that companies set targets as part of their herd behaviour ("benchmarking") where all of them are on a high level, it can be interpreted as company executives believe that the industry in which they are active, is generally characterised by a high level of monopolism, historically speaking. Benchmarking for returns and margins also means that companies avoid strategies that lead to falling profitability. This, in turn, leads to more or less deliberate oligopolistic practices.

7. The capital market and economic policy

If the returns required by companies are high and investment is low, interest rate policy can stimulate investment by cutting rates and hence required returns on capital employed. How low does the interest rate have to be to sustainably enable a return on capital employed corresponding to that achieved historically over the long term?

Statistics show that the long-term return on shares has been around 7 per cent in real terms. Let us take this as an expression of a long-term sustainable level of return on equity.

³⁹ See Tredje AP-fonden (2016).

⁴⁰ See Siegel (1999).

⁴¹ See Section 2.

Can we obtain a corresponding measure for capital employed? Let us also observe that the difference between the return on shares and yields on long-term government bonds has historically been 3-4 per cent. The costs for companies' borrowing ought to be higher if they obtained funding via long-term bonds. But their funding can be assumed to be shorter term, which reduces the measure for the cost of capital employed. On the other hand, companies' credit ratings are lower, which raises their borrowing costs.

Let us assume that the historical return on capital employed is nominally 6 per cent. We enter this into our Equation (3) and ask which lending rate is needed to fulfil a requirement of 20 per cent return on equity. If we assume that the equity ratio should be 40 per cent, we can conclude that the sustainable interest rate needs to be minus 3.3 per cent.

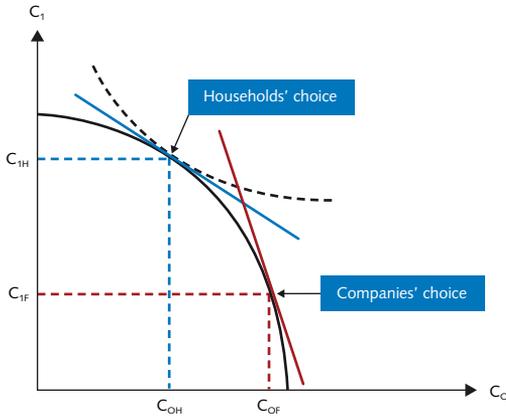
Another possibility for attaining a return of 20 per cent is to have a rate of inflation that is so high that the financial targets approach the historical level of returns on the stock market. But this would assume that the return requirement is not raised in nominal terms due to inflation increasing.

The point of this analysis is not the figure of 20 per cent for the required return. There are companies with higher and lower targets. There is also a risk that the implied requirement for new activities and investments will be raised when companies are struggling to raise their returns. My intention is to show that interest rates may need to be very low or even negative to enable companies to reach their required returns. This may involve difficult trade-offs for economic policy and may require an interest rate conflicting with people's valuation of future welfare.⁴²

To illustrate the dilemma arising when there is a conflict between companies' required returns and people's valuation, I use a classic production-possibility frontier. Assume that the participants in the economy exist in two periods. The curve in Figure 8 shows different possible combinations between consumption today C_0 and production tomorrow C_1 . The more households save today, the more they will be able to consume tomorrow. The slope of the curve shows the relationship between consumption in different periods, which is to say how consumption can be increased in the future by – saving – reducing consumption today. This means that there is an underlying investment that transforms goods between the periods. Households' preferences are illustrated by an indifference slope in the figure. In a well-functioning market, the best solution is reached when an indifference curve just touches the production-possibility frontier. At this point, all possibilities for production are being used and there is full employment. The slope of the curve at this point illustrates the relationship between consumption today and consumption tomorrow, which is to say the interest rate that gives the desired solution. It is this solution that would be achieved if the capital market functioned well and thereby reflected people's valuation of the future.

⁴² Summers (2014) and Krugman (2013) discuss "secular stagnation", in which the real interest rate must be negative, but they do not include the problems of the required return and people's time preference in their analysis. See also Bossone (2015).

Figure 8. Households want more investment and future consumption



Furthermore, assume that investments are not made directly by households, but by companies. Assume also that companies do not fully take account of households' willingness to save/invest. Companies therefore set a high required return on equity. A discrepancy then arises between what households wish and what companies do. The red line in Figure 8 shows the interest rate corresponding to companies having higher requirements for returns on equity and capital employed than the savers do. To achieve full employment on the companies' interest terms thus requires that society as a whole must choose to consume more in period zero and save less than households wish.

7.1 FISCAL POLICY

One way of reducing saving is to use fiscal policy. Let us assume that the government, in an extremely Keynesian manner, chooses to have people dig holes in the ground and then fill them up. This could be funded by the government issuing bonds that people see as a basis for their future standard of living. This corresponds to the government, in period zero, consuming so that full employment is achieved at point C_{0F} . The risk will then arise that households will realise that this means lower consumption in period zero. Households save in bonds to be able to consume more in the future. However, the bonds they have purchased from the government and which comprise their wealth do not correspond to any capital build-up. They do not provide any increased production capacity in the period ahead. On the contrary, this is an indication that consumption has been too high. The government therefore needs to increase taxes to redeem loans or write off loans. If the citizens see this risk, they will wish to save even more to get a better future. To counteract this, the government may then increase its consumption and borrow more, which risks leading to a vicious circle.⁴³

⁴³ If the government invests, this problem will decrease, but will not be eliminated. See Section 10.

Turner (2015) deals with the problem by saying that fiscal policy can create expectations that the government must increase taxes and/or reduce expenditure. If people understand this, they will increase their saving to safeguard their future standard of living. Barro (1989) has illustrated this problem with Ricardian equivalence. Turner discusses the situation in Japan, where the sovereign debt at the end of 2014 corresponded to 234 per cent of GDP and where this proportion is continuing to increase due to the ongoing deficit in the central government budget. It seems as though intentions and plans to fix the deficit push down demand. However, the lower the yield is from government bonds, the lower the future burden on the government budget becomes. In addition, if households can be made to believe that the government will keep the deficit for the foreseeable future, they will not need to worry about future tax increases and expenditure cuts. Turner therefore argues that the Japanese government should take interest-free loans from the central bank. However, it can be noted that, by the end of 2014, the central bank already owned one-fifth of the sovereign debt. But, if the economy finds itself in the vicious circle I described above, the low level of demand will be caused by people saving to secure their future standard of living, at the same time as the problems on the capital market will mean that investments are too low to make a good future standard of living possible. This dilemma cannot be solved by interest-free borrowing from the central bank. On the other hand, this could be included in an attempt to increase inflation so that the real interest rate becomes negative. This brings us to monetary policy.

7.2 UNCONVENTIONAL MONETARY POLICY

A practical option often used to reduce saving is for the central bank to cut the interest rate to stimulate demand and achieve its inflation target. Monetary policy affects resource utilisation and inflation via several channels. When the central bank cuts the policy rate, market rates charged to companies and households normally follow suit. On condition that prices in the economy are sticky, real interest rates also fall, increasing the incentive to consume and invest. Cutting the lending rate stimulates households, via the substitution effect to save less and borrow more, thereby increasing their consumption. A lower interest rate also has an effect on income, however. Because the return on savings is lower, more savings are required to achieve a certain level of consumption in the future. This acts as a counter-stimulus to consumption. The substitution effect needs to be greater than the effect on income, otherwise monetary policy will have no effect on consumption.

The stimulus to companies to increase their investment is created when the lower interest rate on borrowed capital leads to lower required rates of return on capital employed. A direct effect arises as a result of existing loans becoming cheaper regardless of the company's equity ratio. Another effect is that companies become more inclined to borrow and thereby reduce their equity ratio. A counteracting effect is that companies, as described earlier, may increase their required rates of return as it has become easier to achieve the target rate of return. If, at the same time, households increase their consumption, this will stimulate companies to invest as demand will rise.

In addition, expansionary monetary policy normally leads to a weaker exchange rate, which increases exports and decreases imports. Furthermore, imported goods become more expensive and inflation rises thereby directly via this channel.⁴⁴ If the problem that monetary policy is trying to rectify is a global one, however, the exchange rate channel is more difficult to use as measures in different countries can counteract one another.

An interest rate cut also normally leads to an increase in asset prices. The fact that there is more scope for mortgaging assets stimulates both households and companies to borrow more, via the so-called credit channel. Rising asset prices cause people to feel wealthy and increase their consumption.

Most central banks use a short nominal interest rate as their primary monetary policy instrument. Nominal interest rates have a lower bound, however. Recent experience from Switzerland, Denmark, Sweden and Japan suggests, however, that this lower bound is not at zero. This is due to the fact that there are costs attached to holding cash.⁴⁵ But the fact that there is a lower bound means that it may be difficult for the central bank to cut the interest rate dramatically in order to stimulate demand in a deep recession.⁴⁶ But the more negative the repo rate goes, the less the impact on other rates will be.

Even if the central bank's policy rate has a lower bound, there are other ways of influencing the real interest rate. In various ways, the central bank can try to influence the expectations of households and companies regarding future inflation or interest rates. Current demand can be increased either by lowering the current real interest rate or by creating expectations of future low real interest rates. If the nominal rate is already very low, or even negative, the central bank can cut the policy rate to a low level and announce that it will remain low for a longer period of time. The idea is that if expectations are adapted to the central bank's announced interest rate path, demand will start to rise immediately.

Another way for the central bank to make monetary policy more expansionary when inflation is low and the policy rate close to its lower bound, is to buy different kinds of assets, such as government bonds. When the central bank buys government bonds, the economy can be affected via several channels.⁴⁷ The purchases can send a signal that monetary policy will continue to be expansionary in the period ahead. The purchases also reduce the availability of bonds, which pushes their prices and pushes down their yields. In addition, purchases of government bonds can lead to contagion effects on the prices of other assets, via the so-called portfolio balance channel, which contributes to a broader decline in yields. Finally, the purchases can increase the banks' liquidity surpluses in relation

⁴⁴ See Hopkins, Lindé and Söderström (2009) for a more detailed account of the monetary policy transmission mechanism.

⁴⁵ See De Graeve and Lindé (2015) and Söderström and Westermark (2009) for an analysis of monetary policy when the policy rate has reached its lower bound.

⁴⁶ See Alsterlind, Armelius, Forsman, Jönsson and Wretman (2015) for an analysis of how far the repo rate can be cut.

⁴⁷ According to a study of the effects of government bond purchases initiated by the Riksbank in 2015, they have helped push down Swedish yields, reduce the yield differential with other countries and weaken the exchange rate. See De Rezende, Kjellberg and Tysklind (2015).

to the central bank. Greater liquidity in the banks may make them more inclined to lend more to households and companies.

Turner (2014) has pointed out that it seems as though financial wealth has to grow much faster than the real economy before full employment can be achieved. This is a kind of “debt-dependent growth”, in which lending, to a very small extent, is used to fund real investment. Turner does not, however, include companies’ investment decisions in his analysis. His proposed solution to the problems is to regulate borrowing and lending more stringently.

There is therefore a risk that a very expansionary monetary policy will contribute to assets being so overvalued as to provoke talk of a financial bubble. The low interest rate means that people think it is cheap to buy assets such as shares and housing and unfavourable to save in interest-bearing forms. High dividends are reinvested and drive up share prices. Asset value rises and encourages even more borrowing. When several players act in a similar way, this contributes to continuously rising prices and increasing elements of financial leverage. Rising share prices are based to an ever-increasing extent on low interest rates and less and less on investment. The risk of a financial bubble is then considerable.

