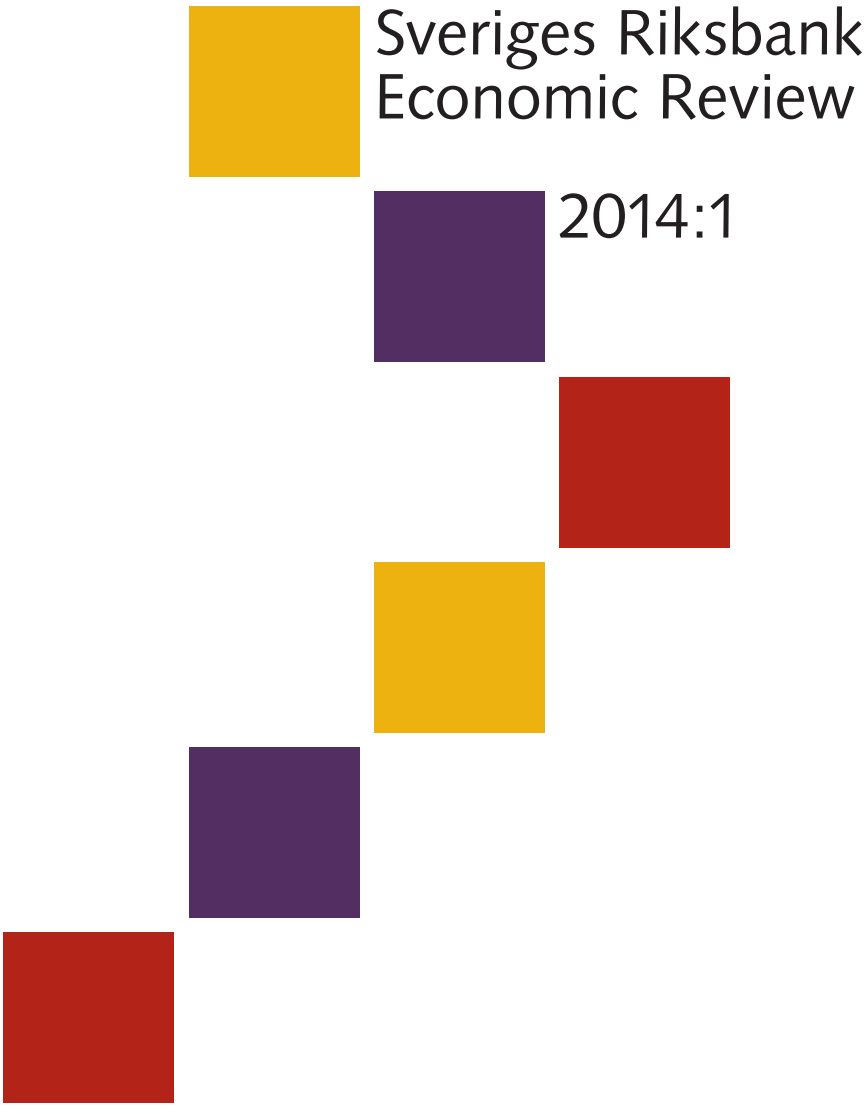

Sveriges Riksbank Economic Review

2014:1

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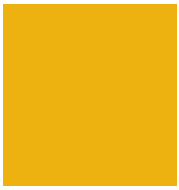

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EDITORS: CLAES BERG, TOMAS EDLUND, KRISTIAN JÖNSSON,
CECILIA ROOS-ISAKSSON AND THE COMMUNICATIONS DIVISION
Sveriges Riksbank, SE-103 37 Stockholm, Sweden
Telephone +46 8 787 00 00

Advisory editorial committee: Martin W Johansson, Göran Robertsson
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Dear readers,

Since the global financial crisis, extensive work has been underway to survey risks and to analyse the need for measures and tools to counteract financial imbalances. In this issue we publish three articles that highlight this work in various ways.

- Magnus Jonsson and Kevin Moran analyse how the monetary policy pursued by a central bank may be affected by a new policy area: macroprudential policy. They focus on a specific macroprudential policy tool, the so-called countercyclical capital buffer. This is a tool that is intended to increase the banks' resilience by building up a capital buffer in the upward phase of the financial cycle that is then put into play in the downward phase. It can thus have effects on the economy that monetary policy may need to take into account. Jonsson and Moran first analyse the business cycle effects of the capital buffer. They then go on to discuss the trade-off between the objectives of macroprudential policy and those of monetary policy and whether there is a risk of a conflict between these objectives.
- Ida Hilander analyses the major Swedish banks' short-term funding in foreign currency, which is very extensive. One reason for this is that their customers need foreign currency to fund and currency hedge foreign assets, while the banks need access to funding in kronor. By exchanging foreign currency for kronor in so-called currency swaps the banks can satisfy their customers' need for foreign currency as well as their own need for kronor. However, this also leads to refinancing risks for the financial institutions that use swaps at short maturities despite the fact that their investments are long term. The article discusses potential ways of reducing these risks.
- Gustav Alfelt, Marieke Bos and Kasper Roszbach analyse data from a Swedish internet-based marketplace for consumer credit that provides more detailed information on uncollateralised lending to Swedish households and the conditions governing this lending. The internet-based marketplace matches loan applications of individuals with financial institutions that subsequently are able to make loans offers. The authors describe how the system works and analyse how loan conditions and loan volumes vary as a result of differences between the borrowers. The size of their incomes, for example, is a major factor in determining the interest rates the borrowers are offered. Whether these differences are also of significance to the monetary policy transmission mechanism and other aspects of economic policy is an open question that requires further analysis.

Read and enjoy!

Claes Berg, Tomas Edlund, Kristian Jönsson and Cecilia Roos-Isaksson

Contents

Many developed countries have experienced substantial growth in consumer credit over the last two decades. Part of this growth has been driven by technological changes, such as the ability of banks to have automated evaluations of loan applicants (credit scoring), lowered entry barriers due to internet technology, and the emergence of internet-based market places for banks. The uptake of different types of credit varies greatly across the income distribution. This is likely to have consequences for households' responsiveness to financial shocks, e.g. shocks to interest rates and the supply of credit. This article describes how web-based intermediation of credit to households works. Using data from a Swedish internet-based marketplace for consumer credit, some descriptive statistics are provided on how much credit households apply for and what quantities, durations and interest rates they are offered.

The linkages between monetary and macroprudential policies

Magnus Jonsson and Kevin Moran*

Magnus Jonsson holds a Ph.D. in economics and works in the Monetary Policy Department at Sveriges Riksbank; Kevin Moran is an Associate Professor of Economics at Université Laval.

Macroprudential policy is a new policy area within the international regulatory framework for banks known as Basel III. In this article we study the linkages between monetary and macroprudential policies in a dynamic general equilibrium model. Macroprudential policy is exemplified by a countercyclical capital buffer. We show that the monetary policy response to the introduction of a countercyclical capital buffer depends on the particular shocks driving the economic fluctuations. This is one reason why it is difficult to foresee the consequences for monetary policy of introducing the capital buffer. We also show that coordination of monetary and macroprudential policies may lead to improved macroeconomic and financial stability for certain shocks, while for others it may reduce the uncertainty of the central bank's and the supervisory authority's decisions.

