# RESEARCH NEWS

## 2009

APP/Research Division

## News from the Research Division

**Tor Jacobson,** head of research (econometrics, banking and credit risk)

**Kasper Roszbach,** deputy head of research (banking, credit risk, corporate governance)

**Mikael Carlsson**, researcher (macroeconomics, econometrics, labor markets)

**Ferre De Graeve**, researcher (macro-finance, monetary policy, macroeconometrics, banking)

**Daria Finocchiaro,** researcher (monetary economics, macroeconomics, international macro)

**Paolo Giordani,** researcher (Bayesian econometrics, forecasting, monetary policy, exchange rates)

**Thomas Jansson,** researcher (household finance, credit risk, and financial markets and institutions)

**Virginia Queijo von Heideken,** researcher (monetary economics, credit markets, empirical macro)

**Ulf Söderström,** researcher (monetary policy, uncertainty, term structure of interest rates)

**Mathias Trabandt,** (on leave) researcher (monetary economics, public economics)

**Mattias Villani,** researcher (Bayesian analysis, econometrics, forecasting)

**Karl Walentin,** researcher (macroeconomics, financial economics, labor markets)

**Andreas Westermark,** researcher (macroeconomics, labor markets)

**Karolina Holmberg,** guest PhD student (financial frictions and business cycles)

**Lauri Vilmi,** guest PhD student (macroeconomics)

**Ingvar Strid,** research assistant

**Erik von Schedvin**, (on leave) research assistant

**Lena Löfgren,** secretary

### Changes in the Research Staff

**Ferre De Graeve** joined the research division in September 2009. Ferre obtained his PhD in 2007 from Ghent University, Belgium. Prior to joining the Riksbank he was an economist in the research

department of the Federal Reserve Bank of Dallas. Ferre's research interests include macro-finance, monetary policy, macroeconometrics, DSGE models, and banking.

**Thomas Jansson** joined the research division in September 2009 after obtaining his PhD in finance from the Stockholm School of Economics. The main theme of his thesis is household portfolio choice with focus on the interaction between labor income risk and investments in housing and financial assets. Thomas' research interests include household finance, credit risk, and financial markets and institutions.

**Andreas Westermark** permanently joined the research staff in April 2009. Andreas obtained his PhD from the University of Rochester in 1999. During the period 1999-2008 Andreas worked first as researcher and then as Associate Professor at the Department of Economics, Uppsala University. Andreas is currently working on DSGE models that analyse the consequences for monetary policy of firm-specific labor and of downward nominal wage rigidities. He is also working on how wage-setting depends on the degree of openness of economies and institutional factors like bargaining power of unions and the degree of downward nominal wage rigidities.

**Karolina Holmberg** returned to PhD studies at the Stockholm School of Economics in September 2009. She is visiting the research division during the academic year 2009-2010. Her main research interests are financial frictions and business cycles. Her licentiate paper focused on the New Keynesian Phillips curve. Her current project deals with firm level financial constraints and the real effects of the Swedish financial crisis in 2007-2008.

**Lauri Vilmi** is a PhD student in economics from the Finnish Doctoral Programme in Economics (FDPE) and the Department of Economics at the University of Oulu. He is visiting the research division during the academic year 2009-10. His research deals with DSGE models and monetary policy. Lauri is currently working on the effects of macroeconomic shocks on firm entry and exit.

**Ingvar Strid** is a PhD student at the Stockholm School of Economics and joined the research division in August 2008. Ingvar is leaving the research division in January 2010 to finish his PhD studies at Stockholm School of Economics.

**Mattias Villani and Paolo Giordani** visited the University of New South Wales in the first quarter of 2009 to work with Professor Robert Kohn on several projects in the area of Bayesian econometrics.

## Research Projects

The following research projects were pursued during 2009:

### Credit and Banking

*Information-Based Bank Runs or Panics?*

This paper proposes a novel approach to distinguish between different theories of bank runs. We construct hypothesis tests, conditional on bank runs, which quantify the role of panic-induced deposit withdrawals as well as the extent to which withdrawals are based on information. We provide an application for the Russian deposit market. Our approach builds on structural identification techniques frequently used in macroeconomics. We extend these time-series methods by extracting information from cross-sectional heterogeneity. We show that such information is very useful for identifying structural shocks, cross-validating the model and extracting testable implications. The method can easily be extended to apply to alternative types of shocks, as well as other markets.