7.3 FINANCIAL BUBBLES, LOW INFLATION AND DEFLATION

In my opinion, the effect of economic policy depends on the extent to which it is adapted to people’s preferences, and on the extent to which consumers, savers and owners understand the context they act in and how they interpret and react to previous experiences. Those who have been impacted, at some point, by the negative effects of a revised economic policy may attempt to guard themselves against a similar experience in the future.

A financial bubble could be described as an increase in wealth that gives households the impression that the economy’s production capacity is higher than it actually is. Expressed in terms of Figure 8, they believe that the production-possibility frontier is shifting outwards. In this bubble, they will wish to increase their consumption, and employment will increase. The value of the assets is thus based on a forecast of future price development that turns out to be wrong. In such a bubble, there is also a risk that governments will overestimate the strength of public finances.

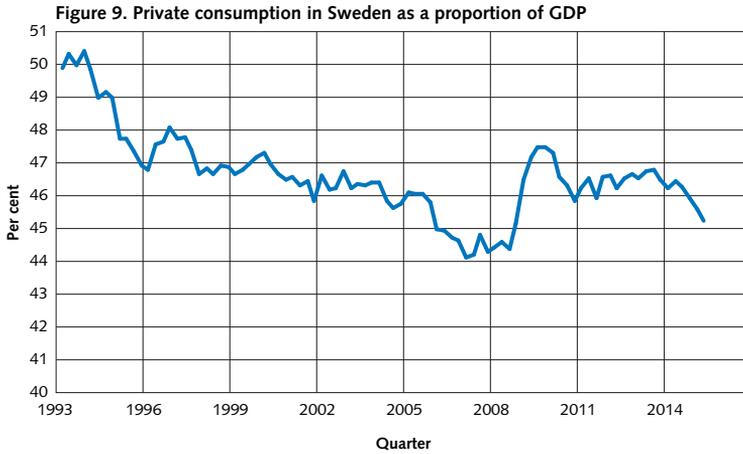
Such a financial leverage cycle often continues until some ‘unexpected’ event occurs to trigger the reverse mechanism. People become uncertain and want to realise the increases in value they have achieved. If many act simultaneously, the fall in prices will be heavy. There then arises a downward spiral that spreads throughout the financial system and impacts the real economy. People feel that their future possibilities are contracting. For a highly-indebted player, the spiral of losses can be dramatic. Demand for goods and services falls heavily and unemployment rises. High indebtedness in the private sector can therefore be an indicator of the risk of a financial crisis leading to a deep downturn in the economy. Following such a decline, it can take the economy a long time to recover. One reason for this may be that it takes time to repair the financial system. Another reason is that it may

take time to reduce indebtedness in the private sector. Structural deficits in public budgets may also arise in the wake of a financial crisis. In addition, measures to capitalise the banks and restore confidence in the financial sector can contribute towards indebtedness increasing in the public sector. This also means that countries risk getting stuck in a vicious circle. The risk is that high indebtedness in the private sector will impede a recovery in the economy, which, in turn, will make it difficult to reduce debt as a proportion of GDP. Increased indebtedness in the public sector inhibits optimism among companies and households. There is a risk of getting stuck in a situation with high debts and low growth.

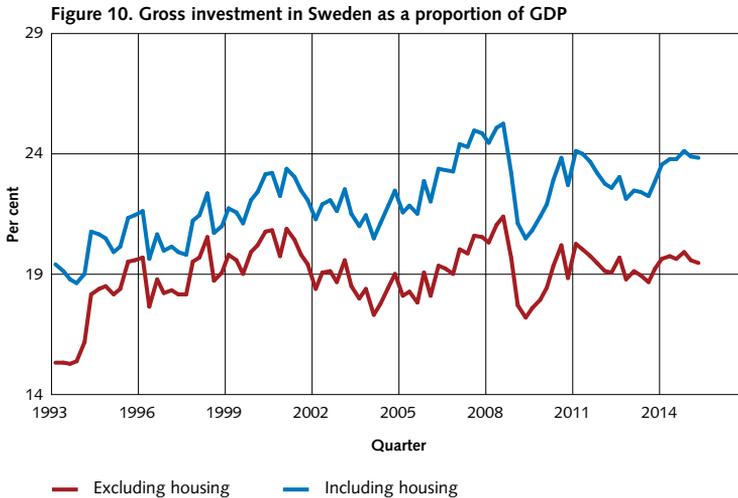
A fundamental dilemma arises if, due to shortages on the capital market, fiscal and monetary policy tries to get people to save less than is sustainable over the long term. Confidence in the policy risks being damaged, with the policy becoming part of the problem. To regain confidence and room to manoeuvre, the political system needs to demonstrate that it is not making the same mistakes as before the crisis, which can be difficult to pull off credibly.

If household and corporate optimism and confidence in economic policy are weak, this may restrain demand and contribute towards sinking inflation. Figure 9 shows that household consumption in Sweden as a proportion of GDP is currently low from a historical perspective, and Figure 10 shows that investment as a percentage of GDP has not increased notably, despite the record low interest rates: the increase in investment is being driven by the increase in housing investment. With an expansionary monetary policy, the central bank is attempting to bring inflation up. The low level of interest rates is restraining interest expenditure for the high level of indebtedness and risks inhibiting the will to reduce debts and contributing to economic imbalances. The question, therefore, is whether low inflation, possibly even deflation, can be seen as the economy's way of satisfying people's desire for a positive return on their saving. In such a case, the view of low inflation and the risks of moderate deflation may need to be nuanced.⁴⁸

48 Jonsson and Reslow (2015) and Kocherlakota (2010) show, in the spirit of Irving Fisher (1977), that there is a risk that long-term low interest rates will contribute towards inflation being low over the long term. This is a consequence of the so-called Fisher relation, which is a relationship between the real interest rate (which is assumed to be stable), inflation and the nominal interest rate.



Source: Statistics Sweden Household consumption, including non-profit organisations, as a proportion of GDP. Current prices



Source: Statistics Sweden Total gross investment (including investment in stocks) as a proportion of GDP. Current prices

7.4 DEBT DEPENDENCY, REGULATIONS AND MONETARY POLICY

The econometric models used by central banks and others as part of forecasts and analyses are based on the assumption that companies are rational and maximise the present value of future profits.⁴⁹ Therefore they do not capture the behaviour I am focusing on. This means that the models, by definition, disregard the fact that the problems arising are due to fundamental shortcomings on the capital market.

⁴⁹ The Riksbank’s model RAMSES is an example. See Adolfsson, Laséen, Lindé and Villani (2007).

However, central banks base their decisions both on models and on assessments of factors that are not captured by the models. There is knowledge outside the frames of the models. For example, experience tells us that high indebtedness and high asset prices often precede financial crises and lead to unemployment and serious setbacks for real production. Discussion of the significance of such factors goes in waves. After the dot.com bubble burst at the start of the century, there were economists who argued that the central banks should have conducted a more cautious monetary policy and should, therefore, consider the development of the asset markets in their assessments. The objective need not be to burst a bubble. It may be to counteract or reduce the extent of crises by 'leaning against the wind'.

Considering factors other than those included in a certain model need not conflict with the will to achieve an established and publically announced inflation target. On the contrary, it may result in the completion of the analysis, the improvement of forecasts and the attainment by policy of its targets.⁵⁰ But the realisation of the models' limitations may also lead to revisions of both the target and the formulation of the policy. The instruments for regulation, so-called macroprudential policy measures, which are being introduced in many countries, are such a way of developing policy to reduce the risks arising on the financial markets.⁵¹ Such regulations can also relieve the pressure on monetary policy from certain considerations so that it can focus on price stability to a greater degree.

At best, these work if consideration of instability risks is based on an understanding of how they can be observed in models of what drives such risks. This involves an insight into how monetary policy affects these risks. As an example, as I have previously shown, a lower lending rate means that, all else being equal, it becomes easier for companies to achieve and exceed their financial targets. It may even form an argument for them to raise the required rate of return.

In section 7.3, I pointed out the risk of a vicious circle forming if economic policy drives the formation of recurring financial bubbles by failing to note dysfunctions on the capital market. This makes it difficult for people to adjust to economic policy in a rational manner. The level of increase in the capital wedge that Hall (2015) has analysed for the United States and that I have demonstrated is also relevant in Sweden, could, from this perspective, be the consequence of decreased faith in the knowledge that economic policy is based on.

The central banks' analyses and dissemination of knowledge may be at least as important as their actual measures. A well-founded analysis of a shortcoming on the capital market leads to the better management of policy rates and so on. But it also means that understanding of policy increases and that the participants on the market may have reason to reassess their reasoning and behaviour. This is something we will return to.

50 This means that I question the criticism of the Riksbank's policy that focuses on the deviation of inflation from the inflation target and calculates the effects of it on the basis of a model that does not include complications on the capital market. See, for example, Svensson (2014a, 2014b). See also Andersson and Jonung (2014).

51 See Niemeier (2016).

8. Reassessment of monetary policy

What conclusions can be drawn for Swedish monetary policy from my analysis? Governor Stefan Ingves has pointed out the following:

“Another central problem is that housing prices and household indebtedness are increasing rapidly... we really need two policy rates – one for companies and another, higher rate for households. The Riksbank expects household debt to increase more rapidly than household income in the period ahead, which also increases the need for decisions on measures in policy areas other than monetary policy.”⁵²

I myself think that it is important that we proceed on the basis of an analysis of how companies' actions contribute towards economic imbalances when measures that affect household indebtedness are considered. I have tried to show how companies' investment decisions are made in an environment focused on very high returns on equity. This leads to excessively low investment and thereby to lower future welfare than would be possible with a greater capital stock. As long as shortcomings remain in the functioning of the capital market, there is a risk that an excessively expansionary monetary policy that attempts to attain inflation in line with the target and stable resource utilisation will contribute towards financial bubbles and the increasing risk of setbacks in the real economy. I have also attempted to demonstrate that lower lending rates may raise returns on equity for companies, which can be understood as meaning that the established return targets are good and may even be raised. There is thus reason to believe that monetary policy may contribute towards increased imbalances deriving from a poorly-functioning capital market, unless its shortcomings are corrected by other measures.

My intention is not to prove that the policy rate should be adjusted by a percentage point or a fraction thereof. My intention is primarily to enrich the discussion and contribute towards developing the view of monetary policy. A well-balanced policy does not need to mean that the present inflation target is attained in every situation. It should not be seen as a failure but as a sign that the transmission mechanism that transfers interest rate adjustments to inflation has changed. Our possibilities for steering towards the target for inflation have thereby been reduced. Inflation has been low for many reasons with nothing to do with domestic monetary policy.⁵³ I argue that Sweden's inflation target may need to be reassessed in light of this.⁵⁴

9. Comparison with new thinking on the labour market

Economies consist of thinking people. This implies the possibility of reconsidering and changing behaviour when this turns out to have been wrong. Well-functioning learning processes are the strength of a market economy. In crises, many people may need to

⁵² See Sveriges Riksbank (2014).

⁵³ See Andersson, Corbo and Löf (2015) and Andersson (2016).

⁵⁴ See Woodford (2012) in the Riksbank's Economic Review for a questioning approach to what central banks can learn from financial crises and Svensson's (2012) comments in the same issue. See also Eichengreen, Prasad and Rajan (2011) and Smets (2013).

reconsider. Not just market participants, but also those with the task of analysing and formulating fiscal and monetary policies.