Introduction

The welfare cost of financial crises is often very high. The Swedish crisis in the 1990s and the global financial crisis that broke out after the crash of Lehman Brothers in the autumn of 2008 are two examples. Cleaning up after financial crises is a slow process, and they also often lead to periods of low employment, reduced investment and major cutbacks in public sector activities. In terms of output losses, the welfare cost of the global financial crisis is estimated to somewhere between 1 and 3.5 times total output in the world in one year, see Haldane (2010).

A lesson from the recent global financial crisis is that it is not solely individual financial institutions that require supervision; the supervisory authorities also need a better focus on preventing risks that threaten the function of the financial system as a whole, so called systemic risks. The greater focus on systemic risks derives from the greater interconnectedness of the financial markets. If problems emerge in one part of the financial system, the risk of contagion to other parts has greatly increased. Furthermore, the existing capital requirements proved insufficient to cover bank losses which, among other things, implied that taxpayers in several countries had to supply new funds.

* The authors thank Claes Berg, Kristian Jönsson, Christian Nilsson and Ulf Söderström for valuable comments and suggestions.

In view of this, the Basel Committee on Banking Supervision has drawn up new banking regulations, known as Basel III.[1] Macroprudential policy is a new policy area within that framework. The purpose of this new policy area is to enhance the financial system's resilience to shocks, as well as preventing the build-up of financial imbalances.[2] It is designed to function as a complement to microprudential policy, which is primarily aimed at the stability of individual financial institutions. Generally, the new regulatory framework implies a greater focus on systemic risks. More specifically for the banks it implies that they need to have more and better capital, among other things.

Macroprudential policy is a new policy area but many of the potential tools are already in use for the supervision of individual institutions. This applies, for example, to various capital requirements for banks, the mortgage cap and risk weights for mortgage loans.[3] However, the countercyclical capital buffer is a new tool that will be introduced with the introduction of Basel III.[4] It is intended to protect the banking system against potential losses when excessive credit growth is linked to higher systemic risks. As opposed to other capital requirements, the capital buffer will vary over time, being activated during periods of rising systemic risks, thus allowing banks to strengthen their capital position. When conditions deteriorate and the systemic risks are realised or decline, the buffer requirement is reduced, permitting banks to cover their losses without having to cut back on lending. Consequently, the capital buffer raises the banks' resilience, thereby reducing their vulnerability to economic crises.

An indirect effect of the capital buffer is that it can contribute to counteract an excessively high credit growth and debt accumulation. As a result, it could help mitigate the procyclicality that the regulations may give rise to; that is, the tendency of the financial system and the macroeconomy to reinforce each other in upturns and downturns. This represents an improvement to the previous regulatory framework, Basel II.

In this article we study the linkages between monetary and macroprudential policies in a dynamic general equilibrium model. Macroprudential policy is exemplified by a countercyclical capital buffer. The first part studies the impact of the capital buffer on the business cycle and the consequences of this for monetary policy. Changes in the capital buffer affect the bank's funding cost and the volume of credit throughout the economy. Normally, a rise in the capital buffer leads to higher interest rates and reduced lending, which ultimately may mitigate demand and inflation. Monetary policy needs to take these business cycle effects into account, just like it needs to take business cycle effects that arise in other parts of the economy into account.

1 The new regulations began to be applied in January 2014 throughout the EU and will gain full force in January 2019.

2 However, the concept of macroprudential policy or regulation has been around since the 1970s, see Clement (2010).

3 The capital requirements for banks regulate how much capital a bank must have in relation to its assets. The minimum requirement for the major Swedish banks is set at 10 per cent as of 1 January 2013 but will be raised to 12 per cent from 1 January 2015. The mortgage cap (loan-to-value ratio) sets a ceiling, currently set at 85 per cent, for the amount that can be borrowed in relation to the value of a property. Risk weights for mortgages represent a specific capital requirement for the housing sector.

4 For a detailed description and discussion of the countercyclical capital buffer, see Juks and Melander (2012).

The second part studies the trade-off between different objectives for the economy. Objectives such as price stability, macroeconomic stability and financial stability are not independent of each other. For instance, it is difficult to maintain price and macroeconomic stability when a financial crisis breaks out. If financial imbalances build up during periods when the economy is overheated, the two policy areas facilitate the attainment of the objectives through the pursuit of a tighter policy. On the other hand, financial imbalances can also build up in relatively calm conditions, as exemplified by the recent global financial crisis. An expansionary monetary policy during an extended time period may imply a more restrictive macroprudential policy in order to lower the risk of new financial crises. Consequently, monetary and macroprudential policies have the potential to both support and counteract the different policy objectives.

Macroprudential policy also interacts with other policy areas such as fiscal policy, competition policy and microprudential policy. Fiscal policy measures, such as the deductions of interest rate expenses, could affect the risk of a build-up of financial imbalances. Actions that impact on competition in the financial sector could also influence risk propensity. Combined, microprudential policy measures deemed appropriate in reducing risks in individual institutions could exacerbate the systemic risks in the financial system. In this analysis, however, we disregard any effects from these policy areas.

The remaining part of the article is organised as follows: in the next section, we describe the theory or model used in the analysis. We discuss in detail the role of the banks and why they need a certain amount of capital to finance their lending. We also address why this level is not necessarily sufficient from a welfare perspective. This is followed by a section analysing the linkages between monetary and macroprudential policies. In that section, we show, firstly, how the business cycle effects of macroprudential policy can affect monetary policy decisions and, secondly, why a trade-off between the different policy objectives of the central bank and the supervisory authority may arise. Within the latter analysis we also show the potential effects of coordinating the decisions. Finally, we summarise the results and provide some concluding comments.

A dynamic general equilibrium model with a banking sector[5]

To study the linkages between monetary and macroprudential policies we use a dynamic general equilibrium model with households, firms, banks, a central bank and a supervisory authority. Like all economic models it includes a number of simplified assumptions regarding the decision-making of the households and the firms as well as the restrictions they face. Hence, the results are an illustration of certain relationships and mechanisms based on economic theory rather than conventional forecasts of what will happen. The basic assumptions underlying the model are that households maximise their expected utility and that firms maximise their profits. Also, the decision-making of the economic agents are

5 For a more detailed and technical description of the model, see Christensen et al. (2011) and Meh and Moran (2010).

based on rational expectations. Overall, the model resembles the Riksbank's macro model Ramses.[6] A difference, however, is that this model includes an explicit banking sector.

THE DIFFERENT ROLES OF FIRMS AND HOUSEHOLDS IN THE MODEL

The model features two types of firms. The first type combines labour inputs and capital goods to produce the economy's consumer goods. These firms operate in a market characterised by monopolistic competition. As a result, there are a large number of competing firms in the same sector that produce and sell similar, though not entirely identical, goods. Thus, the firms have a certain degree of market power, meaning that they set prices. It is also assumed that there are a large number of buyers.

