Research News 2019

Research Division at Sveriges Riksbank

SVERIGES RIKSBANK

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This newsletter describes the research activities and output of the Research Division at Sveriges Riksbank in 2019.

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Oskar Stigland, research assistant
Lena Sundvall, secretary
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Karl Walentin, research economist
Andreas Westermark, research economist
Xin Zhang, research economist

Reflections by the head of research

Taking up the position as Head of Research in November, it is a great joy to be back at the Research Division! Working with policy at the Monetary Policy Department, we of course have regular contact with the research group during seminars and conferences, and for various policy-related projects. But you also lose track a bit of what is going on at the Research Division. So I am very happy to learn more about all the exciting work that is done on a wide range of topics, from traditional macro/monetary economics via monetary theory, labor economics and endogenous growth to household finance, trade credit, asset pricing and even quantum computing. This range of activities certainly makes for very interesting lunch conversations.

2019 has been yet another productive year at the Research Division. In terms of direct research output, the research group has produced a long list of working papers, and had their papers accepted in top academic journals, such as the Review of Financial Studies, the Journal of Economic Theory, the Journal of Monetary Economics, the Journal of Money, Credit, and Banking and the International Economic Review. The research staff was also involved in many different policy-related projects, often jointly with staff at other departments. Examples include studies of the Riksbank balance sheet, online lending, wage formation and the history of payment systems. And to contribute to the development at other departments, we are active in teaching and in organizing reading groups at the bank.

A final important task of the division is to be a link between the Riksbank and other researchers and the academic community in Sweden and abroad, through our research seminar series, hosting visiting researchers (including PhD interns), teaching at universities, and by organizing conferences. This year the division has co-organized three international conferences at the Riksbank, which may be a record, as well as a conference at the Bank of Canada.

During the last few years, monetary policy in Sweden – as in many other countries – has entered new territory, with expanding central bank balance sheets and negative policy rates. Government bond yields are now negative over most of the yield curve, a situation that was almost unthinkable not that long ago! The discussion about negative rates and the possible lower bound on policy rates has been intense in Sweden and elsewhere. Our featured article this year by Andreas Westermark puts that discussion into some perspective by discussing the use of "Gesell taxes" to generate seignorage in medieval Europe, essentially a negative interest rate on cash. This also relates to the discussion on Central Bank Digital Currency (CBDC) and its consequences on the payments system at large, a discussion that is the theme for our interview with David Andolfatto, who has made important contributions in monetary theory over the years, and is now a leading scholar in research about CBDC.

With this, I wish you a good read of our Research News, happy holidays and a happy and productive 2020!

Ulf Söderström

Interview with David Andolfatto

Senior Vice President, Federal Reserve Bank of Saint Louis, and Professor of Economics, Simon Fraser University

Q1. In your opinion, what is the main motivation for issuing a Central Bank Digital Currency (CBDC)?

For a country that issues its own sovereign currency, with that currency serving as a unit of account in which all debt is denominated, I think the Central Bank should take a central place in the money and payments system. I think the business of payments is a natural monopoly. As a practical matter, I think having a central bank compete directly with private consortiums is a better way to enhance competition, rather than delegating the responsibility to a regulated private consortium.

Q2. What do you think could be the benefits of a CBDC? How about in Sweden, a country where 99.7% of the adult population is banked (according to the World Bank)?

The main benefit, I think, would be to foster more competition in the banking sector in terms of what they charge for making payments and the rate of interest they offer on deposit accounts. I'm not sure about Sweden, but in the US there is also a large wholesale banking sector that makes use of shadow banks. Why not bring that business into the daylight?

Q3. In Sweden, the role of cash as a mean of payment is becoming negligible. What do you think could be the drawbacks of a cashless society?

The drawbacks are small, in my view. Cash permits a higher degree of anonymity, but if anonymity is in high demand, I think the private sector will find some alternative (that the authorities can basically ignore).

Q4. Do you expect a CBDC would be widely used? Why or why not?

I think this depends very much on program parameters. CBDC as a basic public option may not have a large take up rate. But even if it does not, the mere **threat** of the public option can provide social benefits (as alluded to above).

Q5. Do you think the financial stability concerns related to the introduction of a CBDC are well founded?

No, I do not. The key is to make sure the appropriate mechanisms are in place. If there is a run on banks as people flock to CBDC, the central bank can just promise regular lender-of-last-resort operations for the banks. Alternatively, one could put in place redemption gates and liquidity fees on CBDC in stress events (much the same way Dodd-Frank does for money funds in the US.)

Changes in the research staff

Since August 2019, **Jesper Lindé** is on leave at the International Monetary Fund (IMF) in Washington DC, where he is an advisor in the Monetary and Capital Markets Division. **Tor Jacobson** was interim head and **Ulf Söderström** is the new head of research since November 2019. He was previously deputy head of the Monetary Policy Department at the Riksbank. In August 2019, **Mathias Klein** joined the Research Division as a researcher—he was previously a postdoctoral researcher at DIW Berlin. **Erik von Schedvin** left and started working as a quantitative researcher at Lynx Asset Management.

Summary of featured article

The following is a summary of the article by Roger Svensson and Andreas Westermark titled "Renovatio Monetae: When Gesell Taxes Worked" which has been accepted for publication in the International Economic Review.

First proposed by Gesell (1906), the idea of a tax on money holdings has received increasing attention in recent decades. The zero lower bound, which limits the ability of central banks to stimulate the economy through standard interest rate policy, was reached in Japan in the 1990s and in the U.S. and Western Europe after the financial crisis in 2008. Buiter and Panigirtzoglou (2003) and Mankiw (2009) have analyzed a tax on money holdings as a way of alleviating this problem. Importantly, the tax breaks the arbitrage condition in standard models that induces savers to hold cash instead of other financial assets when nominal interest rates go below zero, thus allowing for significantly negative nominal interest rates.

Perhaps less known is that a (periodic) tax on money holdings existed for almost 200 years in large parts of medieval Europe. Gesell taxes were implemented by coins being legal for only a limited period of time and, at the end of which they had to be exchanged for new coins for an ex ante known fee—an institution known as renovatio monetae or periodic re-coinage. Tax revenues depended not only on the fee charged but also on the duration of an issue. Both the exchange fee and the duration could vary across regions in the Middle Ages—a common annualized tax rate was 25 percent. In Figure 1, some examples of these coins are illustrated.

Figure. 1. Left:Beatrix II, 1138-1160, Quedlinburg abbey (Source: Fritz Rudolf Künker GmbH & Co. KG, Osnabrück and Lübke + Wiedemann KG, Leonberg)

Right: Rex Vpsalie, late 12th-early 13th century, Unknown king and mint, Svealand (Source: Royal Coin Cabinet)

To generate revenues through seigniorage, the monetary authority benefits from creating an exchange monopoly for the currency. In a system with Gesell taxes and re-minting, in addition to competing with foreign coin issuers, the monetary authority competes with its own older issues. To limit the circulation of illegal coins, authorities penalized the use of invalid coins and required that fees, rents and fines be paid with current coins. Although the disciplines of archaeology and numismatics have long been familiar with the presence of periodic re-coinage (Svensson, 2016), evidence in written sources is scarce on the consequences of periodic re-coinage with respect to prices and people's usage of new and old coins. However, coin hoards indicate that old (illegal) coins often but not always circulated together with new coins. Despite being common for an extended period of time, this type of monetary system has seldom if ever been analyzed theoretically in the economics or economic history literature.

The purpose of the present study is to fill this void in the literature. The model includes households, firms and a lord. To endogenize cash holdings, we introduce a non-cash alternative in the spirit of cash and credit goods models. Credit is costly in the sense that it requires some labor input. Besides credit, households can hold both new and old coins, but only the new coins are legal in exchange. An issue of coins is only legal for a finite period of time; old coins must be re-minted at the re-coinage date to be considered legal in exchange. The lord charges a fee when there is a re-coinage so that for each old coin handed in, the household receives less than its full value in return. Despite being illegal, old coins can still be used for transactions. To deter the use of illegal coins, the lord's agents check whether legal means of payment are used in transactions; illegal coins are confiscated and re-minted into new coins. Thus, whether illegal coins circulate is endogenous in the model.