We had such a crisis period in Sweden about 30 years ago. Wages had long increased far ahead of productivity. This led to high inflation, impaired competitiveness and unemployment. Economic policy tried to cure this by increasing public expenditure and devaluating the krona. Wages and inflation increased. Income policy and price and wage controls were used to decrease inflation. Major devaluations at the start of the 1980s were supposed to lead to a new start with better competitiveness and thereby higher employment. But wages continued to increase too much every year, which contributed towards high inflation. When demand fell, it became evident that we had a large underlying budget deficit. The economic policy had become part of the problem. As it had come to support untenable behaviour, confidence in public finances and the fixed exchange rate had been undermined and room for manoeuvre had decreased.

During the 1980s, several countries abandoned an economic policy that had enabled and exacerbated this counterproductive behaviour. The restructuring of policy led to the rate of inflation falling. In a number of countries, this took place by retaining the fixed exchange rate. Other countries, such as the United States and Canada, chose to prioritise low inflation. The central banks raised interest rates to dampen inflation, which also led to something of a baptism of fire for the labour market when unemployment rose for a period.

These processes are often described simply as an acid test forced by external pressures. But I would like to emphasise that the adjustments, to a significant extent, are due to both people active in economic policy and those considered to be market participants arriving at new insights. It took a long time to develop a policy to change the mechanisms on the labour market and the process moved at different speeds in different countries.

For Sweden's part, the most important change was the one taking place in wage formation. Innovation became necessary on the labour market when everything came to a head at the start of the 1990s. The Riksbank's policy at that point was focused on price stability, and unemployment skyrocketed. New thinking led to wage agreements eventually becoming adjusted to the available economic scope and the inflation target. One reason that the change was possible was the existence of a structure for learning and responsibility in the organisations on the labour market, which led to a cooperation agreement between the unions and employers in 1997, the Industrial Agreement. This contributed towards halting the rise in unemployment and laying the foundation for higher employment over the longer term.

One conclusion is that the earlier and more fundamental a learning process is, the lower the social costs for a reorganisation will be and the more stable the result will be. Another conclusion is that the market's way of functioning sets the boundary for the growth and employment that can be achieved with economic policy.

10. Is there a lesson – an equilibrium?

I consider that there is a large risk that policy has become too expansionary from a global perspective. Interest rates are on extremely low levels and public finances are weak in many countries. There is unease over what will happen in the financial markets when interest rates return to normal levels. Similarly, there is unease that expectations of higher interest rates, higher taxes and lower government expenditure will counteract the effects of monetary and fiscal policies. This is dampening demand and inflation and increasing unemployment.

Many emphasise that economic policy, to be successful, must be sustainable and that people must be successfully convinced that its sustainability is credible. But, if the development that the policy achieves due to shortcomings on the capital market does not correspond with what people want, there will be a risk that the economy will enter into a vicious circle with crises, falling demand, unemployment, low growth and deflation. The consequences will be insufficient credibility for the policy and behaviour dominated by uncertainty.

Avoiding such a development will require a policy based on a sound analysis of what lies behind current problems. This is a necessary precondition if problems are to be remedied. A strong analysis provides both a basis for taking measures and a basis for information giving people increased faith in policy. Together, these provide better conditions for policy to be successful.

My opinion is that one reason for the current economic problems is that the capital market does not function and that there are risks that economic policy is contributing to an attempt to fulfil companies' high demands for return on equity. This is why it is necessary to include companies' investment behaviour in the macro analysis.

10.1 IMPROVE THE CAPITAL MARKET

An initial key conclusion is then that the capital market needs to be improved. This presupposes that participants and decision-makers realise that high required returns are a problem. The reason why required returns are set so high is a lack of insight among business leaders and intermediaries on the capital market. They seem to believe that high required returns imply high efficiency and some see objections as "some kind of theoretical economic philosophy". Corporate governance is substandard since companies do not act in their owners' interests.⁵⁵ As financial analysts note:

"The obsession of investors, asset managers and business leaders with achieving short-term results leads to the destruction of long-term values, a less efficient market and reduced returns on investment. Neither does it help efforts to improve corporate governance".⁵⁶

⁵⁵ See Stout (2012).

⁵⁶ Krehmeyer, Orsagh and Schacht (2006), page 1.

There is obviously an information and agent problem. Corporate executives are to act as agents for the owners – that is, ultimately, the savers. This means that we need a discussion about how to come to grips with the problems of corporate governance, in which both business and political economists cooperate and engage. There are good ideas on strategies on the stock market and company level in Barton and Wiseman (2014), Haldane (2011) and Posen (2014).⁵⁷ The most important corporate governance issue is to ensure that companies' target rates of return correspond with the saver's values.⁵⁸ This means that the institutional capital must engage in the fundamental task – to establish companies' financial targets. The faceless capital must take its ownership responsibility.⁵⁹

Resistance to new thinking may also have political grounds. One is that it is important to safeguard the role and freedom of companies. Another is that as long as one assumes that companies work optimally, measures and stimuli will be aimed at other actors, which can be politically attractive. Measures are concentrated on reducing initial salaries, subsidising companies that take on labour, amending job security legislation, reducing corporate taxes and subsidising corporate investment and similar measures to “improve the business climate”. Another reason is that many on the financial market stand to gain from the spotlight not being turned on the issue of target rates of return. With unreasonable and opaque targets, it is easier to defend unreasonable levels of bonuses and salaries. Compensation in the financial sector in particular has increased dramatically.⁶⁰

Banks have a particular responsibility. It is not their responsibility simply because their own required returns make it more expensive for companies to borrow. It is also a question of their high required returns tainting the way they treat their customers. It may lead to them demanding that their corporate customers have high returns, which will make it more difficult for companies that want to have lower and more reasonable targets to borrow.⁶¹

10.2 MORE CAUTIOUS MONETARY POLICY AND MORE MACROPRUDENTIAL POLICY MEASURES

Another possible conclusion is that central banks should be more cautious and avoid overstimulating the market, thereby reducing the risks of financial crises. This may mean, for example, making the inflation target more flexible. Smets (2013) has provided arguments suggesting that monetary policy should take financial stability into consideration. Jonung (2015) has argued that the Riksbank, with regard for financial stability, should raise the interest rate.

Macroprudential policy measures can reduce risk in the financial system and counteract financial bubbles. One important measure would be to require financial companies to

⁵⁷ See also Aspen Institute (2009).

⁵⁸ Franzén (2009b, 2012a) discusses the effects on business ethics.

⁵⁹ See Stout (2012) and Nachemson-Ekwall (2014) for comments on this.

⁶⁰ See, for example, Turner (2014).

⁶¹ When designing the capital adequacy regulations for banks, some argued that the capital adequacy requirements should not be raised as this would reduce lending and make things more expensive for bank customers. See, for example, Cassidy (2013). This is due to the fact that banks demand such high returns on equity, an example of how even regulations may be adapted in accordance with companies' required returns.

increase their equity in relation to lending so that the shareholders have to take a larger proportion of the losses.⁶²

In Sweden, the low level of interest rates, together with a poorly functioning housing market, have contributed to a substantial rise in household indebtedness and property prices, which heightens the risk of a financial and real economic crisis if economic prospects were to unexpectedly deteriorate. The discussion has therefore begun to focus on the housing market and households' mortgages. Regulations to reduce the loan-to-value ratio have been implemented. Regulations forcing lenders to amortise their mortgages will soon be introduced. These are measures that will inevitably have an impact on income and wealth distribution as well.

A gradual reduction of households' right to deduct a percentage of their interest expenses from tax is also being discussed, aimed at dampening household borrowing and rising property prices.⁶³ Such a change could, however, disrupt the symmetry between deposit and lending rates in the tax system, as pointed out by Persson (2014). Another alternative, which does not affect symmetry, is to reintroduce a real estate tax, taxing the capital value of properties. The effect of such measures depends in turn on how economic policy reacts to the tightening of households' demand and investment that may ensue.

10.3 EXPANSIONARY FISCAL POLICY

Another option is to relieve the burden on monetary policy by pursuing a more expansionary fiscal policy. There is scope for this in Sweden, but in many countries it is very limited. A fiscal policy focusing on investment and capital formation would be a natural conclusion based on the above analysis. In a theoretical analysis, it can be claimed that fiscal policy should help to implement the investment that would have been implemented by companies on a well-functioning capital market. This would necessitate a substantial review of the privatisation policy pursued in a number of countries and reappraisal of our opinions on government aid. In practice, the public sector could start competing with the private sector and by doing so forcing the capital market to adapt. I wish to stress that this is a theoretically possible conclusion. There are a number of objections to it, since it would lead to more state-owned enterprise with all its well-known problems. But such analysis may at least encourage a reappraisal of privatisation strategies, which could help find a solution to the main problem.⁶⁴

Expressed in more neutral terms, greater public investment which increases possible future production and welfare may be a reasonable way of tackling the problems of low corporate investment. One should remember, however, that it will not be adequate substitute for private investment.

⁶² See, for example, Admati, Hellwig and Pfleiderer (2011), Admati and Hellwig (2011).

⁶³ See, for example, OECD (2015).

⁶⁴ Then the Minister for Financial Markets Peter Norman initiated a review of the financial targets for state-owned companies, which resulted in a reduction in required returns, see Swedish Government Offices (2012). He hoped that this would serve as an example to private companies, see Dagens industri (2011a). This was seen by some as an attempt at central governance by the state, see Dagens industri (2011b). Franzén (2013) commented on this.

11. A look into the future

Economics is about finding ways of making the economy operate so that results correspond to people's expectations about the future. It is not just about trying to achieve an inflation rate in line with the target and full resource utilisation in the short term. There is tendency among economists, however, to avoid problems that cannot be solved using the traditional tool-box. Axel Leijonhufvud (2010) has claimed for a long time that economists neglect their most important task – namely to study what happens in dysfunctional conditions when the economy ends up outside the normal corridors where the self-healing powers are not active enough. Assar Lindbeck (2010) has argued that the models used don't show how "normal financial regimes" develop into "crisis regimes".

I believe that there is plenty of evidence to suggest that the global economy is in a crisis regime largely caused by a poorly functioning capital market. Because economic analysis has not explicitly included the capital market, economic policy in several countries has tried to provide for too high required returns. It is difficult to accommodate required returns of 15-20 per cent in economies that are only growing by a few percentage points. The attempt to maintain growth and inflation has, as I see it, led to monetary policy becoming too expansionary and making it difficult to gain a clear picture of the value of assets and liabilities. Monetary policy can of course be complemented by macroprudential policy measures but monetary policy cannot entirely disregard financial stability. There is unease about both lower and higher interest rates. There is unease both about a continued budget deficit and about the fact that public finances are being consolidated. There is a discussion on the need for write-downs of governments' liabilities and how this impacts financial companies and public finances.

Getting out of this crisis regime requires many measures that are based on an analysis that includes the role of companies on the capital market. This also increases the prerequisites for policy to be understood and received in the right way. This reduces uncertainty.

I would like to see political economists, in partnership with business economists and behavioural scientists, study how companies work in practice. It is time to analyse expectations and behaviours and discuss what is rational and compatible with long-term stability and to promote reform of the capital market so that it serves the interests of savers and society. It also means that a review is needed of the role of financial intermediaries, as discussed by Kay (2012).