Prices are assumed to be sticky; that is, firms have a tendency to not fully adjust their prices despite changes in demand. The underlying reasons are not formally explained in the model but may be attributed to costs of changing prices or that there exists long-term price contracts between the firm and the customers. This is an important assumption, since it means that changes in the policy rate can affect the real interest rate.[7] It is the real interest rate that influences investment decisions and how households choose their consumption over time. Sticky prices are also crucial in determining the short-term fluctuations in inflation. The firms' real marginal cost, which depends, among other things, on the real wage and productivity, is the fundamental factor.

The second type of firms act in a perfectly competitive market in which they produce the capital goods used by the first type of firms in the production of consumer goods. In addition to their own funds, these firms require financing from external sources. Households provide those funds by depositing their savings with the banks, which then lend these funds to the firms. In addition to the saving decision, the households decide on how to allocate their time. They can choose between working, which provides a return in the form of a wage bill, or opt for leisure time, which offers relaxation. The model does not include a housing sector; that is, we disregard household indebtedness in the analysis.

BANKS REQUIRE CAPITAL TO GAIN ACCESS TO FUNDING

Banks play an important role in allocating savings and financing among different agents in the economy. There are a number of reasons why there is a demand for this service. One reason, which also is the reason in the model, is asymmetric information between lenders (households) and borrowers (firms), implying that lenders do not have perfect information regarding the borrowers' projects. The role of the banks as financial intermediaries is to mitigate or, in the best of cases, to overcome the effects of this information problem. Banks also have other roles in the economy such as payment intermediation and management of various types of risks, but we disregard these roles in the model.

We assume that asymmetric information between households and firms gives rise to a

6 For a description of the Riksbank's macro model, see Adolfson et al. (2013) and Christiano et al. (2011).
7 The real interest rate is defined as the nominal interest rate (the policy rate in the model) minus the expected inflation.

moral-hazard problem in the following way. Firms may invest in different types of projects. They may invest in good projects with a high probability of success, or in bad projects with a low probability of success.[8] To ensure investment in the good projects, the banks must monitor the firms, a task involving a monitoring cost. However, households cannot observe the degree to which the banks actually monitor. This gives the banks an incentive to ignore monitoring and letting the households take the risk that the firms invest in the bad projects. Realising this, the households demand that the banks also invest their own funds in the lending operations. This gives the banks a "skin in the game", ensuring that they monitor the firms. Consequently, the firms invest in the good projects.

The amount of bank capital that the households require the banks to hold may be viewed as a reflection of the solvency requirement that must be met to attract new lenders, or as commonly expressed: the market demands that the banks have a certain amount of capital. The solvency requirement is reflected in a market-based capital level that depends, among other things, on the return on bank capital and bank funding costs. Households prefer to lend to banks with a substantial portion of capital, since these banks have a greater incentive to monitor the firms' activities. As a result, a high capital position facilitates the bank's funding opportunities. In turn, this affects lending throughout the economy and thus investment and overall economic activity.

THE EXTERNALITIES OF BANK LENDING WARRANT CAPITAL REQUIREMENTS

From a welfare perspective, there may be several reasons why the banks have too little capital. Perhaps the most apparent reason is different forms of state guarantees and subsidies. These include support packages that the authorities frequently resort to in a bid to rescue troubled banks. Another example is the deposit guarantee, which entail that the state guarantees deposits up to a certain limit. A third example is that lenders are prioritised ahead of shareholders in the event of a bank failure. Lenders may therefore require less compensation for their risk-taking than shareholders. Finally, loan financing is also tax subsidised in the sense that the banks can utilise untaxed earnings to cover their interest rate expenses. Hence, a number of state guarantees and subsidies make it likely that the banks fund an excessive portion of their lending by means of loaned funds. This increases risk-taking and limits their buffers against losses warranting some form of regulation of the banks' operations.

Another reason that the banks may have insufficient capital is that their lending can give rise to negative externalities that are not internalised. In the model, this is the reason for the capital requirements. It is based on two assumptions: firstly, the credit gap – defined as the deviation of the credit-to-output ratio from the long run level – affects the aggregated risk of failure in the banking sector; secondly, when an individual bank decides on its lending, it does not take into account the fact that its decision also influences the aggregate risk of

8 The model provides no explicit explanation why firms would wish to invest in the bad projects. But a plausible reason could be that such projects offer firms private benefits that do not accrue to the project.

failure. Consequently, from a welfare perspective, lending volume can be excessive. The purpose of the capital requirements is to give banks an incentive to take this externality into consideration.

THE CENTRAL BANK AND THE SUPERVISORY AUTHORITY HAVE DIFFERENT LOSS FUNCTIONS

The main objective of monetary policy is to maintain price stability. The Riksbank has specified this as a target for inflation of two per cent. At the same time as monetary policy is aimed at attaining the inflation target, it is also to support the objectives of sustainable growth and high employment. This is achieved, in addition to stabilising inflation around the inflation target, by striving to stabilise output and employment around long run sustainable paths. In the model this can be formulated as a (quadratic) loss function that the central bank aims to minimise,

$$(1) \qquad L_t^{CB} = 0.5(r_t - r_{t-1})^2 + (\pi_t - \overline{\pi})^2 + (y_t - \overline{y})^2,$$

where L_t^{CB} denotes the central bank's loss during period t, π_t denotes inflation, $\overline{\pi}$ denotes the inflation target, y_t denotes output, and $\overline{y}$ denotes the long run output level. Hence, the difference, $y_t - \overline{y}$, is the output gap. In addition to targets for price stability and macroeconomic stability, in the form of the output gap, there is also a target for the change in the policy rate, $r_t - r_{t-1}$, with a weight of 0.5. This term is included in order to avoid excessive fluctuations in the policy rate, which would not be consistent with how a central bank normally varies the policy rate. A loss function for the Swedish economy along these lines can also be found in Adolfson et al. (2011).

It is more difficult to specify a loss function for the supervisory authority than for the central bank. Promoting a stable financial system is largely a matter of avoiding events that have a low probability of occurring but which may entail major costs when they do occur. This is difficult to capture in terms of a few values in a quadratic loss function. Moreover, because macroprudential policy is a relatively new policy area, experience of how it works in practice and how a loss function should be specified is limited. Nor is there a definite target for financial stability even though the credit gap is frequently used as an indicator of systemic risks. The Basel Committee on Banking Supervision has also proposed that this measure should serve as a key input when the level of the countercyclical capital buffer is determined, see Juks (2013) for a discussion. Consequently, we let the credit gap be one of the target variables in the supervisory authority's loss function.