An interesting result is that Gesell taxes work when the period of time between two instances of re-coinage is sufficiently long. We also find that the system works when the exchange fee is sufficiently low and when the probability of being penalized for using old illegal coins is sufficiently high. Prices increase over time during an issue period and fall immediately after the re-coinage date, and, the higher the Gesell tax is, the higher the price increases are (as long as coins are handed in for re-coinage).

Empirical evidence indicates that periodic re-coinage ceased to be used after 150-200 years. To compare the periodic re-coinage system with a system of long-lived coins, we construct a model with long-lived coins. We find that increased fiscal spending tends to induce the lord to switch to systems with long-lived coins, since those systems can generate higher revenues. One alternative explanation for the switch to long-lived coins is an increase in the cost of non-cash alternatives, e.g., bartering. Interestingly, this makes periodic re-coinage more viable, since more transactions are made in the market, which leads to higher revenues for the lord. Thus, in light of the model, the switch to long-lived coins was driven by increased fiscal demands.

Research projects pursued in 2019

CREDIT AND BANKING

Curbing Shocks to Corporate Liquidity: The Role of Trade Credit

Niklas Amberg, Tor Jacobson, Robert Townsend and Erik von Schedvin

Using data on exogenous liquidity shortfalls generated by the fraud and failure of a cash-in-transit firm, we demonstrate a causal effect on firms' trade credit usage. We find that firms manage liquidity shortages by increasing the amount of drawn credit from suppliers and decreasing the amount issued to customers. The compounded trade credit adjustments are of a similar size as corresponding adjustments in cash holdings, suggesting that trade credit positions are economically important sources of reserve liquidity for firms. The underlying mechanism in trade credit adjustments is in part due to shifts in credit durations.

(continuing from previous year)

Inter-Firm Lending: An Empirical Analysis of Trade Credit Contracts

Niklas Amberg, Tore Ellingsen, Tor Jacobson and Erik von Schedvin

We study around 52 million trade credit contracts, issued by 50 suppliers over 9 years to 199 ,000 customers. The data contain information on contract size, due dates, time to payment, and firm characteristics. These data allow us to explore how changing conditions affect contract terms at the level of suppliers-customers pairs. We find that opportunity cost of funds, market power, and information asymmetries impact on the contract terms, where the former dominates, especially for the transacted volume. Financial frictions have little impact on agreed contract duration, but firms with higher liquidity needs draw more credit from suppliers by postponing payments.

(continuing from previous year)

Trade Credit and Pricing: The Role of Implicit Interest Rates

Niklas Amberg, Tor Jacobson and Erik von Schedvin

We empirically investigate the proposition that firms charge premia on cash prices in transactions involving trade credit. Using a comprehensive panel dataset on product-level transactions prices and firm characteristics, we relate trade credit issuance to price setting. In a recession characterized by tightened credit conditions, we find that prices increase significantly more on products sold by firms issuing more trade credit, in response to higher opportunity costs of liquidity and counterparty risks. Our results thus demonstrate the importance of trade credit for price setting and show that trade credit issuance induces a channel through which financial conditions affect prices.

(continuing from previous year)

Income Redistribution, Consumer Credit, and Keeping up with the Riches

Mathias Klein and Christopher Krause

In this study, we set up a DSGE model with upward looking consumption comparison and show that consumption externalities are an important driver of consumer credit dynamics. Our model economy is populated by two different household types. Investors, who hold the economy's capital stock, own the firms and supply credit, and workers, who supply labor and demand credit to finance consumption. Furthermore, workers condition their consumption choice on the investors' level of consumption. We estimate the model and find a significant keeping up-mechanism by matching business cycle statistics. In reproducing credit moments, our proposed model significantly outperforms a model version in which we abstract from consumption externalities.

(accepted for publication in the *Journal of Money, Credit and Banking*)

Bank Misconduct and Online Lending

Christoph Bertsch, Isaiah Hull, Yingjie Qi and Xin Zhang

We introduce a high-quality proxy for bank misconduct that is constructed from Consumer Financial Protection (CFPB) complaint data. We employ this proxy to measure the impact of bank misconduct on the expansion of online lending in the United States. Using nearly complete loan and application data from the online lending market, we demonstrate that bank misconduct is associated with a statistically and economically significant increase in online lending demand at the state and county levels. This result is robust to the inclusion of bank credit supply shocks and holds for both broader- and more narrowly-defined bank misconduct measures. Furthermore, we show that this effect is strongest for lower rated borrowers and weakest in states with high levels of generalized trust.

(continuing from previous year)

The Role of Trust in Online Lending

Christoph Bertsch, Isaiah Hull, Yingjie Qi and Xin Zhang

We study the impact of trust on the expansion of online lending in the U.S. over the 2008-2016 period. Using data from the largest platform, we demonstrate that a misconduct-driven decline of trust in traditional banking is associated with a statistically and economically significant increase in online lending at the state level. To the contrary, increased social trust strengthens in-person, bank-based borrowing and informal borrowing, reducing the demand for impersonal online lending. Both of these effects operate primarily through borrowers. We also use a shock that affects only investors to demonstrate that distrust in traditional finance increases participation in online lending.

(continuing from previous year)

Monetary Equilibrium and the Cost of Banking Activity

Paola Boel and Gabriele Camera

We investigate the effects of banks' operating costs on allocations and welfare in a low interest rate environment. We introduce an explicit production function for banks in a microfounded model where banks employ labor resources, hired on a competitive market, to run their operations. In equilibrium, this generates a spread between interest rates on loans and deposits, which reflects the underlying monetary policy and the efficiency of financial intermediation. In a deflation or low-inflation environment, equilibrium deposits yield zero returns. Hence, banks soak up labor resources to offer deposits that do not outperform idle balances, thus reducing aggregate efficiency.

(accepted for publication in the *Journal of Money, Credit and Banking*)

ECONOMETRICS

Score-Driven Tail Shape, with Application to Bond Yields at a High Frequency

André Lucas, Bernd Schwaab and Xin Zhang

We propose a novel observation-driven model for estimating time series variation in the shape and scale parameters of a Generalized Pareto Distribution. We discuss the handling of non-tail time series observations and relate tail variation to observed covariates. We use the model to study the impact of bond purchases by the European Central Bank within its Securities Markets Programme between 2010 and 2012 on the tail shape of changes in sovereign bond yields measured at a high frequency. Both the announcement of the program as well as the actual purchases had a beneficial impact on tail shape, reducing market risk.

(continuing from previous year)

Risk Endogeneity at the Lender/Investor-of-Last-Resort

Diego Caballero, André Lucas, Bernd Schwaab and Xin Zhang

To what extent can a central bank influence its own balance sheet credit risks during a financial crisis through unconventional monetary policy operations? To study this question we develop a risk measurement framework to infer the time-variation in portfolio credit risks at a high (weekly) frequency. Focusing on the Eurosystem's experience during the euro area sovereign debt crisis between 2010 and 2012, we find that the announcement and implementation of unconventional monetary policy operations generated beneficial risk spill-overs across policy portfolios. This caused overall risk to be nonlinear in exposures. In some instances, the Eurosystem reduced its overall balance sheet credit risk by doing more, in line with Bagehot's well-known assertion that occasionally "only the brave plan is the safe plan."

(accepted for publication in the *Journal of Monetary Economics*)

FINANCIAL THEORY

A Wake-up Call Theory of Contagion

Toni Ahnert and Christoph Bertsch

We offer a theory of contagion based on the information choice of investors after observing a financial crisis elsewhere. We study global coordination games of regime change in two regions with an unobserved common macro shock as the only link between regions. A crisis in the first region is a wake-up call to investors in the second region. It induces them to reassess the regional fundamental and acquire information about the macro shock. Contagion can even occur after investors learn that regions are unrelated (zero macro shock). Our results rationalize empirical evidence about contagious bank runs and currency crises after wake-up calls. We also derive new implications and discuss how these can be tested.