This does not mean I distance myself from Keynesian stimulus policy. But it must be placed in its context. The room for manoeuvre for fiscal and monetary policy is not limitless. Consequently, it is important to consider the problems on the capital market. But most of all, it is of central importance to create the prerequisites for correcting the market failure that is the root of the problems through analysis and insight.

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Macroprudential policy in the Nordic-Baltic area

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In this article we provide an introduction to and overview of macroprudential policy implementation in the Nordic-Baltic area. The Nordic-Baltic region is one of the most tightly integrated regions in the world, not least in terms of financial integration. This has spurred the need to cooperate and tackle common risks and the region has a long history of cooperation in the financial stability area. Macroprudential policy, a fairly new field in economic policymaking, aims at reducing the build-up of risks in the financial system as a whole. For a region with strong financial links, and where microsupervision is divided between countries, macroprudential policy will therefore be of particular importance. Our overview shows that significant steps have been taken on the cooperative front and a number of macroprudential measures have been implemented. At the same time, it is too early to conclude how efficient the macroprudential measures have been in mitigating systemic risk.

A region with strong financial integration

The Nordic-Baltic banking system is highly integrated and concentrated, and is dominated by a handful of large banks. Six regional banks make up 90 per cent of the total assets of the regions publicly-listed banks.¹ Four of these banks, Handelsbanken, Nordea, SEB and Swedbank are headquartered in Sweden. The consolidated banking assets of the four Swedish banks, i.e. taking into account their cross-border assets as well, is equivalent to almost four times the size of Swedish GDP.²

The financial integration of the Nordic-Baltic region started in the latter part of the 1990s. It was during these years that the Swedish bank Nordbanken merged with the Finnish bank Merita, forming the largest banking group in the Nordic countries under the name Nordea. Financial integration continued in the 2000s with Nordea, SEB, Swedbank, DNB and Danske Bank merging with local banks in the Baltic countries, soon to dominate the Baltic banking market (see Chart 1). The cross-border linkages are mainly through subsidiaries. This is, for example, the case for Swedbank and SEB's operations in the Baltic countries. Nordea's Baltic operations are organised in branches while its operations in

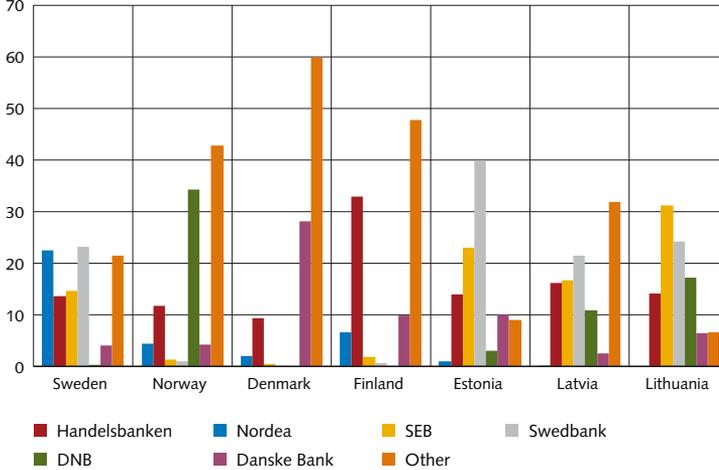
* This article is based on an article published in the Financial Stability Journal of the SEACEN Centre (Farelius, (2015)). The opinions expressed in this article are the sole responsibility of the authors and should not be interpreted as reflecting the views of Sveriges Riksbank.

1 IMF (2013).

2 The Riksbank (2015).

the Nordic countries are subsidiaries. However, Nordea has initiated preparatory work to simplify its legal structure by changing the Norwegian, Danish and Finnish subsidiary banks into branches³.

Chart 1. Bank integration in the Nordic-Baltic area: share of lending to the public
Per cent



Sources: Statistics Sweden, Norges Bank, Statistics Norway, Statistics Finland, Association of Latvian Commercial Banks, Association of Lithuanian banks, Estonian Financial Supervision Authority, bank reports and the Riksbank (2009)

Financial integration and challenges

RISK OF CONTAGION

There are several advantages with financial integration. Among these is increased competition that in turn leads to a greater variety of financial products for companies and households, as well as lower prices and interest rates. However, financial integration means that financial systems become increasingly woven together which increases the risk that a problem in one country and in one bank can easily spread to other banks and across borders.

All eight Nordic-Baltic countries have recently experienced financial crises in various forms. Norway, Finland and Sweden were hit severely by banking crises in the late 1980s and early 1990s, all three ranked as part of the “big five” advanced economy crises according to Reinhart and Rogoff⁴. In those days, the banking systems were almost exclusively domestic as were the crises. The crisis in the Baltic countries in 2008-2009, on the other hand, showed how problems in the subsidiaries spread to the Swedish parent banks and thus quickly became an issue for systemic stability in Sweden.

³ Nordea (2015).

⁴ Reinhart and Rogoff (2008).

In 2008, as the global financial crisis hit Europe, domestic demand collapsed in the Baltic countries following the burst of a property bubble. Fear of a deep recession and abandonment of the fixed exchange rates against the euro, which would result in large loan losses, made investors lose faith in the Baltic banks and consequently in their parent banks.

The parent banks in Sweden and in the other Nordic countries fund themselves to a large extent through the wholesale market. During the crisis in the Baltic countries, market funding for the Swedish parent banks became both more expensive and scarcer. Due to the fact that the Swedish banking system is highly concentrated and interconnected, banks with small or non-existing exposures to the Baltic countries also felt this effect.

Despite the adverse economic development in the Baltic countries, parent banks continued to roll over a large share of their loans to their subsidiaries, acknowledging that cutting credit would probably lead to a worse outcome.⁵ Hence, while the risk of contagion is high in an integrated financial system, the close connection also helped to stabilise the financial system, at least in the case of the Baltics.

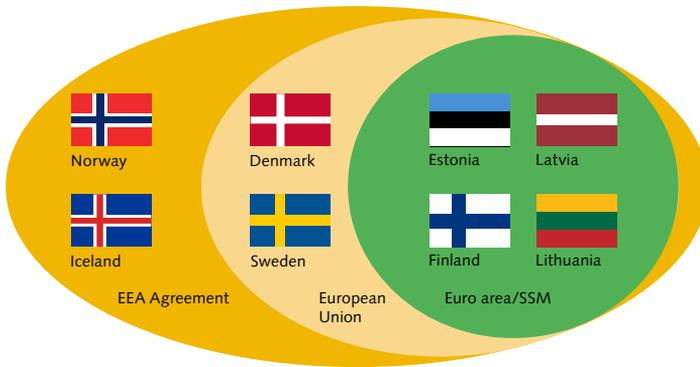
Since the financial crisis of 2008-2009, all three Baltic countries have joined the euro area, and the Nordic banks' subsidiaries in the Baltic States increasingly fund themselves through domestic deposits.

HETEROGENEOUS COUNTRIES

Although the financial links are strong in the Nordic-Baltic region, there are significant differences between the countries. The level of GDP per capita is, for example, larger in the Nordic countries compared to the Baltic countries (Chart 2). Six of the countries participate in the European Union. Four of these countries are also euro area members and therefore participate in the Single Supervisory Mechanism (SSM) and are hence under the supervision of the European Central Bank's (see Figure 1). For those countries outside the euro area, three countries (Norway, Iceland and Sweden) are inflation-targeters with floating exchange rates while one country (Denmark) pursues a fixed exchange rate regime against the euro.

⁵ Committee on the Global Financial System (2010).

Figure 1. Classification of type of membership (EEA, EU, SSM)

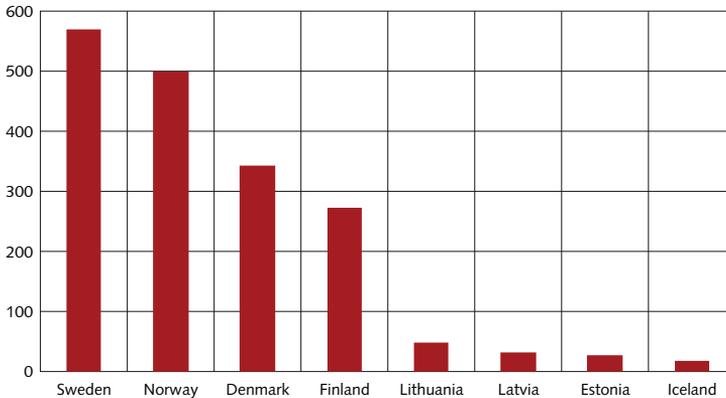


Source: Nordic-Baltic central banks

These differences pose some challenges. One such challenge is that the responsibility for supervision lies with the country where the bank is legally domiciled. That means that parent banks and their subsidiaries are regarded as independent entities and that supervision of a banking group is shared between several countries. When it comes to branches, the supervisory responsibility lies with the home authority, regardless of how large the bank’s foreign operations are. Thus, should Nordea change into a branch structure, the sole responsibility would fall on the Swedish FSA while the bank plays an important role for financial stability in other countries.

The fact that the banks with branches also operates in countries with different currencies also poses a challenge should the bank need liquidity assistance in a currency other than that of its home country. That is because the central bank only has unlimited access to its own currency. Furthermore, should there be a need to restructure the bank; the costs associated with such a measure would fall on the home country.

Chart 2. GDP in 2014 for the Nordic and Baltic countries
USD billion



Source: IMF (World Economic Outlook)

Macroprudential policy implementation

Following the global financial crisis of 2007-2009, extensive international regulatory work started in order to remedy weaknesses in the financial system and its oversight. A new area called macroprudential policy was developed. The aim of macroprudential policy is to prevent the build-up of risks in the financial system as a whole, thereby safeguarding financial stability and the real economy. Macroprudential policy thus takes a systemic perspective as opposed to microprudential supervision, which focuses on single institutions.

In the years that have followed, countries have set up institutional frameworks for conducting macroprudential policies, and on an EU-level, the European Systemic Risk Board (ESRB) was established in 2010.⁶ Macroprudential tools have also been introduced via the Capital Requirements Regulation and Directive (CRR/CRD IV), including the counter-cyclical capital buffer and the Systemic Risk Buffer⁷. Though macroprudential tools were available before the financial crisis, these were mainly aimed at reducing credit growth. CRR/CRD IV has thus paved the way for more diverse means of tackling both cyclical and structural risks.

MACROPRUDENTIAL POLICY IN THE NORDIC-BALTIC AREA

All the countries in the Nordic Baltic region have taken decisions to formally designate a domestic authority or body in charge of macroprudential policy. How the countries have chosen to implement the institutional set-up differs however (see Table 1). In some countries (Estonia and Lithuania), the central bank is in charge of macroprudential policy. In Finland and Sweden, the Financial Supervisory Authority has this role while in Norway; the

⁶ ESRB is mandated with macroprudential oversight of the financial system within the European Union in order to contribute to the prevention or mitigation of systemic risks to financial stability in the EU. The ESRB is part of the European System of Financial Supervision (EFSF).

⁷ See Niemeyer (2016) for a background to the Basel III framework.