The loss function also includes measures of the banks' capital ratio; that is, the capital-to-asset ratio.[9] Both the change in the capital ratio as well as the capital ratio's deviation from the long run level is included. The change in the capital ratio is included for the same

9 Formally, the capital-to-asset ratio is defined as bank capital in relation to risk-weighted assets. The risk weights should reflect the risks inherent in bank lending. Consequently, bank lending is multiplied by the risk weight, resulting in a risk-weighted amount, which is the amount that becomes subject to the capital requirement. In this analysis, however, we disregard risk weights.

reason as the change in the policy rate is included in the central bank's loss function. Normally, the countercyclical capital buffer can exceed the long run level by a maximum of 2.5 percentage points. The model can capture this fact in a simple manner – at least as long as the shocks are not excessive – by including the capital ratio's deviation from the long run level in the loss function. Formally, the supervisory authority minimises the following (quadratic) loss function,

$$(2) \qquad L_t^{SA} = (k_t - k_{t-1})^2 + (k_t - \overline{k})^2 + (l_t - \overline{l})^2,$$

where L_t^{SA} denotes the supervisory authority's loss. The capital-to-asset ratio is denoted by k_t while $\overline{k}$ denotes the long run level, which may be interpreted as the minimum requirement in Basel III. The credit-to-output ratio is denoted by l_t and $\overline{l}$ denotes the long run level. Hence, the difference, $l_t - \overline{l}$, is the credit gap.

The two loss functions specify only the authorities' objectives. Hence, they provide no guidance how the policy rate or the capital buffer changes if, for example, inflation begins to rise or indebtedness gains momentum. To find out this, the authorities' policy rules must be calculated, which can be done in several ways. One approach is to calculate the optimal policy rules that minimise the loss functions. This gives rise to complex rules that depend on a number of different variables and circumstances in many cases. To avoid this, we instead calculate so called optimised policy rules that only depend on a limited number of variables.

We assume that the central bank can react to three variables in its policy rule: deviations from the inflation target, the output gap and the credit gap. The credit gap is included to illustrate the degree to which the central bank takes financial imbalances into account. Note that despite the absence of financial imbalances in the loss function, it can still be optimal to react to them. The central bank selects the parameters γ_y and γ_l in the following policy rule to minimise its loss function,[10]

$$(3) \qquad r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + \gamma_y(y_t - \overline{y}) + \gamma_l(l_t - \overline{l}),$$

where $\overline{r}$ denotes the policy rate's long run level. The supervisory authority is assumed to only be able to react to the credit gap. It minimises its loss function by selecting μ_l in the following policy rule,

$$(4) \qquad k_t = \overline{k} + \mu_l(l_t - \overline{l}).$$

The parameters γ_y and γ_l in the central bank's policy rule indicate the degree to which it adjusts its policy rate to changes in the output and credit gaps. If, all other things being equal, the output gap increases by one per cent, the central bank raises the policy rate by γ_y percentage points and similarly, if, all other things being equal, the credit gap increases by one percentage point, the policy rate is raised γ_l percentage points. The parameter value μ_l in the supervisory authority's policy rule indicates the degree to which the capital

10 The central bank's weight on the deviation from the inflation target is set at 1.5, which is in line with what is referred to as the Taylor rule, see Taylor (1993). Accordingly, we estimate the optimal weights on the output gap and the credit gap, given the weight on the deviation from the inflation target.

buffer is adjusted to changes in the credit gap. A key feature of the analysis concerns the selection of the optimised values for γ_y, γ_l and μ_l. These values will depend on the economic relationships in the model but also on the particular shocks driving the fluctuations in the economy.

The model is calibrated to fit Swedish data. The inflation target is set at two per cent and the long run level for the capital requirement is set at the currently prevailing minimum value of ten per cent. We assume that the firms adjust their prices once a year on average, which is in line with the conclusions of Apel et al. (2005). A number of key parameter values have been adopted from Christiano et al. (2011), who estimated a similar model on Swedish data.

The business cycle effects of macroprudential policy

A linkage between monetary and macroprudential policies involves the business cycle effects of macroprudential policy on demand and inflation. Monetary policy needs to take these effects into account, just like it needs to take the business cycle effects that arise in other parts of the economy into account.

HOW DO THE BUSINESS CYCLE EFFECTS OF MACROPRUDENTIAL POLICY AFFECT MONETARY POLICY?

The countercyclical capital buffer influences the banks' funding cost, since funding activities using capital is in many cases more costly than using loans. In turn, the funding cost affects bank lending rates and lending volumes. Normally, a higher capital buffer raises the funding cost and reduces the lending, leading to a decline in the firms' possibilities to finance new investments. A downturn in investments tends to inhibit both demand and inflation.

The transmission of monetary policy also works through the financial markets. A major part of bank lending is funded via short-term loans. Among other effects, the policy rate influences the overnight rates that the banks apply when they lend and borrow from each other from one day to the next. Thus, changes in the policy rate affect the banks' funding cost and the credit volumes in the economy. A rise in the policy rate typically slows demand and dampens inflationary pressure.

An insight in economic theory is that relationships or correlations among economic variables depend on the particular shocks driving the fluctuations. This suggests that it is important to identify the driving forces in order to analyse the implications for monetary policy of introducing the capital buffer. It also suggests that it will be difficult to predict how monetary policy will respond, since we do not know the nature of future shocks to the economy.[11]

11 How the introduction of different macroprudential tools may affect monetary policy is also discussed in "Macroprudential policy and monetary policy" in the Monetary Policy Report (2013).

We study the effects of introducing the capital buffer given two different shocks. The first is a shock that affects the firms' production possibilities or more precisely the productivity. Hence, it affects the supply of goods and services in the economy and is therefore referred to as a "supply shock".[12] The second shock affects public sector consumption. We refer to this shock as a "demand shock", since it affects the use of, or demand for, the economy's resources. These two shocks have different effects on the relationship between the output gap and the credit gap. A supply shock gives rise to a positive correlation between these variables, whereas a demand shock leads to a negative correlation. This will be an important factor for understanding the results that we present below.

We begin by illustrating a scenario in which the fluctuations in the economy are driven by supply shocks. The central bank follows a simple policy rule à la Taylor,[13]

$$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.12(y_t - \overline{y}), \tag{5}$$

while the supervisory authority follows an optimised policy rule,

$$k_t = \overline{k} + 0.57(l_t - \overline{l}). \tag{6}$$

The weight 0.57 on the credit gap is the value that minimises the supervisory authority's loss function when the central bank follows the Taylor rule.