(continuing from previous year)

Optimal Bank Leverage and Recapitalization in Crowded Markets

Christoph Bertsch and Mike Mariathasan

We study optimal bank leverage in general equilibrium and banks' response to under- capitalization. Making progress towards a "pecking order theory" for private recapitalizations, our benchmark model identifies equity issuance as individually and socially optimal, com- pared to asset sales, as well as conditions that invert the individually optimal ranking. Only if the supply of capital is imperfectly elastic due to financial market segmentation, incomplete financial markets and contracts give rise to inefficiently high leverage ex-ante, and to excessive capital shortfalls and insolvencies ex-post. We study efficiency for different bankruptcy procedures. Abstracting from moral hazard and informational asymmetries, we therefore pro- vide a novel rationale and new insights for macroprudential capital regulation, as well as new testable implications about banks' capital structure management.

(continuing from previous year)

Measuring Systemic Downside Risk Component of Asset Prices

Roméo Tédongap and Xin Zhang

We develop a representative agent consumption-based general equilibrium asset pricing model featuring generalized disappointment aversion preferences and multi-frequency long-run volatility risk, and which allows for closed-form bond prices, stock prices, credit derivatives and inflation derivatives. We estimate the model parameters and state dynamics to match moments of the daily stock index return and yield curve, and the default parameters by fitting moments of the daily term-structure of credit default swap spreads. We analytically decompose asset prices into two major components: a regular component and a systemic risk component. Our results point to a significant contribution of systemic risk to asset prices that is more important during crisis times.

(continuing from previous year)

FISCAL POLICY

The Time-Varying Effect of Fiscal Policy on Inflation: Evidence from Historical U.S. Data

Mathias Klein and Ludger Linnemann

We estimate vector autoregressions with time-varying parameters to demonstrate that the impulse response of inflation to government spending shocks underwent significant changes over time. Fiscal spending increases lowered inflation in the first half of the postwar period, but have been inflationary from about 1980 onwards. In contrast to estimates based on models with constant parameters, the evidence for more recent decades is in line with the prediction of basic New Keynesian models.

(accepted for publication in *Economic Letters*)

Tax and Spending Shocks in the Open Economy: Are the Deficits Twins?

Mathias Klein and Ludger Linnemann

We present evidence on the open economy consequences of US fiscal policy shocks identified through proxy-instrumental variables. Tax shocks and government spend ing shocks that raise the government budget deficit lead to persistent current account deficits. In particular, the negative response of the current account to exogenous tax reductions through a surge in the demand for imports is among the strongest and most precisely estimated effects. Moreover, we find that the reduction of the current account is amplified when the tax reduction is due to lower personal income taxes and when the government increases its consumption expenditures. Historically, a much larger share of current account dynamics has been due to tax shocks than to government spending shocks.

(accepted for publication in the *European Economic Review*)

Government Spending Multipliers in (Un)certain Times

Jan Philipp Fritsche, Mathias Klein and Malte Rieth

We estimate the dynamic effects of government spending shocks, using probabilistic instruments that exploit time-varying volatility in US data. We find that the average government spending multiplier is significantly and persistently above one, driven by a crowding-in of private consumption and non-residential investment. We rationalize the results empirically through a contemporaneously countercyclical response of government spending and an efficient weighting of observations inversely to their error variance. We then show that the multiplier is significantly smaller when volatility is higher, consistent with theories predicting reduced effectiveness of surprise fiscal interventions in uncertain times.

(new project)

The Impact of Local Taxes and Public Services on Property Values

Anna Grodecka and Isaiah Hull

How do property prices respond to changes in local taxes? Attempts to measure this, starting with Oates (1969), have suffered from a lack of local public service controls. We revisit this vast literature with a novel dataset of 947 time-varying local characteristic and public service controls for all municipalities in Sweden for 2010-2016. To make use of the high dimensional vector of controls, as well as time and geographic fixed effects, we employ a novel empirical approach that modifies the recently-introduced debiased machine learning estimator by coupling it with a deep-wide neural network. We find that existing estimates of tax capitalization in the literature, including quasi-experimental work, may understate the impact of taxes on house prices by as much as 50%. We also exploit the unique features of our dataset to test core assumptions of the Tiebout hypothesis and to measure the impact of public services, education, and crime on house prices and the effect of local taxes on migration. We find that local taxes and public services have a substantially larger effect on house prices and migration in urban areas, where municipal competition is higher.

(new project)

GROWTH

Fuel for Economic Growth

Johan Gars and Conny Olovsson

Using data on energy inputs for 134 countries, we document that countries that derive a larger share of their energy from fossil energy sources are richer and grow faster. We then set up an endogenous growth model in which the efficiency of both capital and fossil energy can be improved, whereas that of an alternative energy source is limited. With capital and energy as complements, there exist two steady states: one stagnant where energy is fully derived from the alternative source, and one with balanced growth where energy is fully sourced from fossil fuel. Heterogeneity in initial technology levels can generate the Great Divergence. The demand for fossil fuel in technologically advanced countries drives up its price and makes fossil fuel too costly in less advanced countries that choose the alternative and stagnant energy input.

(accepted for publication in the *Journal of Economic Theory*)

Endogenous Growth, Endogenous Finance

Daria Finocchiaro and Philippe Weil

Financial development affects investment, innovation and growth. At the same time, growth prospects impinge on the costly development of finance. To investigate this, we build a Schumpeterian endogenous growth model with search frictions in the innovation market, and (as in Wasmer-Weil, 2004) search frictions in credit markets. Within a country, the model delivers a negative relation between growth and tension in innovation and credit markets. Nevertheless, better-functioning financial markets, or an increase in banking competition, have an ambiguous effect on long-run growth. In a multi-country setting, where less developed countries strive to reach the technological frontier by imitation, countries with less developed credit markets may achieve a lower level of GDP in the long run but converge to the growth rate of the leading country. When entry of new banks is restricted, higher growth in the leading country decreases credit tightness.

(new project)

HOUSEHOLD FINANCE AND HOUSEHOLD SAVINGS

Financial Literacy Externalities

Michael Haliassos, Thomas Jansson and Yigitcan Karabulut

This paper uses unique administrative data and a quasi-field experiment of exogenous allocation in Sweden to estimate medium- and longer-run effects on financial behavior from exposure to financially literate neighbors. It contributes evidence of causal impact of exposure and of a social multiplier of financial knowledge, but also of unfavorable distributional aspects of externalities. Exposure promotes saving in private retirement accounts and stockholding, especially when neighbors have economics or business education, but only for educated households and when interaction possibilities are substantial. Findings point to transfer of knowledge rather than mere imitation or effects through labor, education, or mobility channels.

(accepted for publication in the *Review of Financial Studies*)

The Impact of Social Environment on Entrepreneurial Risk and Its Distributional Effects

Michael Haliassos, Thomas Jansson and Yigitcan Karabulut

Using a rare natural experiment regarding the exogenous spatial allocation of refugee immigrants in Sweden, we focus on the role of social environment in the entrepreneurial process. We analyze whether early interactions with entrepreneurs have any causal effects on the decision to start a new business, and conditional on being a business owner, on the entrepreneurial income. We find they do. Interestingly, only exposure to successful entrepreneurs has a significant effect, while exposure to unsuccessful entrepreneurs displays no effect on the subsequent entrepreneurial activity. We further analyze the potential mechanisms and find strong suggestive evidence that conforms to transfer of tacit knowledge as the operative channel. Finally, we show that the increased exposure to idiosyncratic entrepreneurial risk leads to a higher rank in the wealth distribution.

(continuing from previous year)

Do Robots Increase Wealth Dispersion?

Thomas Jansson and Yigitcan Karabulut

We demonstrate that increased automation has a significant impact on both static and dynamic aspects of the wealth distribution. Households who are more exposed to robots at work accumulate less wealth and experience greater downward mobility in the wealth distribution. The negative wealth effects of robots are not merely a consequence of differences in earned incomes or in saving rates. We argue and provide evidence that the adverse effects of rapid robotization on individual workers' human capital, and thereby, on their financial risk taking behavior and investment choices appear to be an additional operative channel.