Ministry of Finance is the designated macroprudential authority. In Denmark, the Minister for Business and Growth has the role as designated authority. Domestic cooperative bodies (councils) have been formed in Denmark, Iceland, Latvia and Sweden, bringing together relevant authorities in the macroprudential area. In the Icelandic and Swedish councils, the Ministry of Finance is the chair, while in Denmark; the Central Bank Governor chairs the Systemic Risk Council. Some countries also make a difference between the designated authority and the competent authority for macroprudential policy. For example, in Denmark, the Minister for Business and Growth is the designated authority for the countercyclical capital buffer, while the supervisory authority is the competent authority for risk weights.

Table 1. Institutional responsibility for macroprudential policy

	DENMARK	ESTONIA	FINLAND	ICELAND	LATVIA	LITHUANIA	NORWAY	SWEDEN
Central bank		X				X		
Supervisory authority			X		X			X
Government	X						X	
Council	X			X				X

Sources: Central banks and supervisory authorities in the Nordic and Baltic countries

With an interlinked banking system and the crisis of 2008-2009 in mind, the Nordic-Baltic countries established the Nordic-Baltic Macroprudential Forum (NBMF) in 2011, under the chairmanship of Stefan Ingves, Governor of the Riksbank⁸. With the NBMF, a high-level forum was created, bringing together both central bank governors and heads of supervisory authorities in the whole region for the first time.⁹

While the NBMF is an informal body with no decision-making authority, the Forum has a mandate to discuss risks to financial stability in the Nordic-Baltic countries and the implementation of macroprudential measures. The NBMF has also discussed a number of separate topics such as the application of risk weights in the Nordic-Baltic area, and reference rates. Separate work streams have also been established for more in-depth examination of various topics on, for example, the introduction and analytical frameworks of the countercyclical capital buffer and reciprocation of macroprudential policy.

CHOICE AND DESIGN OF INSTRUMENTS

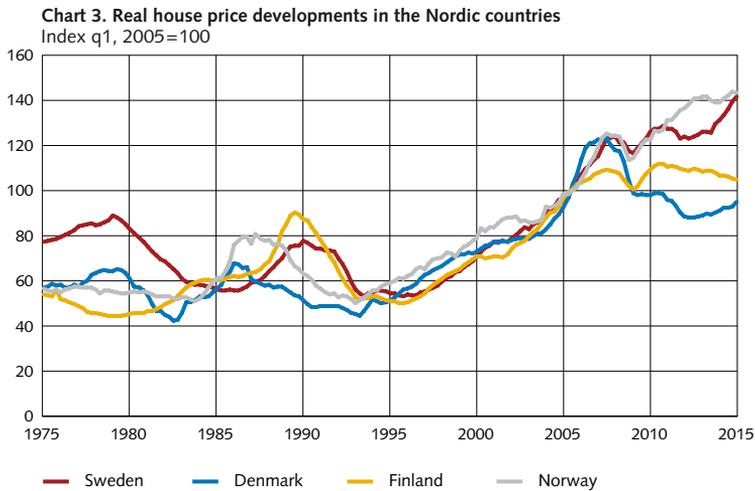
As is generally the case elsewhere, macroprudential policy is a fairly new concept in the Nordic-Baltic area. Prior to the financial crisis in 2008, macroprudential policy implementation was limited to a few cases involving instruments aimed at dampening

⁸ Farelius (2015).

⁹ Prior to 2011, Nordic central banks meet in various forms and different levels of seniority, for example the Nordic central bank governors, who have regular meetings. The heads of the Nordic supervisory authorities also meet regularly. However, there was no high-level forum for both central bank governors and heads of supervisory authorities in the Nordic and Baltic countries prior to NBMF.

credit growth, for example the increase of risk weights for housing loans from 50 per cent to 100 per cent in the calculation of capital requirements in Estonia in 2006. Another example is a loan-to-value (LTV) limit implemented in Latvia in 2007.

The implementation of macroprudential instruments in different countries should be seen in the light of different stages of financial cycles and different structural characteristics. The Nordic and the Baltic countries are at present faced with both domestic and regional risks to financial stability. Domestically, elevated house prices and household debt levels could make it more likely that house price or interest rate shocks could quickly lead to reduced aggregated demand¹⁰. Chart 3 shows that house prices have been on the rise in all Nordic countries during the last ten years. In Norway and Sweden, the rise has been particularly prevalent.



Source: The Riksbank

From a regional perspective, given the financial openness of the Nordic economies, spillovers from the pan-Nordic banking system are potentially large. From a structural perspective, the large size of the banking system relative to GDP could increase the potential severity of a crisis. Moreover, the relatively heavy dependence on wholesale funding in some countries adds to risks. Concerning instruments targeted towards imbalances in the housing market, the loan-to-value limit is the most prevalent in the Nordic-Baltic region. As can be seen from Table 2, the LTV limit is now in use or being phased-in in all Nordic-Baltic countries with levels ranging from 85 to 95 per cent. Also in the European Union, the LTV limit is the most commonly used macroprudential tool¹¹. Other instruments targeting the housing market are loan-to-income (LTI) limits or debt-

¹⁰ IMF (2013).

¹¹ ESRB (2015).

service-to-income (DSTI) ratios. A few countries combine LTV limits with income-related limits. For example, in 2015 Estonia introduced a LTV limit of 85 per cent combined with a DSTI limit of 50 per cent as well as an amortisation period of 30 years¹².

Table 2. Macroprudential policy implementation in the Nordic and Baltic countries

	LTV RESTRICTION	DSTI	COUNTER-CYCLICAL CAPITAL BUFFER	SECTOR SPECIFIC RISK WEIGHT, RISK WEIGHT FLOOR	SYSTEMIC RISK BUFFER (SRB)
Denmark	X		X		X
Estonia	X	X	X		X
Finland	X*		X		
Iceland	X				
Latvia	X		X		
Lithuania	X	X	X		
Norway	X		X	X	X
Sweden	X		X	X	X

	CAPITAL CONSERVATION BUFFER	ADDITIONAL CAPITAL REQUIREMENTS FOR SYSTEMICALLY IMPORTANT INSTITUTIONS	LIQUIDITY COVERAGE RATIO	NET STABLE FUNDING RATIO	AMORTIZATION REQUIREMENTS/ MAXIMUM LOAN MATURITY
Denmark	X*	X**	X		
Estonia	X		X		X
Finland	X				
Iceland			X	X	
Latvia	X		X		
Lithuania	X		X		X
Norway	X	X			X
Sweden	X	X	X		X*

*= planned measure. **= SRB used for additional capital requirements for systemically important institutions.

Note. Announced measures as of September 2015. The table shows both implemented measures as well as the implementation of the legal framework for each measure. For example, in some countries, the legal framework for the countercyclical capital buffer is in place but the buffer is not activated above 0 per cent. The systemic risk buffer (SRB) is intended to increase the resilience of the financial sector to non-cyclical risks that could have a serious negative impact on the national financial system or the real economy. Sources: Nordic and Baltic central banks and supervisory authorities

A few countries have also implemented measures in the risk weight area to address risks related to household debt and housing markets. In view of the very low risk weights resulting from the banks internal models, both Norway and Sweden have taken measures to raise the floor on risk weights for mortgages^{13, 14}.

The countercyclical capital buffer is also in the process of being implemented. Norway and Sweden are the sole countries in the region to have activated and implemented the buffer above zero per cent while all countries will have introduced the legal framework for the buffer by 2016. Further, an amortisation requirement will be implemented in Sweden

12 Eesti Pank (2014).

13 Finanstilsynet (2014).

14 Finansinspektionen (2014).

in 2016 in the face of rapidly increasing household indebtedness. These amortisation requirements were originally to be implemented in 2015 but due to uncertainties regarding the mandate of the Swedish FSA to implement these restrictions, implementation was postponed¹⁵. Amortisation requirements have been in place in Norway since July 2015.

Tax incentives for borrowing are also fairly common in the Nordic countries although in a few countries there are discussions on reducing them (Sweden) while reductions of tax deductibility have been adopted in both Denmark and Finland.

The exact design of the macroprudential instruments varies across the Nordic and Baltic countries. In some cases they are designed as a strong guideline from the supervisor. For example, this applies to the LTV limit in Sweden¹⁶. On the other hand, in the three Baltic States, the LTV limit is a legal requirement.

THE EFFECTIVENESS OF MACROPRUDENTIAL MEASURES

The limited research on the effectiveness of macroprudential measures so far shows that the measures with the most effect on credit growth and house prices are reserve requirements, increased risk weights and LTV limits. Exactly how the instruments work differs from country to country. In some cases the level of the instrument is important while in other cases the change in level is more important. Kuttner and Shin (2012) have examined the effectiveness of non-interest rate policies and macroprudential policy in a sample of 57 countries during 1980-2011. They find that housing credit responds in the expected way to changes in the maximum DSTI ratio, the maximum LTV ratio, exposure limits and housing-related taxes. Of the policies targeted on the demand side of the market, the evidence indicates that reductions in the maximum LTV ratio do less to slow credit growth than lowering the maximum DSTI ratio does. According to Kuttner and Shin, this may be because during housing booms, rising prices increase the amount that can be borrowed, partially or wholly offsetting any tightening of the LTV ratio.

The IMF (2015) has studied the use of macroprudential policies for 119 countries over the period of 2000-13, covering many instruments. The conclusion is that emerging economies use macroprudential policies most frequently; especially foreign exchange related ones, while advanced countries use borrower-based policies more. Usage is generally associated with lower growth in credit, notably in household credit. Effects are less in financially more developed and open economies, however, and usage comes with greater cross-border borrowing, suggesting some avoidance. And while macroprudential policies can help manage financial cycles in booms, they work less well in busts.

South Korea has quite considerable experience in using macroprudential tools and how effective they are. The LTV and DTI limits are considered to have contributed to a dampening of house prices and household indebtedness in the country¹⁷.

15 The original proposal introduced in the spring of 2015 included a requirement to amortise down to a LTV of 50 per cent and would be applicable to new loans only. Finansinspektionen (2015).

16 Prior to July 2015, the LTV in Norway was part of a soft guideline for prudent mortgage lending.

17 Kang (2014).

The effectiveness of the measures in the Nordic-Baltic region

As stated above, it is only after the introduction of Basel III in Europe (via the CRR/CRD IV) that a broad range of macroprudential instruments has become available. Thus given the relatively limited experience with macroprudential instruments in the Nordic-Baltic region, it is too early to draw any conclusions as to how effective the measures have been. Latvia introduced a LTV limit of 90 per cent in 2007, just prior to the onset of the financial crisis, which affected the country severely and caused rapidly falling house prices. While it is difficult to draw any firm conclusions as to the effectiveness of the measure, there was anecdotal evidence that the measure helped to reduce the speculative features of the housing market.

Lithuania introduced a number of measures in 2011 targeted towards the housing market¹⁸. The measures included a LTV limit in combination with a DSTI limit and an amortisation requirement. These measures do not seem to have had a significant effect on credit growth, probably because the demand for housing credits was low after the financial crisis in 2008. Norway introduced a LTV limit of 90 per cent in March 2010 as a soft guideline from the FSA. This limit was subsequently tightened to 85 per cent in December 2011 and has recently been introduced in a regulation which also includes requirements for amortisation¹⁹. While the increase in the rate of growth for mortgages in Norway has fallen since 2012 and there are some signs that the share of debt with very high LTV has been reduced somewhat, it is not possible to draw any firm conclusions as to the role of the LTV recommendation in this development, especially since it was only a soft guideline up until July 2015. Sweden introduced a LTV limit of 85 per cent in October 2010. The measure is deemed to have contributed in curbing the recent trend in rising loan-to-value ratios in Sweden. The mortgage cap has dampened household indebtedness and unsecured loans have become less common²⁰.