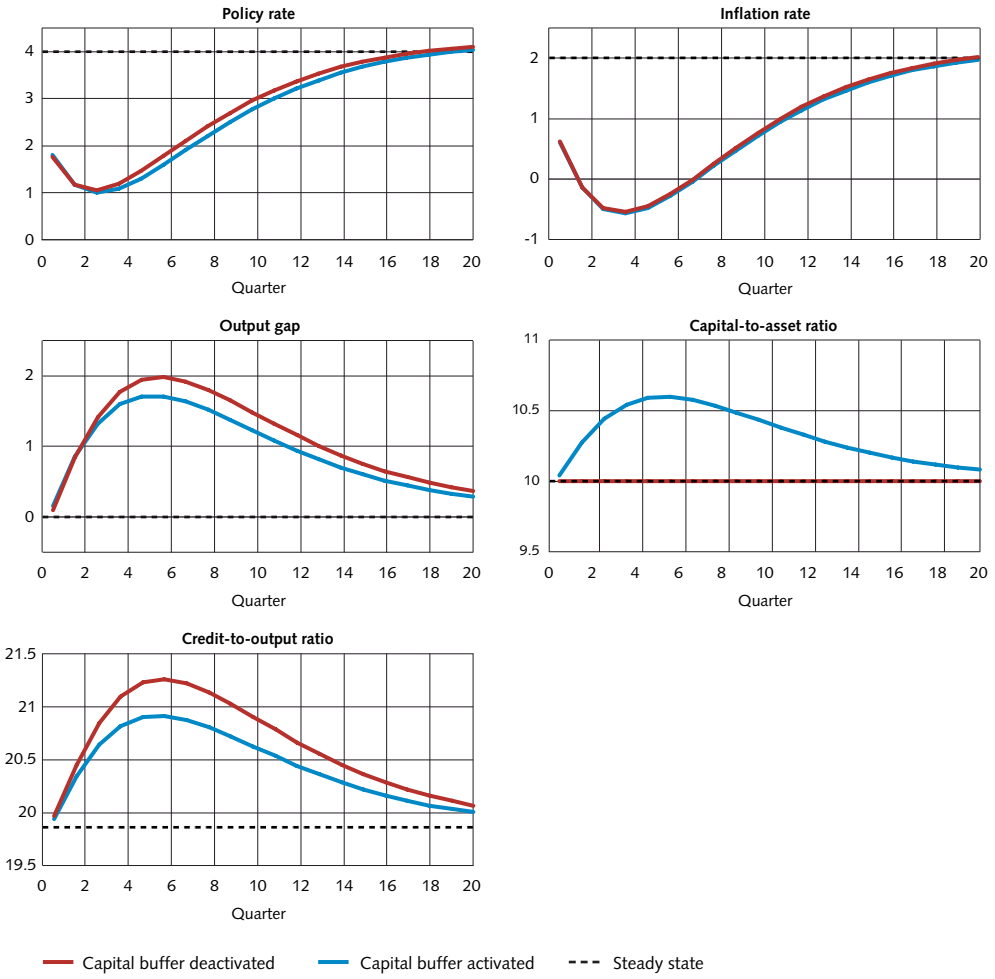
Figure 1 shows the effects of a temporary positive supply shock. The red line shows the case when the capital buffer is deactivated and the blue line when it is activated. Hence, the difference between the red and blue lines shows the effects of introducing the capital buffer.

The firms raise output in response to the improvement in productivity and thus the output gap increase. The improvement in productivity also reduces firm's marginal cost and prices are therefore cut. It also becomes more profitable to invest and, since the investments are financed through borrowed funds, the credit gap expands.

12 In the academic literature this shock is usually referred to as a technological shock.

13 Note that in this section, the central bank does not optimise the parameters in its policy rule but instead follows a simple Taylor rule, see Taylor (1993). The Taylor rule is a benchmark regarding how monetary policy should be pursued under normal circumstances, see Plosser (2008). The Taylor rule has also proved to work well in many different models, which is also discussed in Plosser's speech. However, in the section entitled "The trade-off between the different objectives for monetary and macroprudential policies" both the central bank and the supervisory authority optimise the parameters in their policy rules.

Figure 1. Effects of introducing a countercyclical capital buffer: responses to a positive supply shock
Percentage points respectively percentage deviation from steady state (output gap)



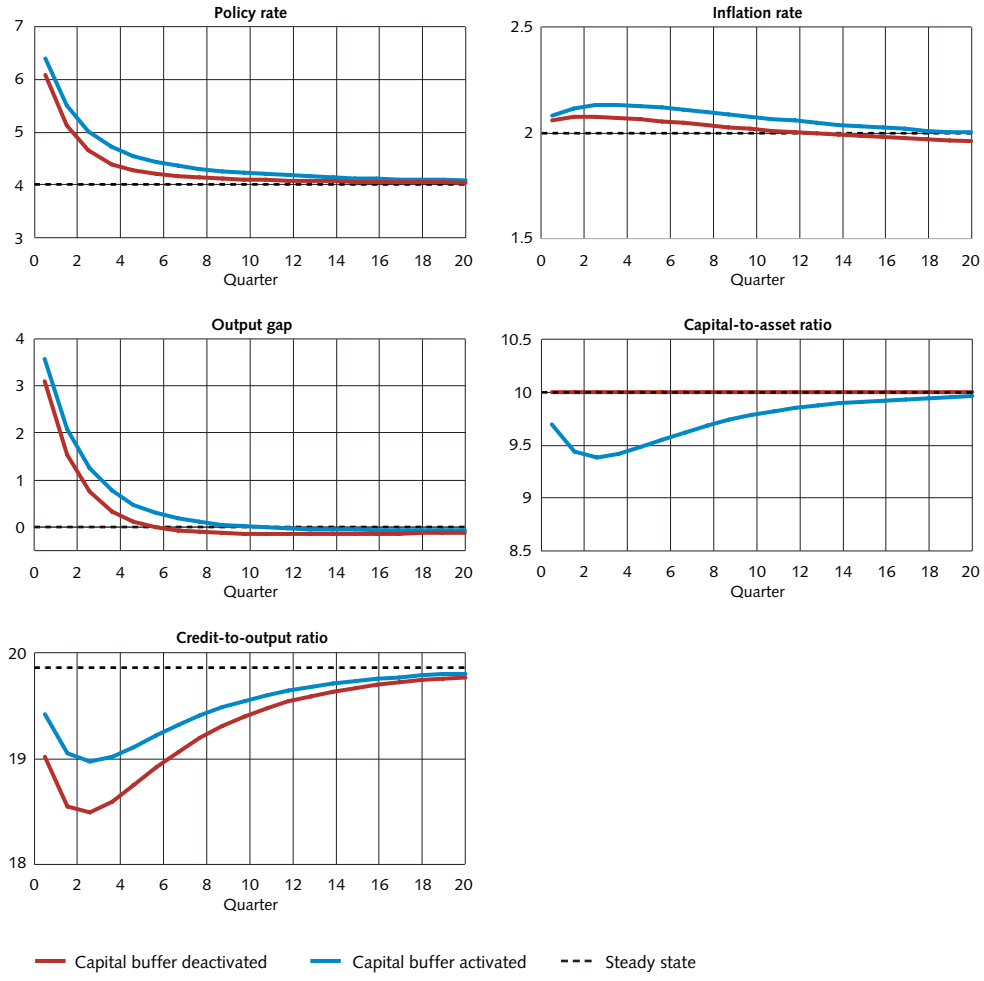
How do the two authorities respond to such a development? The central bank has an inflation target and reduces the policy rate in order to move inflation back towards the target. The supervisory authority responds to the rising credit gap by raising the capital buffer. The higher capital buffer mitigates the upturn in both the credit gap and output gap. However, it has little impact on inflation, since inflation is primarily determined by monetary policy. Thus, the capital buffer's business cycle effects have a limited impact on monetary policy in this scenario.