*Forecasting bankruptcy rates in Sweden, 2010 - 2012*

This project studies the relation between macroeconomic fluctuations and corporate defaults while conditioning on industry affiliation and an extensive set of firm-specific factors. By using an extensive panel data set for all incorporated Swedish businesses over 1990-2009, a period which includes a full-scale banking crisis, and an associated deep recession, followed by periods with more normal cyclical features, we present forecasts of aggregate, as well sector-specific bankruptcy rates for the period 2009, Q3 to 2012, Q2, under various DSGE-modelled macro economic scenarios. Out-of-sample evaluations show our approach is superior to both models that exclude macro information and best fitting standard time-series models. We find that the forecasted bankruptcy rates will not, by far, reach the levels of the former crisis in the 90' even in the unlikely event of a macro economic melt down. In fact, one has to induce unrealistically severe shocks to firms' balance sheets to achieve that.

*Credit Ratings and Monitoring Ability*

This paper uses credit rating data from two Swedish banks to elicit evidence on these banks' loan monitoring ability by comparing the ability of bank ratings to predict loan defaults relative to that of public ratings. There is some evidence that bank credit ratings do contain valuable private information. However, public ratings are also found to have predictive ability for future bank ratings, indicating that risk analyses by regulators should be based on both public and bank ratings. The methods developed in the paper represent a new basket of straightforward techniques that enable both financial institutions and regulators to assess the performance of credit ratings systems.

*The Anatomy of the Bank and Borrower Relationship*

This paper investigates how bank relationships with distressed firms evolve. The paper uses data from two Swedish banks on loan composition and a wide range of distress events to study how various dimensions of bank-borrowers' relationships are affected by different levels of distress.

*The dynamics of loan losses*

The existing literature on recoveries of defaulted bonds and loans typically assumes there is an unambiguous point in time at which final loan losses can be determined. In reality, recoveries on particular vary widely over time. This paper employs detailed data from a Swedish bank to analyze the dynamic behaviour of loan losses.

*Hedging Labor Income Risk*
This paper studies the relationship between workers' labor income and capital market investment. The empirical results indicate that highly productive industries are more likely to pay workers variable wages, and that both levels and changes of wage volatility are significant in explaining changes in household investment portfolios.

## *Monetary Policy*

*Potential Output, the Output Gap, and the Labor Market*
We provide estimates of potential output and the output gap in the US. We relate the estimated output gap to the model of the labor market, and we evaluate the uncertainty surrounding our estimates. We show that a particular model is able to generate an output gap that is similar to traditional measures of the gap: the deviation of output from trend. This output gap is also estimated with considerable precision. We then show that model uncertainty has severe implications for output gap measurement. In particular, small changes in the model of the labor market generate very different estimates of the output gap.

*Introducing Financial Frictions and Unemployment into a Small Open Economy Model*
This paper incorporates two important extensions of the emerging standard monetary DSGE model in a small open economy setting, e.g. RAMSES. We add financial frictions and labor market frictions. We make an important contribution to the literature by endogenizing the job separation decision in this rich setting. Most of the work on this project during 2009 has revolved around quantifying aspects of the labor market, mainly related to endogenous job separation and labor supply elasticity.

   The first empirical result worth highlighting is that the shock to entrepreneurial wealth is important in explaining the dynamics of several macro variables. The second empirical result comes from the fact that our model allows for both an intensive and an extensive margin of labor supply. We can therefore provide a meaningful estimate of the intensive elasticity of labor supply and find it to be close to micro-evidence, i.e. a Frisch elasticity of 1/8. Third, it is worth noting that in contrast to the existing literature on estimated DSGE models, e.g. Smets and Wouters (2003) and RAMSES, our model does not contain any "wage-markup shocks" or similar shocks with low autocorrelation, and we can still match both hours worked, unemployment and wage data series.

*DSGE Models for Monetary Policy*
In this paper, we begin by reviewing the New Keynesian model. We describe and motivate its various features. These features are primarily motivated by researchers' beliefs about how the economy responds to monetary policy shocks. In many cases, though not all, researchers' beliefs are motivated by results based on identified vector autoregressions (VARs).
But, there remain important challenges for DSGE models. The financial crisis of the past two years has alerted researchers to the absence of a serious financial sector in the consensus model. Progress on rectifying this problem is now well underway. Another challenge is that the consensus model has nothing to say about labor market variables like unemployment, the labor force, vacancies, etc. These variables are also of substantial interest to policy makers. We explore recent efforts to improve the labor market implications of the consensus DSGE model.