(continuing from previous year)

Households' Housing and Borrowing Decisions

Tor Jacobson, Thomas Jansson and Vicke Norén

A household's most important financial decision generally involves the purchase of a home and the associated mortgage contract. The existing literature has covered several aspects of housing, such as past experiences and reference prices (Bordalo et al., 2019, Simonsohn and Loewenstein, 2006), expectations (Armona et al., 2019, Bailey et al., 2019), social networks (Bailey et al., 2018), benefits from homeownership (Aaronson, 2000, Sodini et al., 2017), housing assets over the life cycle (Cocco, 2004, Landvoigt et al., 2015), mortgage choice (Campbell and Cocco, 2007, 2015), housing choice and labor income risk (Jansson, 2017), and the effects of housing on consumption (Campbell and Cocco, 2003) and on the financial portfolio (Chetty et al., 2017). In this paper we analyze the decision of becoming a first-time homeowner and how much to borrow with a focus on the effects of households' price expectations. In the empirical analysis we use a unique micro dataset, which includes detailed information on households' financial and real assets and their liabilities

(new project)

The Costs of Macroprudential Deleveraging in a Low Interest Rate Environment

Jack Chen, Daria Finocchiaro, Jesper Lindé and Karl Walentin

We examine the short- and long-term effects of different borrower-based macroprudential (MPP) tools in an environment where both real and nominal interest rates are low. The analysis is conducted in a two-agent New Keynesian model that includes long-term debt, housing transaction costs and a zero lower bound constraint on policy rates. We find that the long-term macroeconomic costs, in terms of forgone consumption, of all the MPP tools we consider are moderate. Yet, the short-term output loss can more substantial following an LTV rather than an LTI tightening, especially in an environment where debt is high and monetary policy is close to the effective lower bound. Our findings stress that when designing macroprudential policies aimed at addressing household debt imbalances, it is important to take into account their interaction with monetary policy and the initial state of the economy, in terms of both debt level and closeness to the zero lower bound.

(continuing from previous year)

Who Are the Socially Responsible Mutual Fund Investors?

Charlotte Christiansen, Thomas Jansson, Malene Kallestrup Lamb and Vicke Norén

This paper examines socially responsible investing in mutual funds using an administrative panel of Swedish households. We find that, on average, socially responsible mutual fund investors are more financially sophisticated and hold a more diversified portfolio. Younger entrepreneurial couples with higher education and wealth are more likely to hold socially responsible mutual funds. The mutual fund portfolios of older, poorer and more risk-averse households align more with social responsibility

(new project)

House Prices, Home Equity, and Personal Debt Composition

Jieying Li and Xin Zhang

Using a monthly panel dataset of Swedish individuals' debt composition including mortgage and non-mortgage consumer credit, we show that house price changes can explain a significant fraction of personal debt composition dynamics. We exploit the variation in local house price growth as shocks to homeowners' housing wealth to study the consequential adjustment of personal debt composition. To account for local demand shocks and disentangle the housing collateral channel from the wealth effect, we use renters and non-equity-withdrawal homeowners in the same region as control groups. We present direct evidence that homeowners reoptimize their debt structure by using withdrawn home equity to pay down comparatively expensive short-term non-mortgage debt during a housing boom, unsecured consumer loans in particular. We also find that homeowners withdraw home equity to finance their entrepreneurial activities. Our study sheds new light on the dynamics of personal debt composition in response to changes in house prices.

(continuing from previous year)

LABOR MARKETS

Involuntary Unemployment and the Business Cycle

Lawrence Christiano, Mathias Trabandt and Karl Walentin

Can a model with limited labor market insurance explain standard macro and labor market data jointly? We construct a monetary model in which: i) the unemployed are worse off than the employed, i.e. unemployment is involuntary and ii) the labor force participation rate varies with the business cycle. To illustrate key features of our model, we start with the simplest possible framework. We then integrate the model into a medium-sized DSGE model and show that the resulting model does as well as existing models at accounting for the response of standard macroeconomic variables to monetary policy shocks and two technology shocks. In addition, the model does well at accounting for the response of the labor force and unemployment rate to these three shocks.

(new project)

The Optimal Inflation Target under Downward Nominal Wage

Mikael Carlsson and Andreas Westermark

We study the implications for optimal average inflation when there is both a role for money as a medium of exchange and when nominal wages are downwardly rigid. The model also features transaction costs, as in Dotsey, King & Wolman (1999), and a non-Walrasian labor market with search frictions as in Trigari (2009). The introduction of downward nominal wage rigidities into a model with flexible wages can be decomposed into two effects; first, introducing (symmetric) wage adjustment frictions and, second making them asymmetric. Productivity growth is important for the level of inflation and also affects the size of the effect of the asymmetric wage friction. Without productivity growth, symmetric wage adjustment frictions lead to a yearly inflation rate of approximately 1.0%, while introducing an asymmetry on top of this increases the inflation rate by an additional 0.7%. With productivity growth, inflation is almost a percent lower and the effect of adding asymmetric wage frictions is also somewhat smaller - about 0.5%. Overall, we find an optimal inflation rate of about 0-2 percent.

(continuing from previous year)

What Accounts for the German Labor Market Miracle?

Mathias Klein and Stefan Schiman

This study examines the driving forces behind the strong decline in German unemployment from 2005 onwards and the exceptionally small increase during the Great Recession. Structural VARs with sign restrictions show that wage moderation as a result of labor market reforms was the dominant factor of the unemployment decline, and that improved matching and shrinking labor supply also contributed to it. The adjustment to business cycle shocks (Great Recession), on the other hand, is to a large extent borne by the intensive rather than the extensive margin, which can be explained by institutional aspects of the German labor market.

(new project)

Endogenous Separations, Wage Rigidities and Employment Volatility

Mikael Carlsson and Andreas Westermark

We show that in micro data, as well as in a search and matching model with endogenous separations and rigid wages, separations and hence employment volatility are non-neutral to wage rigidities of incumbent workers. In contrast to when all wages are flexible, the standard deviation of unemployment in a model with rigid wages for incumbent workers (only) matches the standard deviation in the data. Thus, the degree of wage rigidity for newly hired workers is not a sufficient statistic for determining the effect of wage rigidities on macroeconomic outcomes in this class of models.

(continuing from previous year)

Learning on the Job and the Cost of Business Cycles

Karl Walentin and Andreas Westermark

We show that business cycles reduce welfare through a decrease in the average level of employment in a labor market search model with learning on-the-job and skill loss during unemployment. A negative correlation between unemployment and vacancies implies, via the concavity of the matching function, that business cycles reduce the average number of new jobs and employment. Learning on-the-job implies that the decrease in employment reduces aggregate human capital. This, in turn, reduces the incentives to post vacancies, further decreasing employment and human capital. We quantify this mechanism and find large output and welfare costs of business cycles.

(continuing from previous year)

Skill Loss, Job Mismatch and the Slow Recovery from the Great Recession

Karl Walentin and Andreas Westermark

In this paper we ask to what degree i) human capital dynamics induced by skill loss during unemployment and ii) job mismatch (low match quality) contributed to the slow recovery from the Great Recession, in particular the low post-2009 growth in GDP, labor productivity and real wages. Mismatch has increased because workers that lost their jobs in the recession tend to be less well matched compared to their pre-recession jobs. We find that the increase in unemployment during the initial phase of the Great Recession had long-lasting effects through the skill loss it induced, mainly in terms of increased unemployment and reduced GDP.

(continuing from previous year)

MACROECONOMICS

International Business Cycles Propagated through the World Market for Oil?

Johan Gars and Conny Olovsson

To what extent is the international business cycle affected by the fact that an essential input (oil) is traded on the world market? We quantify the contribution of oil by setting up a model with separate shocks to efficiencies of capital/labor and oil, and global shocks to the oil supply. The oil related shocks both contribute to comovements in output and inputs. The wealth effect associated with these shocks is typically smaller than the substitution effect, which induces higher responses in output than in consumption. Overall, the model can resolve both the consumption correlation puzzle and the international comovement puzzle.