RECIPROCATION OF MACROPRUDENTIAL POLICY

Reciprocity of prudential requirements is widely regarded as a mechanism aiming to address the negative consequences caused by the differences in prudential requirements in various countries for the same exposure in one of these countries. The term reciprocity refers to an arrangement whereby the authority in the home country recognises the prudential requirement set by the authority in the host country, for exposures through a foreign branch or directly from the home market. This means that for countries with important branches abroad, reciprocity agreements with the home supervisors of these banks will be important for the effectiveness of macroprudential policy. For example, consider a supervisor in a country with a banking system dominated by foreign branches that decides

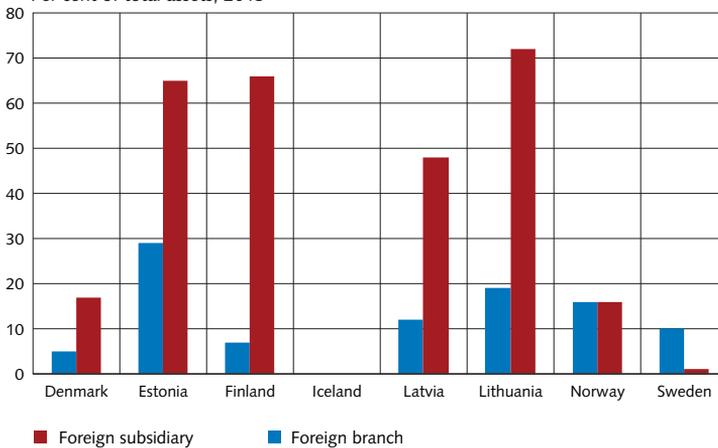
¹⁸ Bank of Lithuania (2011).

¹⁹ The regulation includes an amortisation requirement of 2.5 per cent per year for loans with a LTV higher than 70 per cent, a LTV limit of 85 per cent and a stress test for borrowers (borrowers must be able to manage a 5 percentage point interest rate hike) (see Finanstilsynet 2015).

²⁰ Finansinspektionen (2015).

to activate a specific buffer (e.g. the countercyclical capital buffer) for domestic exposures. In order for the measure to be effective, a decision to reciprocate that measure from the home supervisor of the foreign branches would be needed. In the absence of such reciprocity decision, the buffer will only apply to domestic exposures of institutions that fall under the supervision of the host supervisors and, hence, cover fewer exposures and become less effective. Chart 4 shows the relative importance of foreign branches and subsidiaries in the Nordic-Baltic countries. As can be seen, reciprocity for macroprudential policy will be important in for example Estonia, with around 30 per cent of assets in the hands of foreign branches.

Chart 4. Relative importance of foreign branches and subsidiaries in the Nordic-Baltic countries
Per cent of total assets, 2013



Sources: Nordic-Baltic central banks

Reciprocity is mandatory for some instruments in the CRR/CRDIV such as the countercyclical capital buffer (up to 2.5 per cent) and some measures aimed at increasing risk weights and loss-given-default rates. For other measures, such as the systemic risk buffer, reciprocity is voluntary. There are already examples of voluntary reciprocity arrangements in the Nordic area. For example, both Denmark and Sweden have reciprocated a measure to make the calibration of Norwegian IRB-banks' risk weight models for mortgage loans stricter.²¹

Given the importance of reciprocity in some of the Nordic-Baltic countries, work on reciprocity issues started in the NBMF in 2013. This work was later fed into work at the EU level and efforts to design a voluntary framework for reciprocity within the EU have recently been concluded. An underlying principle will be that measures targeting exposures

²¹ The letter from Finanstilsynet (in Norwegian), the note describing the proposed calibration (in English) and the answers from the Danish FSA (in Danish) and the Swedish FSA (in Swedish) are available at Finanstilsynet's website: http://www.finanstilsynet.no/no/Artikkelarkiv/Aktuelt/2014/2_kvartal/Okte-risikovekter-for-boliglan--nordisk-samarbeid/.

(such as mortgages) should be reciprocated while there would be less of a presumption to reciprocate measures targeting institutions (such as buffers for systemically important institutions). ESRB will be given an essential role in the framework. In the context of this framework, which will be implemented as a recommendation of the ESRB, the EU member state activating a measure will have to notify the ESRB and ask for the measure to be reciprocated. The countries with banks having exposures in the activating country will have to reciprocate or explain the reason for not reciprocating.

One future development that could potentially have important consequences for reciprocity of macroprudential policy is an announced change to the legal structure of Nordea.²² Should this change be implemented, it will imply that reciprocity issues will become even more important for the Nordic-Baltic area, not least for Finland, as its largest domestic bank now would be in the form of a foreign branch.

CONCLUSIONS

Macroprudential policy implementation in the Nordic and the Baltic countries is a fairly new concept with limited empirical experience. The introduction of the CRR/CRD IV in national legislation has increased both the availability and use of macroprudential instruments. In addition, the institutional responsibility for macroprudential policy has now been clarified and decided in all eight countries. Concerning macroprudential instruments, the LTV limit is the most prevalent instrument, followed by the increased use of the countercyclical buffer. It is too early to draw any conclusions as to the effectiveness of the macroprudential policy measures given the limited empirical experience. Reciprocity of macroprudential policy is important in the Nordic-Baltic context due to strong financial integration and, in some countries, a large share of foreign banks operating through a branch or subsidiary network.

In a financially integrated region such as the Nordic-Baltic, cooperation in the macroprudential area has been promoted, not least with the creation of the Nordic-Baltic Macroprudential Forum (NBMF). The informal nature of the Forum has been promoting good discussions. The fact that the group is relatively small, with less than 20 persons around the table, has also likely helped. Work in the NBMF has also been effective. For example, the work on reciprocity issues was initiated in the NBMF before work at the European level. As the work in the ESRB on reciprocity issues started, the EU could benefit from the work that was already done in the NBMF.

For the future, a number of challenges will have to be tackled. One such challenge is that not all designated authorities of macroprudential policy are part of the Forum. As can be noted in Table 2, both Denmark and Norway have decided that the Government is the

²² "As communicated in the Q2 2015 report, Nordea is working on simplifying its legal structure with the aim of changing the Norwegian, Danish and Finnish subsidiary banks into branches of the Swedish parent company by means of cross-border mergers. The preparations are progressing as planned, including the ability to present a proposal to the Annual General Meeting in March. The changes to the legal structure depend among other on regulatory approvals and a satisfactory outcome of discussions with the local authorities." Nordea (2016).

designated authority. While this challenge should not be overemphasized, this fact will most likely mean that the Forum will remain informal in the future as any strengthening of the mandate of the group would require changes to its composition.

Another challenge is the fact that some countries of the Forum are members of the euro area and hence are in the recently introduced single supervisory mechanism (SSM) among the euro area countries. The SSM assigns some macroprudential responsibilities to the European Central Bank (ECB) for countries in the euro area. The ECB is currently not taking part in the discussions in the Forum and given that it is an informal group, participation will most likely remain unchanged in the future as well. At the same time, as the implementation of macroprudential policy evolves, and given the role of the ECB in the implementation of macroprudential policy in the euro area countries, the question is whether there will be a future need to somehow involve the ECB in the Forum.

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Thinking about the future of money and potential implications for central banks

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1. Introduction

The technological infrastructure of financial transactions is changing fast, due in part to innovations such as peer-to-peer lending, crowdfunding and cryptocurrencies. Peer-to-peer lending is the large-scale lending of money between people online, for which well-known sites include LendingClub and Prosper. Crowdfunding, instead, is the recent practise of soliciting financial contributions from the online community to fund a new business venture, for which leading examples are Kickstarter and IndieGoGo. Last, cryptocurrencies such as Bitcoin are virtual and digital currencies protected by cryptography. More specifically, cryptocurrencies use a technology that allows every single transaction that ever happened within each specific currency network to be recorded on a distributed ledger called the block chain¹. The integrity and chronological order of the block chain are made secure with cryptography.

These innovations have potentially serious implications for the traditional business model of commercial banks and for the ability of central banks to shape monetary policy. This is so because if lending were to take place increasingly outside the traditional banking system, the role that traditional commercial banks play in the standard money multiplier process, by which changes in open market operations and the quantity of reserves directly affect the amount of lending in an economy, could be severely diminished. This may in turn hamper central banks' ability to control liquidity in the economy and the economic performance through standard monetary policy operations. Additional implications could come from cryptocurrencies like Bitcoin. Indeed, one must wonder what the consequences for regulation and supervision would be if banks were to adopt distributed ledgers such as the block-chain technology in order to settle payments.

In Sweden, such challenges overlap with a large decline in money demand in the last 10 years, when cash in the hands of the public (M0) has fallen from 3.5 per cent to 2 per cent as share of GDP. Indeed, even if the decrease in the cash/GDP ratio is quite common across OECD countries (see for example Sveriges Riksbank, 2013), in Sweden even the nominal

* The opinions expressed in this article are the sole responsibility of the author and should not be interpreted as reflecting the views of Sveriges Riksbank.

1 A key issue for any digital payment system is how to avoid double spending of money. Banks solve this problem by keeping records on individuals' balances, i.e. ledgers. The Bitcoin network, instead, relies on a shared public ledger known as the block chain. All confirmed transactions are included in the block chain, which is enforced with cryptography. See Segendorff (2014) for a detailed explanation of the block chain technology.

value of cash in circulation has been decreasing since 2008 (see Figure 1). This may affect seigniorage substantially if a decrease in cash implies a lower inflation tax and hence has important implications for the balance sheet of the Riksbank, especially in times of zero or even negative interest rates.

In what follows, I will explain these new challenges in detail and investigate their potential implications for central banks through the lenses of monetary theory.

2. Decrease in money demand

Recently, an interesting debate has emerged around the need for cash in modern societies. On the one hand, Rogoff (2014) has proposed the elimination of paper currency in favor of all-electronic transactions, primarily for two reasons. First, a no-cash economy would allegedly allow central banks to set negative interest rates, a possibility which, in the current situation, would provide an additional tool for central banks to stimulate the economy. The argument is that policy rate well below zero is not possible as long as paper currency is available, since cash pays a zero interest rate which means that households and firms can always use it to avoid negative interest rates.² Second, paper currency facilitates anonymous transactions, which makes it easier to avoid laws and taxes. Getting rid of cash should create obstacles for the underground economy and hence likely lead to an increase in governments' tax bases and revenues. Indeed, exactly in light of this second argument, several European governments (e.g. Belgium, Greece, Italy, Spain and Slovakia) have introduced ceilings on cash transactions, and the European Commission is considering stricter rules on the use of cash. On the other hand, Chapter IV of the ECB Payment Accounts Directive (PAD)³ introduced measures aimed at ensuring that all consumers in the EU by law have access to payment accounts with basic features, among them the right to make cash withdrawals and placing funds in an account.