Next we show what happens if the economy is instead hit by demand shocks. We assume that the central bank follows the same Taylor rule. The supervisory authority's optimised weight on the credit gap is slightly higher in this case,

$$k_t = \overline{k} + 0.69\,(l_t - \overline{l}\,). \tag{7}$$

Figure 2 shows that a temporary rise in demand, in the form of higher public sector consumption, drives up total output and the output gap. But higher public consumption also crowds out investments, which means that the demand for credit falls, leading to a fall in the credit gap. The central bank attempts to counter the rising output gap by raising the policy rate while the supervisory authority reduces the capital buffer to increase the credit gap. An indirect effect of the supervisory authority's action is that the output gap tends to increase even more. To counteract this, the central bank raises the policy rate to an even higher level. Thus, in this scenario the introduction of a capital buffer means that the central bank is more active in using the policy rate.

Figure 2. Effects of introducing a countercyclical capital buffer: responses to a positive demand shock
Percentage points respectively percentage deviation from steady state (output gap)



These two scenarios show that the implications for monetary policy of introducing a countercyclical capital buffer will depend on the nature of the shocks underlying the fluctuations in the economy. But they also illustrate a more general macroeconomic principle, namely, that relationships between different variables cannot generally be described by simple rules of thumb.

MONETARY POLICY MAY MITIGATE FINANCIAL IMBALANCES IN A SIMILAR WAY AS THE COUNTERCYCLICAL CAPITAL BUFFER

Both monetary policy and the countercyclical capital buffer work via the financial markets and may therefore have similar effects on the economic development. Hence, monetary policy may mitigate financial imbalances in a similar way as the capital buffer. We show that this is the case when the economy is driven by supply shocks. In this context, financial imbalances refer to the credit gap and the lending gap (deviations of lending from the long run level).

We compare three different policy regimes. The first two are the same as those described in the previous section. In the **first regime**, which is our reference regime, neither the central bank nor the supervisory authority attribute any weight on fluctuations in financial imbalances. The central bank follows a simple Taylor rule,

$$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.12(y_t - \overline{y}). \quad (8)$$

The supervisory authority deactivates the capital buffer and accordingly does not assign any weight on fluctuations in financial imbalances,

$$k_t = \overline{k}. \quad (9)$$

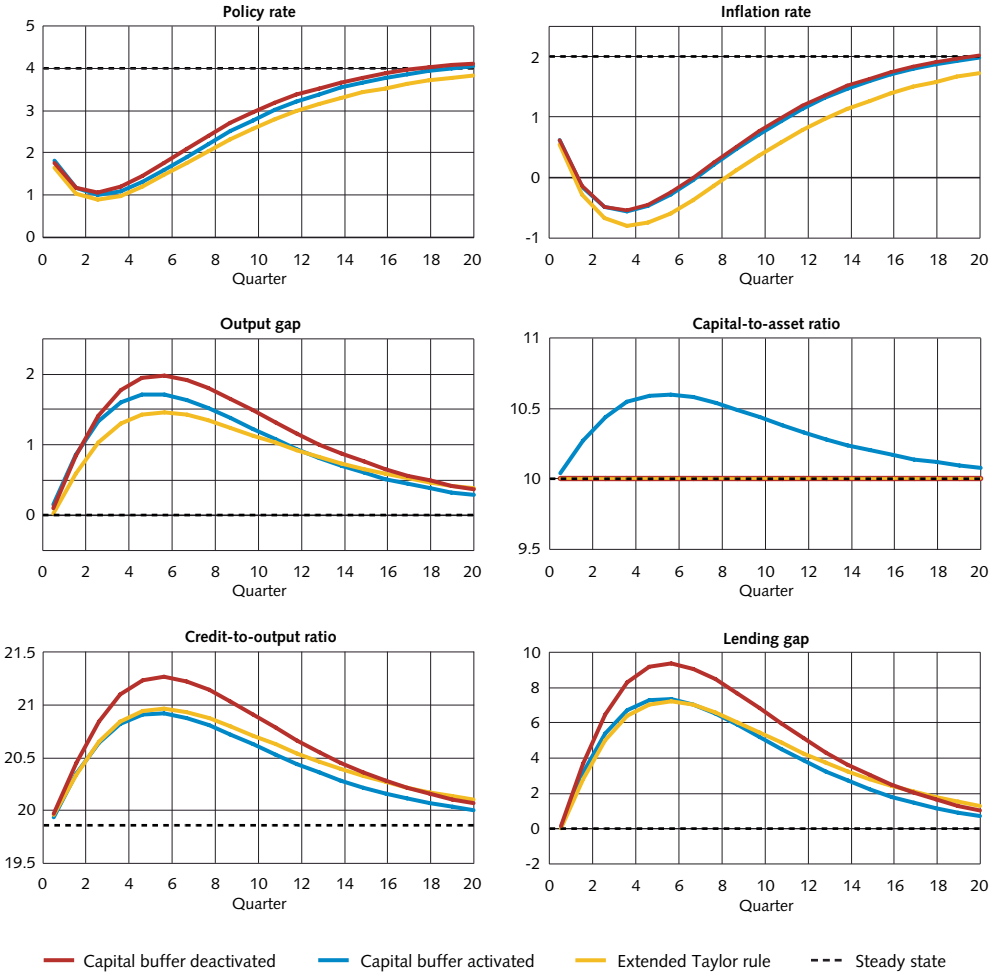
The red line in Figure 3 shows the responses to a temporary supply shock. The basic mechanisms are the same as those in the previous section. The firms' productivity rises and their costs fall, leading to higher output and lower inflation. Lending rises to finance new investments. This leads to positive credit and lending gaps.

In the **second regime**, the central bank still follows the Taylor rule, while the supervisory authority activates the capital buffer. Thus, the supervisory authority takes fluctuations in financial imbalances into account in terms of the credit gap. The optimised policy rule is the same as in the previous section,

$$k_t = \overline{k} + 0.57(l_t - \overline{l}). \quad (10)$$

The capital buffer is raised in an effort to counter the rising credit gap, see the blue line in Figure 3. Financial imbalances in terms of both the credit gap and the lending gap are thus mitigated compared with the reference regime. The output gap is also reduced. However, the impact on inflation resulting from the higher capital buffer is minor.

Figure 3. Monetary policy may mitigate financial imbalances in a similar way as the countercyclical capital buffer: responses to a positive supply shock
Percentage points respectively percentage deviation from steady state (output gap and lending gap)



In the **third regime**, the central bank follows an extended Taylor rule, which in this case means that it also assigns a weight on the credit gap. We assume that the weight on the credit gap is the same as that assigned to the output gap,

(11) $$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.12(y_t - \overline{y}) + 0.12(l_t - \overline{l}).$$

The supervisory authority, however, deactivates the capital buffer,

(12) $$k_t = \overline{k}.$$

Consequently, the central bank takes fluctuations in financial imbalances into account while the supervisory authority does not, see the yellow line in Figure 3. The increases in the credit and lending gaps are mitigated compared with the reference regime and are

essentially equivalent to those in the second regime. The effects on the other variables also resemble those of the second regime, although the output gap rises a little less and inflation falls slightly more. The greater impact on inflation is due to relatively less weight on the inflation target in the central bank's policy rule. Hence, a cost of mitigating financial imbalances using monetary policy is that the deviations from the inflation target may be higher.