(new project)

The Macroeconomic Implications of Migration

Conny Olovsson, Karl Walentin and Andreas Westermark

International migration flows are large and have been growing in recent decades but little is known about the effect of immigration on macroeconomic aggregates. In this paper we attempt to fill this gap with a particular emphasis on variables of interest for central banks and from the perspective of Sweden facing mainly refugee migration. To do this we build a structural model that quantifies the effect of different immigration scenarios, e.g. a repeat of the 2015 refugee wave, on the paths of per capita GDP, unemployment, labor force participation, real wages, average labor productivity and unit labor cost.

(new project)

Energy-Saving Technical Change

John Hassler, Per Krusell and Conny Olovsson

How do markets economize on scarce natural resources? In this paper we emphasize technological change aimed at saving on the scarce resource. We develop a neoclassical macroeconomic theory that is quantitatively oriented and that views technical change as directed: it can be used to save on different inputs. At a point in time, the elasticity between inputs - in our application a capital-labor composite and fossil energy - is given by a production function with fixed parameters, but because the future values of these parameters can be changed with R&D efforts today, the long-run elasticity between the inputs is higher than it is in the short run. We demonstrate how the theory can be used to robustly derive predictions for the long-run cost share accruing to the scarce resource as well as for its rate of depletion. In an application, we look at postwar U.S. data, estimate the short-run elasticity between inputs using an aggregate CES production function, and also estimate the implied input-saving technology series. From these technology series, we can gauge what the historical tradeoff has been in the choice between allocating R&D to save on one or the other input. The implied parameter estimates are then used in our aggregate model to make long-run predictions, which indicate a marked increase in the share of costs going to fossil energy.

(continuing from previous year)

Integrated Assessment in a Multi-region World with Multiple Energy Sources and Endogenous Technical Change

John Hassler, Per Krusell and Conny Olovsson

We construct an integrated assessment model with multiple imperfectly substitutable energy sources---including fossil fuels and "green energy"---and multiple world regions. The model also incorporates fracking and endogenous technical change directed at reducing the production costs for the different energy sources. Apart from the oil price, all endogenous variables have closed-form solutions. We derive four main results. First, if only Europe were to implement optimal taxes, this would have negligible effects on reducing global warming. Second, an effective carbon tax must be levied also on oil that is produced with fracking technology. Third, a coal tax that is proportional to the coal price is completely impotent. Fourth, per-unit taxes are effective in mitigating global warming. In this case, endogenous technical change reinforces the effectiveness of carbon taxes.

(continuing from previous year)

Resolving the Missing Deflation Puzzle

Jesper Lindé and Mathias Trabandt

We propose a resolution of the missing deflation puzzle, i.e. the fact that inflation fell very little during the Great Recession against the backdrop of the large and persistent fall in GDP. Our resolution of the puzzle stresses the importance of nonlinearities in price and wage-setting using Kimball (1995) aggregation. We show that a nonlinear macroeconomic model with Kimball aggregation resolves the missing deflation puzzle, while a linearized version of the same underlying nonlinear model fails to resolve the missing deflation puzzle. In addition, our nonlinear model reproduces the skewness of inflation and other macroeconomic variables observed in post-war U.S. data. All told, our results caution against the common practice of using linearized models to study inflation-output dynamics when the economy is exposed to large shocks.

(continuing from previous year)

Monetary Normalizations and Consumer Credit: Evidence from Fed Liftoff and Online Lending

Isaiah Hull

On December 16th of 2015, the Fed initiated "liftoff," a critical step in the monetary normalization process. We use a unique panel dataset of 640,000 loan-hour observations to measure the impact of liftoff on interest rates, demand, and supply in the online primary market for uncollateralized consumer credit. We find that credit supply increased, reducing the spread by 16% and lowering the average interest rate by 16.9-22.6 basis points. Our findings are consistent with an investor-perceived reduction in default probabilities; and suggest that liftoff provided a strong, positive signal about the future solvency of borrowers.

(continuing from previous year)

The Impact of Foreign Shocks on the Swedish Economy

Jesper Lindé, Henrik Lundvall, Conny Olovsson and Spyridon Sichlimiris

We aim to explain the positive cross-country comovement observed in the data among the main macroeconomic variables both nominal and real ones. We address the comovement problem by introducing international trade in durables. Durables trade in OECD represents roughly 2/3 of the total imports and the total exports. Based on the work of Engel & Wang (2011), incorporating durables trade into a standard international business cycle model improves substantially the volatility of imports and exports and induces positive correlation of these variables with respect to GDP. However, the issue of comovement has not been addressed because prices are flexible. We intend to build a two country New-Keynesian model with price and wage stickiness. Given the price stickiness, there has to be a strong adjustment through quantities that can potentially induce positive comovement among the main macroeconomic variables across the two countries.

(continuing from previous year)

Manufacturing Decline and House Price Volatility

Isaiah Hull, Conny Olovsson, Karl Walentin and Andreas Westermark

Using a unique dataset of all Swedish housing transactions over the 2009-2017 period, we find that an increase in manufacturing's share of employment is positively associated with house price growth volatility and negatively associated with risk-adjusted housing returns. Both effects appear to be related to manufacturing's impact on firm concentration, employment growth volatility, and economic uncertainty. Moreover, as we demonstrate in an application, our results have implications for portfolio choice. They also suggest that the manufacturing decline since 1970 could account for a 32% reduction in house price volatility in Sweden, and similar reductions in the U.S., U.K., and Japan.

(continuing from previous year)

A Note on Measuring U.S. Time Series Volatility During the Great Moderation

Isaiah Hull

We identify volatility breaks in all testable series in the FRED database over the 1957-2013 period. This yields 17,681 breaks, which we categorize using text analysis. We show that 70.5% of series categories experienced a decline in volatility over the 1985-1999 period, suggesting that the Great Moderation was far broader in scope than the literature has documented. We also show that this decline reversed in 2000, leading to a sharp increase in volatility for most time series categories; however, this did not fully materialize in GDP volatility until the Great Recession. Finally, we identify labor markets, demographics, finance, and government debt as potential drivers of low-frequency shifts in volatility over the 1957-2013 period.

(accepted for publication in *Macroeconomic Dynamics*)

MONETARY POLICY AND THEORY

Spread the Word: International Spillovers from Central Bank

Hanna Armelius, Christoph Bertsch, Isaiah Hull and Xin Zhang

We construct a novel text dataset to measure the sentiment component of communications for 23 central banks over the 2002-2017 period. Our analysis yields three results. First, comovement in sentiment across central banks is not reducible to trade or financial flow exposures. Second, sentiment shocks generate crosscountry spillovers in sentiment, policy rates, and macroeconomic variables; and the Fed appears to be a uniquely influential generator of such spillovers, even among prominent central banks. And third, geographic distance is a robust and economically significant determinant of comovement in central bank sentiment, while shared language and colonial ties have weaker predictive power.

(accepted for publication in the *Journal of International Money and Finance*)

Gains from Wage Flexibility and the Zero Lower Bound

Roberto Billi and Jordi Galí

We analyze the welfare impact of greater wage flexibility while taking into account explicitly the existence of the zero lower bound (ZLB) constraint on the nominal interest rate. We show that the ZLB constraint generally amplifies the adverse effects of greater wage flexibility on welfare when the central bank follows a conventional Taylor rule. When demand shocks are the driving force, the presence of the ZLB implies that an increase in wage flexibility reduces welfare even under the optimal monetary policy with commitment.

(continuing from previous year)

Unemployment Fluctuations and Nominal GDP Targeting

Roberto Billi

I evaluate the welfare performance of a target for the level of nominal GDP in a New Keynesian model with unemployment, accounting for a zero lower bound (ZLB) constraint on the nominal interest rate. Nominal GDP targeting is compared to employment targeting, a conventional Taylor rule, and the optimal monetary policy with commitment. I find that employment targeting is optimal when supply shocks are the source of fluctuations; however, facing demand shocks and the ZLB constraint, nominal GDP targeting can outperform substantially employment targeting.