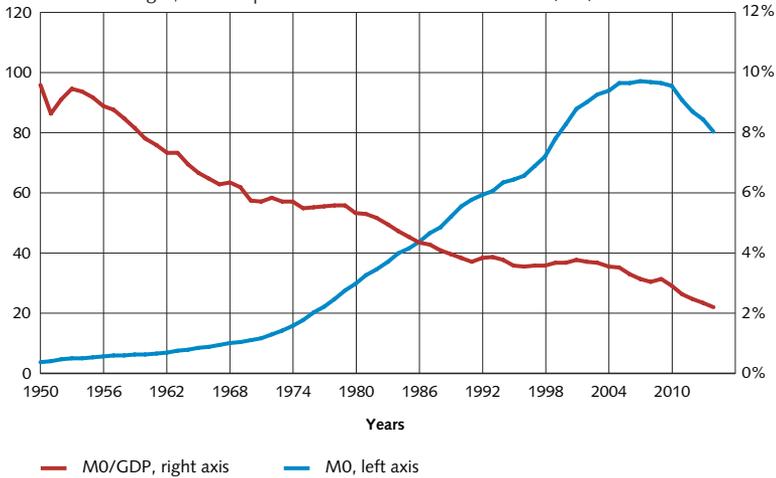
Sweden constitutes an interesting case study for the purpose of this debate, primarily for two reasons. First, as can be seen in Figure 1 and as documented in Segendorff and Wretman (2015), Sweden has been experiencing not only a decrease in the cash/GDP ratio for a prolonged period of time (-27 per cent since 2007 as per Sveriges Riksbank, 2013⁴). Second, it has experienced a decrease in the nominal value of cash in the hands of the public (M0) ever since 2008. While reasons behind the sharp decline remain unclear, it is not unreasonable to believe that the important changes in the Riksbank's role in cash handling in recent decades might have played a role.

2 The Riksbank repo rate is currently at -50 basis points. Switzerland maintains an even more negative policy rate at -75 basis points. However, policy rates cannot be persistently below the storage cost of paper money as this would give incentives for banks and firms to keep accumulating paper currency.

3 <http://www.cliffordchance.com/content/dam/cliffordchance/PDFs/PaymentAccountsDirectiveMay2014.pdf>

4 http://www.riksbank.se/Documents/Rapporter/Riksbanksstudie/2013/rap_riksbanksstudie_The_Swedish_retailpayment_market_130605_eng.pdf.

Figure 1. M0 (cash in the hands of the public) and M0/GDP
Annual averages, M0 is expressed in billions of Swedish kronor (SEK)



Sources: The Riksbank and Statistics Sweden

Nowadays, the Riksbank is in charge of promoting a safe and efficient payment system. In this capacity, it is responsible for supplying Sweden with cash and has the sole right to issue Swedish banknotes and coins. In the past, however, the Riksbank was involved in the daily flows of cash between banks, retail traders and other market participants. Moreover, commercial banks were offered compensation for interest expenses for cash stored in their own depots. Starting in 2005, however, the handling of cash in circulation was left in its entirety in the hands of private participants. The purpose of this change was to increase efficiency in cash handling, partly by reducing transports to and from the Riksbank. As a consequence of such changes, the Riksbank's role today is limited to issuing and receiving cash from depot owners, but the Riksbank does not decide on how much cash is put into circulation, which is instead determined by market participants.

Currently, commercial banks' cash handling in Sweden consists of over-the-counter deposits and withdrawals from accounts, withdrawals and deposits via ATMs, and cash deposits in service boxes, but it is presently undergoing some significant structural changes. As noted in Sveriges Riksbank (2011), Sweden's major banks (Danske Bank, Handelsbanken, Nordea, SEB, and Swedbank) are cutting back on the possibilities of conducting cash transactions over the counter.⁵ Indeed, roughly fifty per cent of bank branches in Sweden are entirely closed to cash transactions, referring their customers to ATMs or other bank branches. The reason for this is that possibilities to charge fees on such transactions are limited while the costs for cash handling are relatively high, even more so after the Riksbank's change in cash handling since 2005.

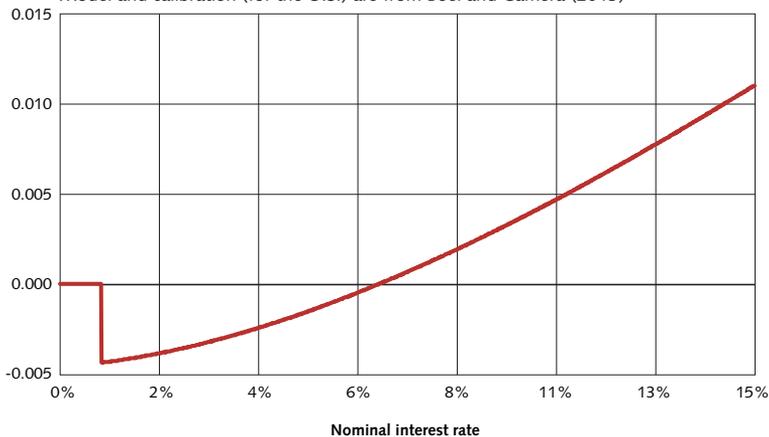
Such a pushback against cash does not come without consequences. Indeed, there is an important question of how forcing a shift to electronic payments affects transaction

5 http://www.riksbank.se/Documents/Sedlar_mynt/2012/Kontanhantering_2011_ENG.pdf.

costs since retailers generally pay a pro-rata fee for credit card services to companies such as MasterCard and Visa. Moreover, as Rogoff (2014) noted, since cash is anonymous, replacing it with non-anonymous electronic money would likely lead to a large shrinkage in demand and therefore seigniorage. Only if paper currency were replaced with electronic currency one to one would there be no long-run shrinkage in demand and the government would continue to garner seigniorage revenues as before.⁶

Boel and Camera (2015) also examine the issue of cash versus cashless societies, albeit from a different perspective. Specifically, they use a microfounded model of money and banking to investigate the welfare implications of costly banking in an economy where cash is used compared to a hypothetical economy without cash. Their model builds on Lagos and Wright (2005) and Berentsen, Camera and Waller (2007), who provide microfoundations for the existence of money and banking within a tractable framework. Compared to Berentsen, Camera and Waller (2007), Boel and Camera (2015) consider an economy where financial intermediation is costly because banks need to pay wages to employees. When this is taken into consideration, the model shows that the interest rate spread between loans and deposits depends on both monetary policy and the efficiency of the intermediation technology. Moreover, labor market wage distortions generate general equilibrium effects that affect financial activity and in turn welfare. Figures 2 and 3 describe the welfare implications of the model, which is calibrated to the US economy for the period 1965-2010.

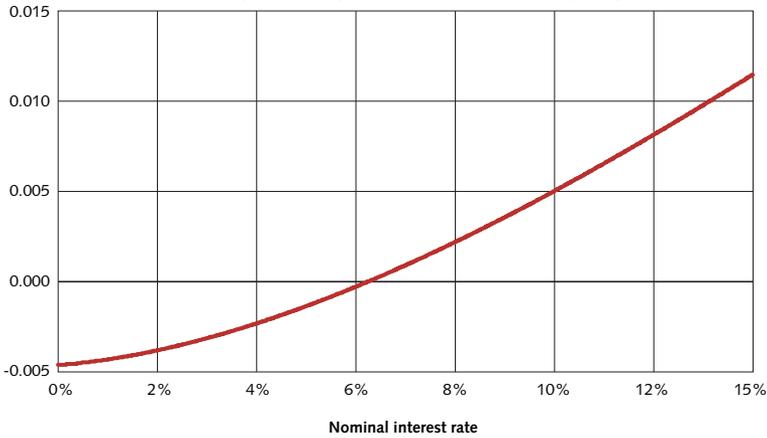
Figure 2. Welfare differences with and without banking when agents can use cash
 Model and calibration (for the U.S.) are from Boel and Camera (2015)



Note. The graph shows the difference in the expected lifetime utilities with and without financial intermediation as a function of the interest rate. The welfare difference is quantified in an economy where agents can use cash.

⁶ Because currency demand would be replaced by demand for electronic central bank reserves.

Figure 3. Welfare differences with and without banking when agents cannot use cash
 Model and calibration (for the U.S.) are from Boel and Camera (2015)



Note. The graph shows the difference in the expected lifetime utilities with and without financial intermediation as a function of the interest rate. The welfare difference is quantified in an economy where agents cannot use cash.

Figures 2 and 3 plot the difference in welfare between the economy with costly banking in Boel and Camera (2005), and in the hypothetical economy with no banking at all as in Lagos and Wright (2005). The takeaway from both figures is that for sufficiently small inflation rates, banks end up compensating depositors too little and charge too high a premium on borrowers. This is so because in this economy, intermediation absorbs labor resources, and there is a threshold inflation level below which active intermediation lowers macroeconomic efficiency. This threshold level depends on the productivity of the banking sector.

Figures 2 and 3 also emphasize that the welfare consequences at low inflation rates are different whether we are considering an economy where agents can trade with each other and hold cash outside of banks (Figure 2) or not (Figure 3). Specifically, agents are better off using cash when interest rates are very low. Why is that the case? Intuitively, when interest rates are sufficiently low, banks cannot fully compensate depositors since banks still need to pay for costly resources to operate. At the same time, the workers hired by the banks affect wages in the economy. Through general equilibrium effects, Boel and Camera (2015) find that abandoning paper currency increases wages, in turn lowering the production of goods due to higher labor costs.

This suggests that in thinking of cashless societies, we should remind ourselves that while cash is costly, so are banks' operations. Indeed, they absorb real resources such as labor, and this might have welfare-decreasing general equilibrium effects at low interest rates. Whether this is the case or not depends on the efficiency of alternative intermediation technologies.

3. Cryptocurrencies

Much has already been written describing the most salient features of cryptocurrencies,⁷ but some aspects of the phenomenon are still worth emphasizing. First, there are some important differences between digital, virtual and cryptocurrencies. Digital currency is any currency stored and transferred electronically (e.g. Paypal); a virtual currency, as defined in ECB (2015),⁸ is a digital representation of value, not issued by a central bank, credit institution or e-money institution, which in some circumstances can be used as an alternative to money.; a cryptocurrency, instead, is a digital and virtual currency protected by cryptography. Bitcoin, Feathercoin, and Namecoin, among others, are all examples of cryptocurrencies, of which Bitcoin is so far the best known and used among the hundreds currently existing.

Second, cryptocurrencies serve a dual purpose as a medium of exchange to facilitate the trade of goods and services between parties and a payment system to settle financial transactions. That is, cryptocurrencies are both money and a technology at the same time. Indeed, the genuinely innovative aspect of cryptocurrencies is not that they are a new form of money, thus leading to the coexistence of different currencies in the same country. Different currencies have coexisted within the same country in the past – think for example of the Free Banking Era (1837-1863) in the United States, when entry into banking was virtually unrestrained and banks could issue their own currency (see Rolnick and Weber, 2008) or Sweden between 1534 and 1803 (see Edvinsson, 2010). Instead, the truly novel aspect of cryptocurrencies relies on the fact that they are also a decentralized digital payment system, in that they use distributed ledgers to allow remote peer-to-peer exchanges of electronic value in the absence of trust between the parties and without the need for intermediaries.

One obvious question is whether cryptocurrencies can coexist with traditional forms of money in the long run, given the anonymous nature of both. As cryptocurrencies are a new phenomenon and the empirical evidence is still scarce, we need a theoretical model to answer this question. Boel (2015) develops a microfounded model of money based on Trejos and Wright (1997), which in turn builds on Trejos and Wright (1995), in an attempt to answer this question.