Each economic model illustrates certain economic relationships and mechanisms while disregarding others. Consequently, when interpreting results from a model, it is important to also take into account of what is not in the model. For example, a factor that is not dealt with in this scenario is that raising the capital buffer strengthens the banks' capital position, thereby enhancing their resilience to new shocks in a manner that is not generally achieved by a rise in the policy rate.

The trade-off between the different objectives for monetary and macroprudential policies

In many cases the objectives of monetary and macroprudential policies complement each other. Monetary policy that stabilises both inflation around its target and the output gap promotes stability in the financial system. Conversely, a stable financial system facilitates the monetary policy's possibilities to achieve price and macroeconomic stability. However, the objectives of the two policy areas – price stability, macroeconomic stability and financial stability – are not independent of each other. Trade-offs may therefore arise in certain cases; that is, the monetary policy may prefer a tightening of the economy while the macroprudential policy advocates a more expansive approach, or vice versa. These trade-offs typically arise when the objectives move in different directions.

A scenario in which a trade-off could arise is if inflation falls while the output and credit gaps rise. We have seen that this scenario occurs when the fluctuations are driven by supply shocks. For the central bank, this gives rise to a trade-off between stabilising deviations from the inflation target and the output gap. The central bank's main focus is to bring inflation back towards the target, leading to a cut in the policy rate. Meanwhile, the supervisory authority raises the capital buffer in response to the positive credit gap. As a result, a trade-off arises, since the central bank prefers an expansive policy in its efforts to stabilise inflation around its target while the supervisory authority prefers a restrictive policy in order to stabilise the credit gap.

Another scenario that also could result in a trade-off is one in which inflation is close to the target while the output gap is rising and the credit gap is falling. This scenario occurs when changes in demand are driving the fluctuations. Rising demand, in the form of higher public consumption, increases the output gap, but crowds out investments. A decline in investment demand dampens the credit gap. The rising output gap prompts the central bank to tighten monetary policy, while the falling credit gap induces the supervisory authority to a more expansive policy.

COORDINATION COULD RESULT IN MORE SUBDUED FLUCTUATIONS IN THE OUTPUT AND CREDIT GAPS

From a welfare perspective, it is usually desirable to coordinate decisions when a trade-off arises among the objectives of different authorities. This means that the authorities consider the impact of their decisions on the objectives of the other authority. This may take various forms. The decisions could, for example, be brought together under the auspices of a single authority or some form of joint decision-making could be introduced that actively weighs the different objectives against each other. In the model, coordination implies that the loss functions for the central bank and supervisory authority are combined into an aggregated loss function. Each authority thus minimises the joint loss function, L_t^{TOT},

(13) $$L_t^{TOT} = L_t^{CB} + L_t^{SA}.$$

Coordination can be compared with a non-coordination case. If the decisions are not coordinated, each authority minimises its own loss function, given the other's policy rule. In other words, how the other authority acts is taken into account but how one's own policy impacts on the objectives of the other authority are not accounted for.

We first show how a trade-off between the objectives of the central bank and the supervisory authority can influence their policy rules in the event of supply shocks. When decisions are coordinated, the authorities select the parameter values in their policy rules to minimise the joint loss function, L_t^{TOT}. This gives rise to an individual policy rule through which each authority considers the effects of its own decisions on the objectives of the other authority. The central bank's optimised policy rule is,

(14) $$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.76(y_t - \overline{y}) + 0.08(l_t - \overline{l}),$$

while the supervisory authority's policy rule is,

(15) $$k_t = \overline{k} + 0.93(l_t - \overline{l}).$$

Without coordination the central bank's policy rule is,

(16) $$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.68(y_t - \overline{y}) + 0.06(l_t - \overline{l}),$$

while that for the supervisory authority is,

(17) $$k_t = \overline{k} + 0.49(l_t - \overline{l}).$$

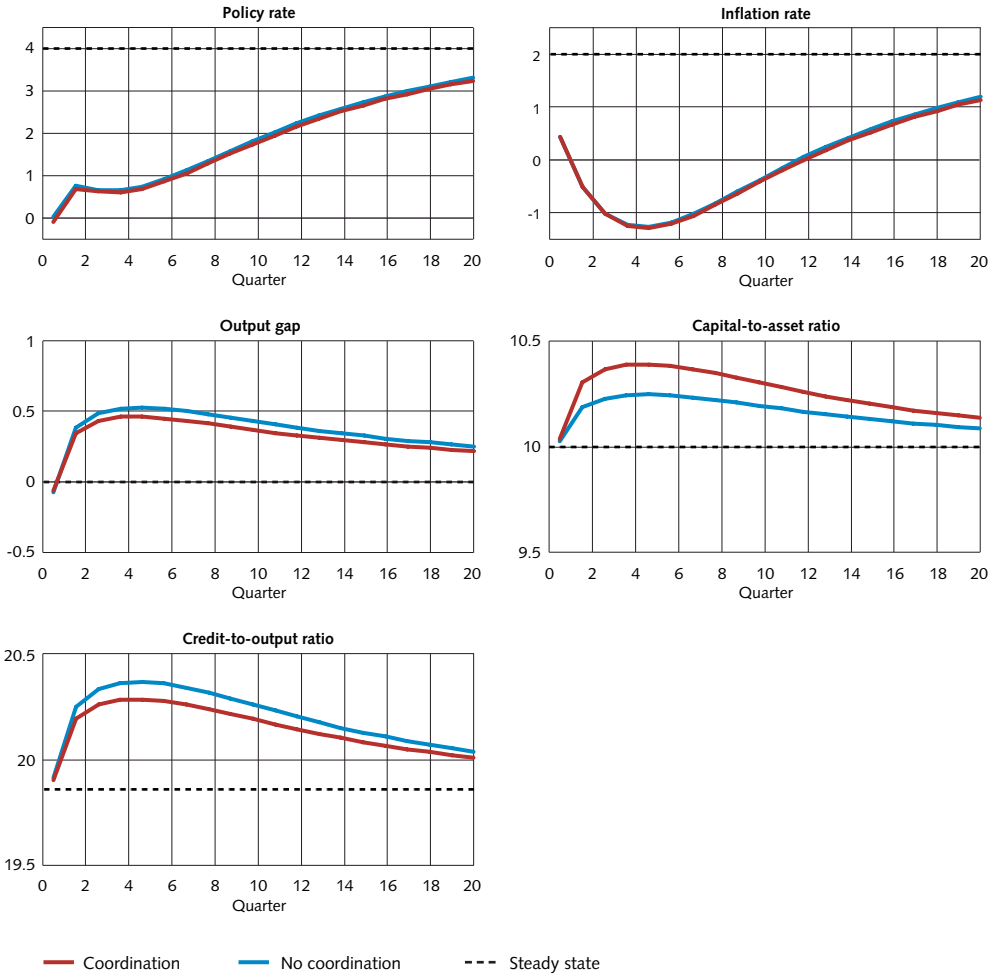
The central bank attaches a somewhat higher weight on the output gap when the decisions are coordinated than when they are not; that is, 0.76 compared with 0.68. Under coordination the credit gap is part of the central bank's loss function and since the credit gap and the output gap move in the same direction, a higher weight on the output gap reduces fluctuations in both gaps. Consequently, there is no trade-off between stabilising the credit gap and the output gap. The weight assigned to the credit gap is also slightly higher when the decisions are coordinated. However, the central bank cannot assign

excessively high weights to the two gaps because that would result in too much variation in the inflation rate.