*The Effects of Monetary Policy on Firm Entry*
The paper studies the effects of monetary policy on firm entry. We find a statistically significant positive response of firm entry to an expansive monetary policy shock. Secondly, we formulate a theoretical model which replicates observed impulse responses. Finally we estimate the model parameters and study how different nominal and real rigidities affect the response of firm entry.

## Macro-Finance

*The Term Structure of Interest Rates and the Monetary Transmission Mechanism*
We provide empirical evidence that the term structure of interest rates is an integral part of the monetary transmission mechanism. Based on these findings, we augment the standard monetary business cycle model to generate an endogenous term structure of interest rates where movements in the term structure (and in term premia) have a direct effect on private agents' spending decisions. The model features bond market segmentation through adjustment costs for bond holdings and transaction costs between money and bonds.

*Risk Premiums and Macroeconomic Dynamics in a Heterogeneous Agent Model*

We analyze financial risk premiums and real economic dynamics in a DSGE model with three types of agents - shareholders, bondholders and workers - that differ in participation in the capital market and in attitude towards risk and intertemporal substitution. Aggregate productivity and distribution risks are transferred across these agents via the bond market and via an efficient labor contract. The result is a combination of volatile returns to capital and a highly cyclical consumption process for the shareholders, which are two important ingredients for generating high and countercyclical risk premiums. These risk premiums are consistent with a strong propagation mechanism through an elastic supply of labor, rigid real wages and a countercyclical labor share. Based on the empirical

estimates for the two sources of real macroeconomic risk, the model generates significant and plausible time variation in the risk premiums. Interestingly, the single largest jump in both the risk premium and the price of risk is observed during the current recession.


## Housing

*Housing collateral and the monetary transmission mechanism*
We set up a two sector DSGE model that includes production of goods and housing. Households can only borrow by using their houses as collateral. The structure of the model closely follows Iacoviello and Neri (2009). We estimate the model on Swedish data 1986q1-2008q3. The main results from the estimated DSGE model are: i) Roughly a quarter of the population appear to be borrowing constrained ii) Shocks to the demand for or supply of housing explain only a very small fraction of the fluctuations in GDP and inflation. iii) Housing used as collateral for loans reinforces the effects of monetary policy: 9% of the effect of a monetary policy shock on inflation is due to collateral constraints, and the corresponding numbers are 12% for GDP and 25% for consumption. This component of the transmission mechanism increases with the maximum loan-to-value ratio. We conclude that to properly understand the monetary transmission mechanism and its changing nature over time, we need to take into account the effects of housing and housing related collateral constraints

*Housing and Labor Income Risk*
In this paper, a positive relationship between the value of owner-occupied housing and the covariance between unemployment risk and local housing prices is found empirically. It is also found that married couples who work in the same industry invest more on average in owner-occupied housing, conditional on owning, than do couples who work in different industries.

*Housing and the Composition of the Financial Portfolio*
This paper shows that when the exogenous consumption demand for housing increases, households optimally respond by increasing their exposure to local stocks and reducing their exposure to domestic stocks. The empirical results indicate that Swedish households that are highly exposed to the local owner-occupied housing market significantly reduce their exposure to directly owned local stocks and increase their exposure to globally diversified equity mutual funds.


## Labor Market

The overarching aim of this project is to deepen our knowledge about the interaction between the labor market and macroeconomic outcomes, and the role played by stabilisation policy. Recently, important steps have been taken in the development and estimation of Dynamic Stochastic General Equilibrium models (DSGE). However, the labor market in this type of models have, up to date, been modelled in a very stylized way. This is not because one believes that the labor market is unimportant for macroeconomic outcomes, but rather due to the technical complexity of such modelling. Not only does this simplified view of the labor market prohibit the analysis of a number of important issues, it also implies strong restrictions on DSGE models when confronted with data.