Trejos and Wright (1997) consider an environment with two different countries, A and B . Agents are anonymous and specialized, so that there is no double coincidence of wants and money is needed to trade. Each of the two countries issues its own fiat currency, i.e. currency with no intrinsic value, M^A and M^B . Population and money supply are constant, so that there is no inflation in either country. Two possible equilibria exist in this environment: (i) if the two countries are relatively isolated in terms of trade, currency A circulates only in country A , and currency B circulates only in country B , thus leading to two national monies; (ii) currency A and B circulate in both countries so that two international monies exist.

⁷ See, among others, Segendorff (2014), Velde (2013), Brito and Castillo (2013) and CPMI (2015) for interesting overviews of cryptocurrencies.

⁸ <https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf>.

Boel (2015) builds on this result and considers the case where countries A and B are not too isolated and therefore agents would prefer to use both currencies. The environment is analogous to the one in Trejos and Wright (1997), but now money supply grows according to $M_t^A = \pi_{t-1}^A M_{t-1}^A$ and $M_t^B = \pi_{t-1}^B M_{t-1}^B$. A cash-in-advance constraint is introduced, so that agents need to pay taxes using domestic currency. This is reminiscent of the legal restriction theory of the demand for money in Wallace (1983) and captures the idea that currencies A and B are backed by the governments of the respective countries. A fiat currency C , with no intrinsic value and unbacked by either government, is also introduced, with $M_t^C = \pi_{t-1}^A M_{t-1}^C$. Currencies A , B and C are assumed to have the same volatility, but may be associated with different expected inflation rates.

Without transaction costs, currency C circulates in equilibrium if, and only if, its expected inflation rate is lower than for the other currencies. This suggests that cryptocurrencies, which are intrinsically worthless and unbacked by any government and thus reminiscent of currency C , could circulate in countries with high inflation rates.⁹ Of course, if currencies had different volatilities, this would also affect the acceptance rate of currency C .

Another reason why currency C may exist in equilibrium is transaction fees. Assume a positive transaction cost is incurred for exchanging currencies A and B , much like a fee for international money transfers. In this case, currency C will be used in equilibrium as long as the transaction cost is low enough. Why? Agents will use it to acquire the money with the lowest expected inflation rate. Intuitively, this suggests that cryptocurrencies should survive as a technology as long as they offer low transaction costs. That is, they should have value as a payment instrument regardless of their currency function.

This feature of cryptocurrencies can have important consequences. The use of distributed ledgers in payment systems may induce changes in clearing and settling transactions. Indeed, this would become even more revolutionary if banks were to adopt distributed ledgers such as the block chain, as that could have implications for supervision and regulation, and thus for the safety and soundness of payments systems.

4. Peer-to-peer lending

Peer-to-peer, or person-to-person, lending (henceforth “P2P lending”), which emerged in 2004 with the UK’s Zopa platform, is essentially a virtual marketplace that matches supply and demand of funds. The virtual marketplace term is used because P2P lending uses platforms connecting investors/lenders and borrowers in one direct online market that removes layers of intermediation for investors wanting a diversified portfolio of a fixed-income asset class of consumer loans. With P2P lending, such investors do not need to access asset-backed security (ABS) markets.

⁹ See <http://cointelegraph.com/news/114547/hyperrinflationleads-the-number-of-venezuelan-bitcoin-users-to-double>, for a brief discussion of Bitcoin use in Venezuela in 2014-2015.

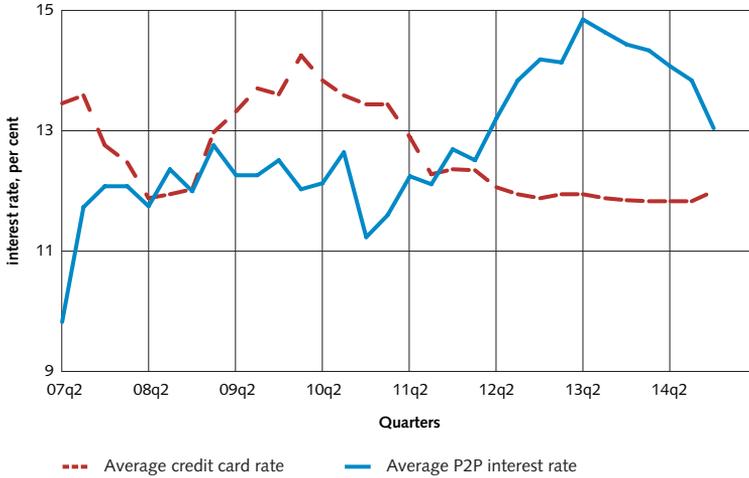
The attractiveness of P2P for borrowers lies in the promise of reduced rates. This is possible because P2P lending's use of internet platforms reduces costs by eliminating many operational expenses associated with traditional consumer bank loans, such as the cost of maintaining and staffing physical branches. Some cost savings are passed on to borrowers through lower interest rates than those offered by traditional banks. The loans are however unsecured, meaning there is no collateral for lenders to keep if the borrowers do not repay their loans. Thus, P2P investors face losing all their capital if the platform goes bankrupt.¹⁰

The P2P lending process varies by platform, but it generally involves some standard steps. First, a prospective borrower submits an application to the platform for consideration. Borrower applicants enter mandatory information including the loan amount request, maturity choice, purpose for loan, income, employment, and other debt, as well as voluntary information that is posted on the website. Borrowers may also upload documentation verifying income and employment. The platform can then obtain a credit report on the applicant (platforms typically set minimum FICO credit scores) and use this information, along with other data (e.g., loan characteristics), to assign a risk grade to the proposed loan. Depending on the pricing mechanism used, the loan interest rate is usually determined either by the platform itself or via an auction among bidding lenders.¹¹ If accepted, a loan request is posted on the platform's website, where investors can review all loans. They need not fund entire loans for any prospective borrower, but can instead diversify across borrowers. They can also choose to invest independently or within investment groups. Typically, platforms issue loans in amounts ranging from USD 1,000 to USD 35,000 with maturities of three to five years.

10 For example, the Swedish P2P firm TrustBuddy filed for bankruptcy and froze lenders' cash in October 2015. For more details, see <http://www.telegraph.co.uk/finance/personalfinance/investing/11947261/Peer-to-peer-firm-delisted-from-stock-exchange-after-3m-of-savers-cash-goes-missing.html>.

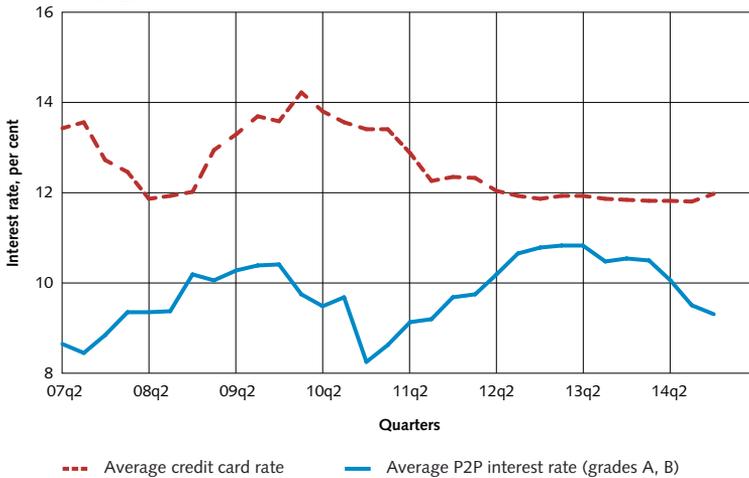
11 See Wei and Lin (2015) for an analysis of Prosper's switching from an auction to a posted-price mechanism in 2010.

Figure 4. Average credit card and P2P interest rates
Annualized



Sources: LendingClub (P2P Rate) and St Louis FRED (credit card rate)

Figure 5. Average credit card and P2P interest rates for borrowers A and B (low default risk)
Annualized



Sources: LendingClub (P2P Rate) and St Louis FRED (credit card rate)

The vast majority of P2P borrowing is for credit card and mortgage refinancing, but some P2P platforms focus on other segments of the consumer lending market as well, such as student loans (SoFi, Kiva), and younger borrowers (Upstart). As shown in Figure 4, not every borrower is able to obtain a better interest rate than a credit card one. However, LendingClub¹² ranks borrowers from A to G, with A reflecting the lowest probability of

¹² LendingClub and Prosper are the two largest P2P lending platforms in the United States.

default. As shown in Figure 5, borrowers with grades A and B, i.e. the least risky borrowers, have consistently been getting better rates through P2P.

Platforms generate profits by closing and servicing loans. Using data from Morse (2015) based on all LendingClub loans issued in the first quarter of 2013, the mean and median origination fees were 2.7 per cent and 3 per cent, respectively. This fee is taken out of the funds provided to the borrower. The platform informs the borrower of the interest rate and the implied APR with the fee added into the calculation, so that the APR reflects the true borrower cost. When fees are paid to LendingClub to service the loan, the platform takes out a 1 per cent service charge before submitting the payments to the investor. LendingClub also collects delinquency fees from borrowers and collection fees from investors.

P2P lending has received great interest and experienced tremendous growth worldwide in the past few years. By one estimate, in the year 2014 alone in the United States, P2P generated more than USD 8.9 billion in loans, and received more than USD 1.32 billion in venture capital investments.¹³ Yet, little research has so far emerged on the topic. Indeed, such research is very much needed to understand the welfare implications of P2P across borrower and investor types. As P2P continues to grow, it is also worth investigating the optimality of the lending structure of P2P. Are these middle-to-high income individuals with a probably higher than average tax burden well served by a 3 to 5 year installment loan? Is this the optimal maturity? A few studies have recently emerged on the optimal pricing mechanism in P2P. Wei and Lin (2013) study the event of the P2P platform Prosper unexpectedly moving from price setting via auction (the interest rate is priced at the margin when supply of credit reaches demand) to a coarser system in which Prosper pre-assigns an interest rate based on credit scoring assignment of prospective borrowers into buckets or grades of risk. The authors find that under the pre-set prices, loans are funded with a higher probability at a higher price, but with a higher default rate.

Most importantly, there is the big-picture question of where P2P is headed in terms of consumer finance and whether it could seriously erode the position of traditional commercial banks. So far, most US and UK banks have watched the growth of P2P from the sidelines. This attitude may be a reflection of P2P's relatively small size. While online lending is growing, its size still remains negligible given that the US consumer credit market is worth more than USD 3,000 bn. Moreover, as the business expands, P2P operators will need to find riskier borrowers to lend to. Indeed, they are already doing so, moving into areas such as small business lending where there is an appreciable need. What bankers seem ultimately to be counting on is that P2P will struggle to make this transition. If banks were proven wrong and P2P were to seriously drive activity out of the traditional banking sector, it could have disruptive effects for the standard channels of impact monetary policy has on the economy. At this stage, it is of course too early to quantify how big P2P should be for this to happen.

¹³ <http://cdn.crowdfundinsider.com/wp-content/uploads/2015/04/P2P-Lending-Infographic-RealtyShares-2014.jpg>.

5. Concluding remarks

Technological innovation could potentially lead to a diminished lending role from the traditional banking sector if phenomena such as peer-to-peer lending and cryptocurrencies become mainstream and grow. At the same time, the role of central banks could change in a world without cash. Regulators and central banks therefore need to understand how these innovations could potentially transform the banking sector as we know it today and fundamentally change the traditional channels through which monetary policy affects the economy. Monetary theory can offer valuable insights in this important analysis.

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