(new project)

The Role of Money in Monetary Policy at the Lower Bound

Roberto Billi, Ulf Söderström and Carl Walsh

In light of the recent surge in popularity of proposals for central-bank financed fiscal stimulus, we reconsider the merit of a money growth target relative to conventional inflation targeting. We show that, through the lens of a New Keynesian model, and accounting for a lower bound constraint on the nominal interest rate, the ranking between inflation targeting and a money growth target is not a foregone conclusion. In particular, although a money growth target makes monetary policy vulnerable to money demand shocks, it contributes to achieving price level stability and therefore reduces the incidence and severity of the lower bound. Furthermore, a money growth target lessens the need for the fiscal authority to engage alongside the central bank in fighting recessions.

(new project)

Stabilization Policy at the Zero Lower Bound

Paola Boel and Christopher Waller

We construct a monetary economy in which agents face aggregate liquidity shocks and heterogeneous idiosyncratic preference shocks. We show that, in this environment, not all agents are satiated at the zero lower bound even when the Friedman rule is the best interest-rate policy the central bank can implement. As a consequence, there is scope for central bank stabilization policy, which takes the form of repo arrangements in response to aggregate demand shocks. We find such a policy temporarily relaxes the liquidity constraint of impatient agents without harming the patient ones, thus improving welfare even at the zero lower bound. Due to a pecuniary externality, the policy may also have beneficial general-equilibrium effects for the patient agents even if they are unconstrained in their holdings of real balances.

(accepted for publication in the *International Economic Review*)

How Much Information Do Monetary Policy Committees Disclose? Evidence from the FOMC's Minutes and Transcript

Mikael Apel, Marianna Blix Grimaldi and Isaiah Hull

The purpose of central bank minutes is to give an account of monetary policy meeting discussions to outside observers, thereby enabling them to draw informed conclusions about future policy. However, minutes are by necessity a shortened and edited representation of a broader discussion. Consequently, they may omit information that is predictive of future policy decisions. To investigate this, we compare the information content of the FOMC's minutes and transcripts, focusing on three dimensions which are likely to be excluded from the minutes: 1) the committee's degree of hawkishness; 2) the chairperson's degree of hawkishness; and

3) the level of agreement between committee members. We measure committee and chairperson hawkishness with a novel dictionary that is constructed using the FOMC's minutes and transcripts. We measure agreement by performing deep transfer learning, a technique that involves training a deep learning model on one set of documents – U.S. congressional debates – and then making predictions on another: FOMC transcripts. Our findings suggest that transcripts are more informative than minutes and heightened committee agreement typically precedes policy rate increases.

(new project)

Liquidity, Capital Pledgeability and Inflation Redistribution

Paola Boel, Julian Diaz and Daria Finocchiaro

We investigate the redistributive effects of expected inflation using a microfounded monetary model where agents differ in their degree of patience. Agents can insure against consumption risk with money and a partially-liquid capital. Borrowing and lending is also possible, but only in specific markets in which capital can be used both as a mean of production and as collateral. We find that, as long as inflation is not too high and capital is sufficiently illiquid, agents hold both money and capital in equilibrium though in different quantities according to their type. We demonstrate that in a world without collateral constraints borrowing and lending are not affected by inflation in steady state since bonds' prices adjust perfectly for inflation. When collateral constraints are introduced, instead, inflation generates income redistribution via borrowing and lending since capital increases with inflation.

(continuing from previous year)

On the Essentiality of Credit and Banking at the Friedman Rule

Paola Boel and Christopher Waller

We investigate the essentiality of credit and banking in a microfounded monetary model in which agents face heterogeneous idiosyncratic time preference shocks. Three main results arise from our analysis. First, the constrained-efficient allocation is unattainable without banks. Second, financial intermediation improves the equilibrium allocation even at the Friedman rule, because it relaxes the liquidity constraints of impatient borrowers. Third, changes in credit conditions are not necessarily neutral in a monetary equilibrium at the Friedman rule. If the debt limit is sufficiently low, money and credit are perfect substitutes and tightening the debt limit is neutral. As the debt limit increases, however, patient agents always hold money but impatient agents prefer not to since it is costly for them to do so given they are facing a positive shadow rate. Borrowing instead is costless when interest rates are zero and increasing the debt limit improves the allocation.

(new project)

Renovatio Monetae: When Gesell Taxes Worked

Roger Svensson and Andreas Westermark

Gesell taxes on money have recently received attention as a way of alleviating the zero lower bound on interest rates. Less known is that such taxes were an important method for generating seigniorage in medieval Europe for around two centuries. When a Gesell tax was levied, current coins ceased to be legal and had to be exchanged into new coins for a fee. This could occur as often as twice a year. Using a cash-in-advance model, we analyze under what conditions agents exchange coins and the tax generates revenues. A key result is that the system broke down because of increases in fiscal spending, and not because non-cash alternatives, e.g., bartering, became more costly. We also analyze how prices fluctuated over an issue period.

(accepted for publication in the *International Economic Review*)

Monetary Normalizations and Consumer Credit: Evidence from Fed Liftoff and Online Lending

Christoph Bertsch, Isaiah Hull and Xin Zhang

On December 16th of 2015, the Fed initiated "liftoff," a critical step in the monetary normalization process. We use a unique panel dataset of 640,000 loan-hour observations to measure the impact of liftoff on interest rates, demand, and supply in the online primary market for uncollateralized consumer credit. We find that credit supply increased, reducing the spread by 16% and lowering the average interest rate by 16.9-22.6 basis points. Our findings are consistent with an investor-perceived reduction in default probabilities; and suggest that liftoff provided a strong, positive signal about the future solvency of borrowers.

(continuing from previous year)

Quantum Computing and Quantum Money for Economists

Eleni Diamanti, Isaiah Hull, Or Sattath and Göran Wendin

Quantum computing is a field that spans multiple disciplines: physics, computer science, and mathematics. The objective of this manuscript is to provide an accessible introduction to this emerging field for economists. We proceed in three steps. First, we provide a basic introduction to quantum computing that assumes knowledge of linear algebra and statistics, but not of computer science or physics. This covers fundamental topics, such as qubits, superposition, entanglement, quantum circuits, oracles, and the no-cloning theorem. Second, we provide an overview of quantum money -- one of the earliest inventions in quantum cryptography -- which may have substantial relevance for economists and central banks in the future. Our analysis here focuses on privacy, security, and scalability; and compares quantum money to physical cash, central bank digital currencies, and cryptocurrencies. Finally, we describe quantum algorithms that are likely to have future relevance for econometrics and computational economics, including schemes that can achieve speed-ups for function approximation, the solution of linear systems, principal component analysis, Monte Carlo simulation, matrix inversion, linear regression, interpolation, and numerical differentiation. We also discuss the difficulty of achieving quantum speed-ups and comment on common misconceptions about what is achievable with quantum computing.

(new project)

The Long-Run Forward Guidance Problem

David Vestin

This paper distinguishes between two distinct forward-guidance puzzles in the standard NK model. The first is the standard one, that expectations about low future interest rates results in large current increases in inflation and output. The second is that pre-announced monetary policy can generate unbounded real effects far in the future, the “long-run forward guidance puzzle”. The paper shows that the proposed solutions to the short-run puzzle based on discounting in the Euler-equation does not solve the long-run puzzle. I show that replacing the Calvo assumption with sticky information, which Kiley (2016) has been discussing as a possible solution to the short-run puzzle, resolves the long-run puzzle. The intuition is straight-forward: sticky information is analytically equivalent to Calvo with price-plans. That is, at the time a firm is “allowed” to adjust its price, it sets a non-state contingent plan for future prices that may not be adjusted until the next time the Calvo signal “allows” a price change. With this assumption, all firms that have been “allowed” to adjust their price plans can coordinate on a nominal adjustment that offsets the real effects of a monetary policy shock. The paper goes on to show that a combination of Euler-equation discounting and sticky information results in a satisfactory solution of both puzzles. In terms of policy implications for central banks, the paper argues that extending forward guidance too far can be counterproductive.