In the first ongoing project project, the starting point is the empirical observation that nominal wages almost never falls. This observation can be explained in a rational setting by introducing asymmetric conflict-costs in the bargaining problem between firms and workers (see Holden, 1994, European Economic Review). By adapting the model developed in Carlsson and Westermark (2009), we can study the effects of downward rigid nominal wages in a general equilibrium setting. This is done in a simple way in Carlsson och Westermark (2008), B.E. Journal of Macroeconomics (Advances). In this project we extend this analysis to handle issues related to the dynamic developments of the wage distribution and its effects on price-setting. We also aim at relaxing restrictions in Carlsson and Westermark (2008) to enable a study of the optimal level of the inflation target.

A second project aims at empirically evaluate a DSGE model incorporating firm-specific labor and bargaining between the firm and workers within the firm as outlined in Carlsson and Westermark (2009) in a state of the art DSGE model with staggered wage and price contracts. Beside incorparating a more realistic model of the labor market, this also entails an analysis of issues like how labor market institutions affect the dynamics of the economy and what the role is for stabilisation policy in this framework.

The third ongoing project aims at empirically evaluating the effect of different labor market institutions on wage setting behavior and unemployment in a standard DSGE model incorporating firm-specific labor and bargaining between the firm with staggered wage and price contracts. Moreover, the relationship between labor market institutions and wage setting and unemployment will also be studied using reduced form IV methods that is standard in the literature to investigate whether general equilibrium DSGE models performs better than reduced form methods.

These three projects builds on a macro approach to study the link between the labor market and other markets. An alternative approach is to start at the micro level and use micro data in order to study this link, as well as, how the labor market should be modeled in order to match micro-level regularities. Sveriges Riksbank/APP has aquired a very rich micro data base containg information on firms and their employees that is very useful for this purpose.

In a fourth, already started project, we study the empirical relationship between price-setting and unit labor cost (which can be shown to be a measure of marginal cost under standard assumptions) on the firm level using the Riksbank micro data. The idea here is to test the empirical relevance for different proposed microfoundations for price-setting used in competing models of the business cycle, as well as, collecting stylized facts useful for model building.

A fifth, also initiated study involve studying how wage setting is affected by productivity shocks using matched employeer-employee data. A key question here is if the labor market is best modeled as a spot market or if factors such as movments in sectoral/firm specific productivity matters for wages. An important issue is if wages of incumbents are affected differently as compared to new hires. That is, since wage rigidities for entrants lies at the hart of the search-matching model's ability to match macroeconomic data (see e.g. Pissarides, 2008, Haefke, Sonntag and Van Rens, 2008, and Gertler, Huckfeldt och Trigari, 2008).

## *Bayesian Econometrics*

*Time series analysis*

The scope of this paper is to bridge the gap between textbooks and research articles, and give the reader and up-to-date account of Bayesian time series analysis. Topics include Kalman filtering, dynamic mixture models, parameter and variance shifts, dynamic factor models, particle filter, diagnostics and model comparison.

*Adaptive sampling using copulas*

We propose a new adaptive sampler, based on the t-copula, which greatly improves Markov Chain Monte Carlo sampling efficiency in problems with truncated priors, such as truncated normals for variance and correlation parameters. The new sampler can in general be expected to prove useful whenever the marginal posterior distribution of some parameters is highly non-normal.

*Adaptive hybrid Metropolis-Hastings samplers for DSGE models*

The adaptive sampler of Silva, Giordani and Kohn is improved and adapted to the estimation of DSGE models, including RAMSES. Efficiency gains of 3-8 times are obtained compared to currently used samplers. The gains are much larger when the possibility of parallelization is taken into account. The hope is that the combination of increased statistical efficiency and increased parallelizability will substantially reduce model development times.

*Structural breaks, parameter uncertainty and term structure puzzles*

We show that uncertainty about parameters of the short rate model can account for the rejections of the expectations hypothesis for the term structure of interest rates. Agents employ Bayes rule to learn parameter values in the context of a model that is subject to stochastic structural breaks. We show that parameter uncertainty will also imply that the verdict on the expectations hypothesis will vary systematically with the term of the long bond, and the particular test employed, in the same way that is found in empirical tests.

*Particle filter and Markov Chain Monte Carlo*

Recent theoretical advances in statistics prove that Markov Chain Monte Carlo sampling using the particle filter to evaluate the likelihood function does converge to the correct distribution, even though the likelihood is measured with a random error. This potentially opens entirely new possibility in time series modeling. Our work (in progress) shows that the approach can work in models that have so far been difficult to estimate, and provides guidelines for successful implementation.