(continuing from the previous year)

Monetary Policy Communication and Private sector Expectations

Oreste Tristani and David Vestin

Central banks that publish the most likely, or intended, future path of their policy rates occasionally observe a decoupling of private sector expectations from the intended path. We demonstrate that such a decoupling can arise because of incomplete and asymmetric information and that it is not necessarily a sign of lack of credibility. Even if the central bank truthfully communicates its future policy intentions, households and firms can reasonably judge that those intentions are based on an incorrect assessment of the state of the economy, and notably an assessment which may be revised in the future. Incomplete and asymmetric information also paves the way for a theory of policy shocks -- that is, an interpretation of occasional deviations from the normal monetary policy rule as reactions to central bank signals on the state of the economy that are not observed by the private sector. Depending on households' and firms' inference about such deviations, the policy shocks can look like the "central bank information shocks" that have recently received attention in the literature.

(continuing from the previous year)

Publications accepted in 2019

Armelius, Hanna, Christoph Bertsch, Isaiah Hull and Xin Zhang, ‘‘Spread the Word: International Spillovers from Central Bank Communication’’, forthcoming in the *Journal of International Money and Finance*

Boel, Paola and Gabriele Camera, “Monetary Equilibrium and the Cost of Banking Activity”, forthcoming in the *Journal of Money, Credit, and Banking*

Boel, Paola and Christopher Waller, “Stabilization Policy at the Zero Lower Bound”, *International Economic Review, vol.* 60(4), 2019, pages 1-25

Caballero, Diego, André Lucas, Bernd Schwaab and Xin Zhang, ‘’Risk Endogeneity at the Lender/Investor-of-Last-Resort, forthcoming in the *Journal of Monetary Economics*

Gars, Johan and Conny Olovsson, "Fuel for Economic Growth", forthcoming in the *Journal of Economic Theory*

Haliassos, Michael, Thomas Jansson and Yigitcan Karabulut, “Financial Literacy Externalities”, forthcoming in the *Review of Financial Studies*

Hull, Isaiah, "A Note on Measuring U.S. Time Series Volatility During the Great Moderation", forthcoming in *Macroeconomic Dynamics*

Klein, Mathias and Christopher Krause, "Income Redistribution, Consumer Credit, and Keeping up with the Riches", forthcoming in the *Journal of Money, Credit and Banking*

Klein, Mathias and Ludger Linnemann, "The Time-Varying Effect of Fiscal Policy on Inflation: Evidence from Historical US Data", forthcoming in *Economic Letters*

Klein, Mathias and Ludger Linnemann, "Tax and Spending Shocks in the Open Economy: Are the Deficits Twins?", forthcoming in the *European Economic Review*

Svensson, Roger and Andreas Westermark, ‘’Renovatio Monetae: When Gesell Taxes Worked’’, forthcoming in the *International Economic Review*

Working papers

No. 383, Hjalmarsson, Erik and Pär Österholm, ”Heterogeneity in Households’ Expectations of Housing Prices – Evidence from Micro Data”

No. 382, Caballero, Diego, André Lucas, Bernd Schwaab and Xin Zhang, “Risk Endogeneity at the Lender/Investor-of-Last-Resort“

No. 381, Apel, Mikael, Marianna Blix Grimaldi and Isaiah Hull, “How Much Information Do Monetary Policy Committees Disclose? Evidence from the FOMC's Minutes and Transcripts“

No. 380, Reslow, André, “Inefficient Use of Competitors' Forecasts?“

No. 379, Levander, Mats, “Financial Buffers, Unemployment Duration and Replacement Labor Income“

No. 378, Canova, Fabio and Filippo Ferroni, “Mind the Gap! Stylized Dynamic Facts and Structural Models“

No. 377, Klein, Mathias and Ludger Linnemann, “Tax and Spending Shocks in the Open Economy: Are the Deficits Twins? “

No. 376, Engert, Walter, Ben Fung and Björn Segendorf, “A Tale of Two Countries: Cash Demand in Canada and Sweden“

No. 375, Hassler, John, Per Krusell and Conny Olovsson, “Directed Technical Change as a Response to Natural-Resource Scarcity“

No. 374, Grodecka, Anna and Isaiah Hull, “The Impact of Local Taxes and Public Services on Property Values“

No. 373, Cella, Cristina, “Institutional Investors and Corporate Investment“

No. 372, Dang, Khue-Dung, Matias Quiroz, Robert Kohn, Minh-Ngoc Tran and Mattias Villani, “Hamiltonian Monte Carlo with Energy Conserving Subsampling“

No. 371, Gunawan, David, Khue-Dung Dang, Matias Quiroz, Robert Kohn and MinhNgoc Tran, "Subsampling Sequential Monte Carlo for Static Bayesian Models"

No. 370, Paulie, Charlotte, "Does Inflation Targeting Reduce the Dispersion of Price Setters' Inflation Expectations?"

No. 369, Hassler, John, Per Krusell and Conny Olovsson, "The Consequences of Uncertainty: Climate Sensitivity and Economic Sensitivity to the Climate"

No. 368, Björklund, Maria, Mikael Carlsson and Oskar Nordström Skans, "Fixed Wage Contracts and Monetary Non-Neutrality"

No. 367, Billi, Roberto M. and Jordi Galí, "Gains from Wage Flexibility and the Zero Lower Bound"

No. 366, Debortoli, Davide, Jinill Kim, Jesper Lindé and Ricardo Nunes, "Designing a Simple Loss Function for Central Banks: Does a Dual Mandate Make Sense?"

No. 365, Ankargren, Sebastian and Hovick Shahnazarian, "The Interaction Between Fiscal and Monetary Policies: Evidence from Sweden"

No. 364, Cipullo, Davide and André Reslow, "Biased Forecasts to Affect Voting Decisions? The Brexit Case"

No. 363, Lindé, Jesper and Andrea Pescatori, "The Macroeconomic Effects of Trade Tariffs: Revisiting the Lerner Symmetry Result"

Non-refereed publications in 2019

The Riksbank's Balance Sheet and Financial Independence

David Kjellberg and David Vestin

Sveriges Riksbank Economic Review *(Penning- och Valutapolitik)* 2, 2019

Financial independence prevents the Riksbank's financial position from having a negative impact on its tasks concerning price stability, financial stability and payments. There have been substantial changes in the Riksbank's earning capacity during the last ten years, also changing the prospects for financial independence. This article reviews how the Riksbank's balance sheet is structured, how it has changed over time and how the Riksbank's earning capacity has developed. Historically, the volume of banknotes in circulation has formed the basis of stable earnings for the Riksbank. Recently, however, the combination of decreasing banknote volumes and low interest rates has contributed to reduced earnings. If this trend continues, it will eventually increase the need for more equity to ensure satisfactory financial independence. In a scenario with declining earnings, it will be difficult for the Riksbank to build up more equity itself. The conclusion of the authors is that, if we want to avoid the a need to recapitalise the Riksbank a contingency plan will be needed so that other sources of earnings are available, such as fees of some sort or a flexible framework for the level of equity. This would allow the Riksbank to be able to manage both losses in its asset portfolio and changed macroeconomic conditions in the form of low interest rates and decreasing banknote volumes.

FinTech Credit: Online Lending Platforms in Sweden and Beyond

Christoph Bertsch and Carl-Johan Rosenvinge

Sveriges Riksbank Economic Review *(Penning- och Valutapolitik)* 2, 2019

New digital technologies in banking and finance, commonly referred to as 'FinTech,' have the potential to transform established banking business models. This article studies online lending platforms, which are new players in the financial sector that allow individuals or firms to obtain loans directly from investors via the internet. To date, online lending is still small relative to total bank lending. However, online lending has expanded rapidly not only in China, the US and the UK, but also in Sweden. In 2018 Swedish platforms originated more than SEK 2bn of new loans – exceeding the 2017 volume by 51 per cent. The authors discuss how online lending platforms differ from commercial banks and how they are regulated. Moreover, they analyse market developments, such as the growing linkages between platforms and the banking sector. Against this backdrop, they review potential financial stability implications that may appear if online lending continues to grow in importance.

How can Various Structural Changes in the Economy Affect Wages and Inflation?
Andreas Westermark
Sveriges Riksbank Economic Review *(Penning- och Valutapolitik)* 2, 2019

This article contains a review of the research literature on various structural changes that may have affected wage and price formation over the past 25 years. During that period, there have been extensive changes both in Sweden and abroad that have affected the Swedish labour market. First, significant reforms have been carried out on the Swedish labour market; for example, the unemployment compensation level has been considerably lowered. Second, increases in foreign trade appears to have had effects on producer prices. Third, trade has also had some effects on wages, although it is primarily technological developments benefitting highly educated workers that seems to have had an impact on wage formation. Fourth and finally, migration has risen sharply over the period, affecting labour force composition, for example in terms of education level. Somewhat surprisingly, it is suggested in the literature that the increases in migration and labour market integration within the EU in the past few decades have had limited effects on wages in general. However, this does not rule out that the effects potentially have been greater for certain sectors, for instance the construction sector.

Is Germany a Compass for Wage Formation in Sweden?
Andreas Westermark
Sveriges Riksbank Economic Review *(Penning- och valutapolitik)* 2, 2019

In this article, wage formation in Sweden since the Industrial Agreement was reached at the end of the 1990s is studied. Using wage-setting equations, wage determination in various sectors in Sweden is analyzed. The results confirm that the Industrial Agreement sets a mark for other sectors and that industrial wages provide a significant and strong explanatory value for wages in both the construction and service sector. Industry is export-dependent and wages in the sector shall ensure its long-term competitiveness, distribute the surplus between employers and employees and be in line with the Riksbank's inflation target in the long run. In Sweden, it has been debated whether wages in Germany have a direct impact on wages in Swedish industry, besides the effects from other channels, such as competitor prices. I find that Swedish industrial wages could have such a link with German industrial wages by using German wages in a wage-setting equation similar to how Swedish industrial wages are used to explain wages in the construction and service sectors, even though the relationship is not as strong. However, there is a much stronger link between Swedish industrial wages and industrial wages in the Euro area.

Payment Systems: History and Challenges
Paola Boel
Sveriges Riksbank Economic Review *(Penning- och valutapolitik)* 1, 2019

Payment systems are currently undergoing important changes, mostly because of technological innovations. Such changes include a declining role for cash and a growing prominence of fast payment solutions. In this article, the author discusses these developments and the challenges they create for central banks. She does so taking into consideration the historical evolution of payment systems and the insights derived from the literature on the economics of payments.

Other research activities

Conferences

The Riksbank organized and hosted the 15th Annual Central Bank Conference on the "Microstructure of Financial Markets", which took place on November 7-8 2016. At the conference, researchers, policy makers and practitioners discussed theoretical work, empirical findings and policy implications related to the microstructure of financial markets. The program is available at:
https://www.riksbank.se/globalassets/media/forskning/seminarier/2019/program---15th-annual-central-bank-conference-on-the-microstructure-of-financial-markets.pdf

Together with the Bank of Canada, the Riksbank organized a conference on the "Economics of Central Bank Digital Currency (CBDC)", which took place at the Bank of Canada on October 17-18, 2019. The event provided a forum for central bankers and academic researchers to discuss the arguments for and against the issuance of CBDC and under what conditions, if any, governments should issue their own digital currencies. The program is available at: https://www.bankofcanada.ca/wp-content/uploads/2019/10/agenda-economic-central-bank.pdf

In September 2019, the Riksbank organized a conference on "Business Cycles and Open Economies", which was hosted by the Riksbank and organized in conjunction with the Bank of Canada, Norges Bank, Reserve Bank of Australia and Reserve Bank of New Zealand. The conference was aimed at discussing new theoretical and empirical research on the determinants of business cycles in small open economies and their implications for policy. The program is available at: https://www.riksbank.se/globalassets/media/forskning/seminarier/2019/program-business-cycles-in-small-open-economies-13-14-sept-2019.pdf

Together with the Kiel Institute for the World Economy and as part of the Ensuring Economic and Employment Stability (EES) network, the Riksbank organized and hosted a conference on May 17-18, 2019 to bring together high-quality research at the intersection of labor economics and macroeconomics. The program is available at: https://www.riksbank.se/globalassets/media/forskning/seminarier/2019/program-for-ees-macro-labor-workshop-may-2019.pdf

Courses

In 2019, the Research Division organized a second-year PhD course on monetary economics. The course was held at the bank and was taught by faculty from Stockholm University and by Riksbank researchers. The purpose of the course was to introduce students to modern New Keynesian models for monetary policy and business-cycle analysis.

Greater Stockholm Macro Group

Together with Per Krusell (IIES, Stockholm University), the Research Division continued to organize a monthly internal seminar series for macro researchers from all major institutions in Stockholm and Uppsala. The series is known as "Greater Stockholm Macro Group" and aims at fostering exchange of ideas and cooperation among macro researchers in the Stockholm area.

Internship Program

As customary, the Research Division together with the policy departments hosted several PhD interns. This year's six interns were Zihao Liu (Tilburg University), Kerstin Olsson (Uppsala University), Ana Sofia Pessoa (Bonn University), Thorsteinn Sveinsson (Copenhagen Business School), Phuong Van Nguyen (Kiel University), Frederick Zadow (Mannheim University). In addition, Ricardo Duque Gabriel (Bonn University) visited the Research Division.

Research Seminars

The Research Division organizes weekly research seminars, mainly by invited international speakers. The seminars usually take place on Tuesdays at 11 am and attendance is open to Riksbank employees as well as to academics. A complete list of both upcoming and past seminars is available on the homepage of the Riksbank's Research Division: https://www.riksbank.se/en-gb/about-the-riksbank/the-tasks-of-the-riksbank/research/research-seminars/.

Teaching and Advising

Daria Finocchiaro taught "Applied Macro" (master's level) and "Macro I" (PhD level) at Uppsala University. Conny Olovsson taught the course "The Climate and the Economy" during the spring of 2019 at Stockholm University and at the University of Gothenburg (together with John Hassler and Per Krusell). Conny also gave several guest lectures at Uppsala University and at the Royal Institute of Technology on the same topic. Andreas Westermark taught part of the PhD course on "Monetary Economics" organized by the research division. Mathias Klein participated in the PRISMA project at the ECB.

Miscellanea

Daria Finocchiaro is partially on leave at Uppsala University. Christoph Bertsch was on a fellowship at the BIS for three months (October-December) working on a project on bank recapitalization. Thomas Jansson participated at the ECB Household Finance and Consumption Network (HFCN) meetings. Mathias Klein participated in the ECB PRISMA network, which aims to investigate inflation dynamics by using micro-level price data.

Xin Zhang was in the scientific committee of the ECSB Day-Ahead Conference hosted by the Banco de Portugal in August 2019. Karl Walentin and Andreas Westermark were in the organizing committee for the conference on "New Developments in the Macroeconomics of Labor Market Conference" organized by the Riksbank and the Kiel Institute. Jesper Lindé and Conny Olovsson were in the organizing committee for the conference on "Business Cycles in Small Open Economies" organized by the Riksbank together with the Bank of Canada, Norges Bank, Reserve Bank of Australia, and Reserve Bank of New Zealand. Paola Boel was in the organizing committee for the conference on the "Economics of Central Bank Digital Currency" organized by the Riksbank with the Bank of Canada. Isaiah Hull, Tor Jacobson and Xin Zhang were in the organizing committee for the conference on the "Microstructure of Financial Markets" organized by the Riksbank. Christoph Bertsch and Paola Boel taught classes at the Riksbank course on central banking.

Upcoming events in 2020

In 2020 the Research Division will, jointly with CEBRA and CEPR, be organizing a conference on "Exchange Rates and Monetary Policy" to be held at the Riksbank. The organizing committee consists of Daria Finocchiaro, Ulf Söderström and Karl Walentin from the Riksbank, Philippe Bacchetta from Lausanne University and Galina Hale from the Federal Reserve Bank of San Francisco.

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This newsletter, as well as other information about the Research Division at Sveriges Riksbank, is available online at
https://www.riksbank.se/en-gb/about-the-riksbank/the-tasks-of-the-riksbank/research/