*Multivariate regression density estimation with marginal adaptation*

Accurate modeling or high dimensional distribution is important for Value-at-Risk and portfolio selection and monitoring. Our article addresses the problem of flexibly estimating a multivariate density while attempting to also estimate its marginals correctly. We do so by proposing a new estimator that tries to capture the best features of mixture of normals and copula estimators while avoiding some of their weaknesses.

 *Flexible Modeling of Conditional Distributions using Smooth Mixtures of Asymmetric Student T Densities*

The SAGM model is a model for the density of a response variable conditional on a number of covariates. SAGM is a mixture of normal densities where the means, variances and the mixing probabilities depends on covariates. In this paper we extend the SAGM model to be a mixture of skewed student t densities, where also the skewness and degrees of freedom parameters may depend on covariates. We show that this model outperforms GARCH models, Smoothly Mixing Regressions and SAGM in predicting the distribution of US stock market returns during the recent financial crises.

## Recent Publications

Christiano, Lawrence, Mathias Trabandt and Karl Walentin "DSGE Models for Monetary Policy", *Handbook of Monetary Economics*, edited by Friedman and Woodford, forthcoming.

Dennis, Richard, Kai Leitemo and Ulf Söderström, "Methods for Robust Control" *Journal of Economic Dynamics and Control*, Vol 33 (8), 1604-1616, 2009.

Frisell, Lars, "A Theory of Self-Fulfilling Political Expectations", *Journal of Public Economics*, Vol 93(5-6), 715-720, 2009.

Giordani, Paolo and Robert Kohn, "Adaptive Independent Metropolis-Hastings by Fast Estimation of Mixtures of Normals", *Journal of Computational and Graphical Statistics*, forthcoming.

Giordani, Paolo, Robert Kohn and Mike Pitt, "Time series analysis", chapter for the *Handbook of Bayesian Econometrics,* forthcoming.

Giordani, Paolo and Mattias Villani, "Forecasting Macroeconomic Time Series with Locally Adaptive Signal Extraction", *International Journal of Forecasting*, forthcoming.

Li, Feng, Villani, Mattias and Kohn, Robert, "Flexible modeling of conditional distributions using smooth mixtures of asymmetric student t densities", *Journal of Statistical Planning and Inference*, forthcoming.

Queijo von Heideken, Virginia, "How Important are Financial Frictions in the U.S. and the Euro Area?", *Scandinavian Journal of Economics*, Vol 111 (3), 567-596, 2009.

Melecky, Martin, Diego Rodríguez Palenzuela and Ulf Söderström, "Inflation target transparency and the macroeconomy", in *Monetary Policy under Uncertainty and Learning*, edited by Klaus Schmidt-Hebbel and Carl E. Walsh, Series on Central Banking, Analysis, and Economic Policies, Volume XIII, Central Bank of Chile, 2009.

Strid, Ingvar, "Efficient parallelisation of Metropolis-Hastings algorithms using a prefetching approach", *Computational Statistics and Data Analysis*, forthcoming.

Söderström, Ulf, "Re-evaluating Swedish Membership in EMU: Evidence from an Estimated Model", *Europe and the Euro*, edited by Alberto Alesina and Francesco Giavazzi, University of Chicago Press, forthcoming.

Villani, Mattias, Robert Kohn and Paolo Giordani, "Regression Density Estimation using Smooth Adaptive Gaussian Mixtures", *Journal of Econometrics*, Vol 153(2), 155-173, 2009.

## Working Papers

The working papers are downloadable from our external webpage *www.riksbank.com/research*. If you want to publish a working paper please contact Mikael Carlsson, Ph. 7870433. Note that to be considered for publication a paper should first have been presented at a research seminar.

No. 227, Ulf Söderström, "Re-Evaluating Swedish Membership in EMU: Evidence from an Estimated Model"

No. 228, by Ola Melander, "The Effect of Cash Flow on Investment: An Empirical Test of the Balance Sheet Channel"

No. 229, by Karl Walentin, "Expectation Driven Business Cycles with Limited Enforcement"

No. 230, by Christina Håkanson, "Effects of Organizational Change on Firm Productivity"

No. 231, by Mikael Carlsson and Oskar Nordström Skans, "Evaluating Microfoundations for Aggregate Price Rigidities: Evidence from Matched Firm- Level Data on Product Prices and Unit Labor Cost"

No. 232, by Malin Adolfson, Stefan Laseen, Jesper Linde and Lars E. O. Svensson, "Monetary Policy Trade-Offs in an Estimated Open-Economy DSGE Model"

No. 233, by Feng Li, Mattias Villani and Robert Kohn, "Flexible Modeling of Conditional Distributions Using Smooth Mixtures of Asymmetric Student T Densities"

No. 234, by Paolo Giordani and Mattias Villani, "Forecasting Macroeconomic Time Series With Locally Adaptive Signal Extraction"

No. 235, by Lars E.O. Svensson, "Evaluating Monetary Policy"

## Other Research Activities

### Workshops

*Financial Markets and the Macroeconomy: Challenges for Central Banks* (Nov 2009)
The aim of the workshop was to discuss the implications of financial disruption for the economy and the new challenges that the current situation poses for central banks. Both theoretical and empirical work was presented. High level policymakers (Stefan Ingves, Seppo Honkapohja and David Altig) started off the conference by discussing lessons both from the Nordic crises in the early 1990's and the current crisis. Two key topics for the research papers presented were financial intermediation and the macroeconomy, and financial markets and banking in macro models, with a special focus on bank capital. A highpoint of the workshop was the presentation by John Moore on liquidity, business cycles, and monetary policy.

### Special Seminars

In March the research division met for one day with the Executive Board of Sveriges Riksbank to present our research and discuss policy issues.

In September the Economic Studies Division at the Oesterreichische Nationalbank (Central Bank of Austria) visited the Research Division for a two-day workshop.

### Reading Group

Since September 2007 the Research Division has been organizing a reading group that meets once or twice a month. The purpose of this reading group is to read and discuss research frontier papers across all fields of economics and econometrics. For questions regarding the reading group please contact Daria Finocchiaro, Ph.787 0432.

### Internship program

As every year the research division had a number of PhD students as summer interns. This year's interns where Gabrieli Silva, University of Rome "Tor Vergata"; Seok Gil Park, Indiana University; Andreas Müller, IIES/Stockholm University and Dario Caldara, IIES/Stockholm University.

### Teaching

In the spring of 2009 two researchers taught a graduate level course at Uppsala University on business cycle facts and models of business cycles in both a classical and a standard New Keynesian framework. The course also covered introductory monetary policy analysis, as well as implications of financial frictions.

In the summer, three researchers from the Research Division, together with other people, taught a graduate monetary policy course at Uppsala University.

Lectures have also been given at Groningen University on credit risk and Stockholm University on financial institutions management.

Several researchers are advisors for PhD students at various Swedish universities.

## Guest Program

During 2009, the following researchers visited the Research Division:

- Francesca Rondina, University of Wisconsin – Madison
- Paolo Casini, Universite Libre de Bruxelles
- Michael Plante, Indiana University
- Anke Weber, University of Cambridge
- Michal Kowalik, University of Mannheim
- Sofia Bauducco, Universitat Pompeu Fabra
- Paul Söderlind, University of St. Gallen
- Nicolas Groshenny, Università
- Martin Ellison, Oxford University
- Kristoffer Nimark, CREI
- Marie Hoerova, ECB
- Andrea Tambalotti, Federal Reserve Bank of New York
- Antonella Trigari, Università Bocconi
- Refet Gürkaynak, Bilkent University
- Eric Leeper, Indiana University
- Charles Engel, University of Wisconsin
- Jean-Pierre Danthine, Université de Lausanne
- Jesper Lindé, Board of Governors
- Alejandro Justiniano, Federal Reserve Bank of Chicago
- Leonard Nakamura, Federal Reserve Bank of Philadelphia
- Scott Frame, Federal Reserve Bank of Atlanta
- Sumit Agarwal, Federal Reserve Bank of Chicago
- Carlos Carvalho, Federal Reserve Bank of New York
- Eric Swanson, Federal Reserve Bank of San Francisco
- Martin Brown, Swiss National Bank
- Roland Meeks, Bank of England
- Michael Krause, Deutsche Bundesbank
- Roberto Billi, Federal Reserve Bank of Kansas City
- Michael Johnston, Bank of Canada

Correspondence to the editor:
Karl Walentin
Research Division
Sveriges Riksbank
103 37 Stockholm, Sweden
Phone +46 8 787 04 91
Email: karl.walentin@riksbank.se