Neither does a trade-off between stabilising the credit and output gaps arise for the supervisory authority when the decisions are coordinated. The supervisory authority almost doubles the weight on the credit gap, 0.93 when the decisions are coordinated compared with 0.49 without coordination. That the supervisory authority can raise the weight to such an extent is because the capital buffer does not affect inflation to the same degree as monetary policy.

Figure 4 shows the effects of a temporary increase in the supply when the authorities follow the optimised policy rules (14)-(17). The red line shows the coordinated case while the blue line shows the non-coordinated case. Fluctuations in the output and credit gaps are reduced when the decisions are coordinated. This is because the central bank assigns a

Figure 4. Effects of coordinating the decisions: responses to a positive supply shock
Percentage points respectively percentage deviation from steady state (output gap)



higher weight on both gaps and that the supervisory authority attributes a higher weight on the credit gap when the decisions are coordinated. However, the stabilisation of the two gaps occurs at the expense of higher fluctuations in the capital buffer. Nonetheless, in terms of welfare, the more subdued fluctuations in the output and credit gaps outweigh the higher fluctuations in the capital buffer.

COORDINATION COULD ALSO RESULT IN MORE SUBDUED FLUCTUATIONS IN THE TOOLS

In the following scenario, we show how a trade-off between the authorities affects the policy rules when the fluctuations are instead driven by demand shocks. When the decisions are coordinated, the policy rule for the central bank is,

(18) $$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.20(y_t - \overline{y}) + 0.04(l_t - \overline{l}),$$

and for the supervisory authority it is,

(19) $$k_t = \overline{k} + 0.00(l_t - \overline{l}).$$

Without coordination, the policy rule for the central bank is,

(20) $$r_t = \overline{r} + 1.5(\pi_t - \overline{\pi}) + 0.38(y_t - \overline{y}) + 0.00(l_t - \overline{l}),$$

and for the supervisory authority it is,

(21) $$k_t = \overline{k} + 0.47(l_t - \overline{l}).$$

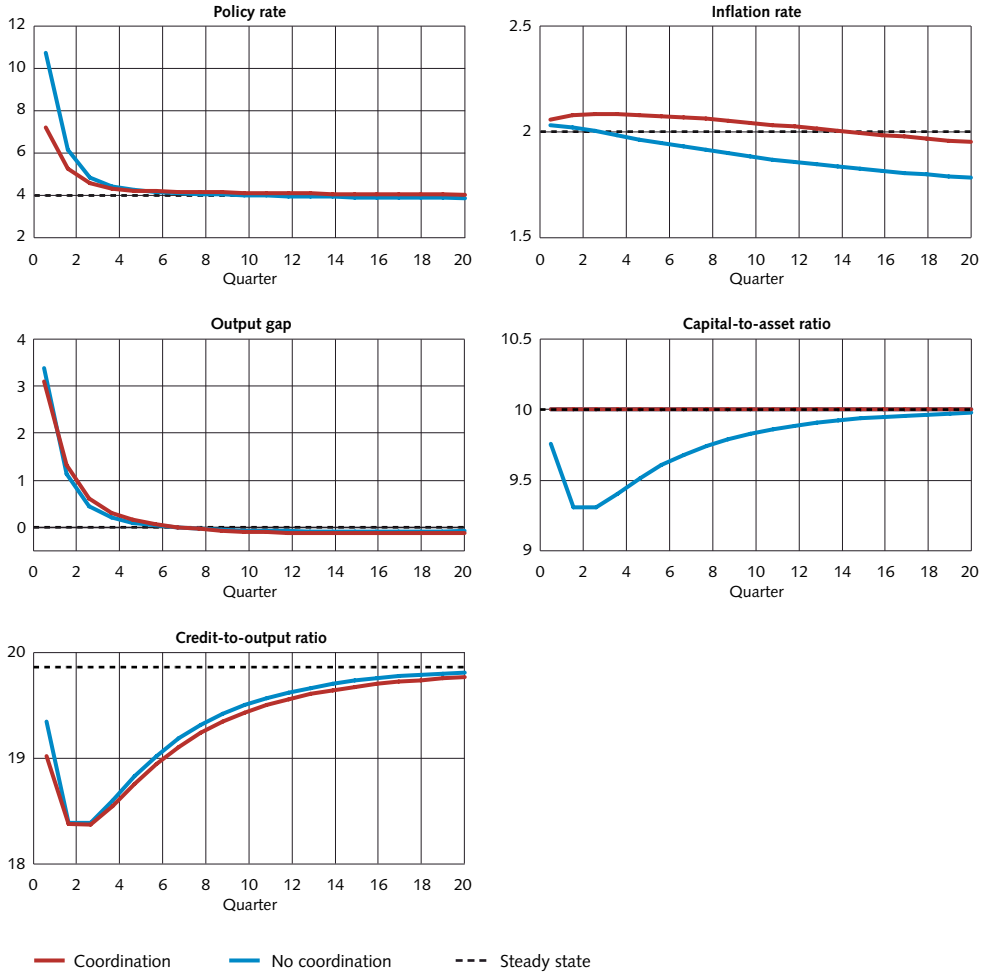
The central bank assigns a slightly lower weight on the output gap when the decisions are coordinated in this scenario, 0.20 compared with 0.38. This is because if the central bank attempts to mitigate a rise in the output gap by raising the weight on the output gap, the credit gap will fall even more. The central bank takes this into account when the decisions are coordinated. In the trade-off between stabilising the output gap and the credit gap, slightly higher fluctuations are permitted in the output gap in a bid to reduce the fluctuations in the credit gap. The central bank assigns a small weight on the credit gap if the decisions are coordinated which, per se, tends to stabilise the credit gap at the expense of the output gap.

The supervisory authority is faced with a similar trade-off when the decisions are coordinated. If, for example, it raises the capital buffer to mitigate a positive credit gap, the decline in the output gap is amplified. The supervisory authority takes this into account and, thus, does not assign any weight on the credit gap.[14] On the other hand, if the decisions are not coordinated it is optimal for the supervisory authority to assign a positive weight on the credit gap, since in this case it does not take into account the negative effects on the output gap.

14 The supervisory authority (and the central bank) cannot assign negative weights on the credit gap in the policy rules.

Comparing the central bank's policy rules in this section with the ones in the previous section, we see that the weights are smaller on the output and credit gaps and this applies irrespective of whether or not the decisions are coordinated. This also applies to the supervisory authority as it puts a smaller weight on the credit gap in this section. This can be understood as follows. The actions taken by the authorities tend to counteract each other's objectives in the event of demand shocks but support each other's objectives when supply shocks are the driving force. If, for example, the central bank attempts to mitigate a rise in the output gap by raising the policy rate in response to a demand shock, this would result in a further decline in the credit gap. The supervisory authority would then reduce the capital buffer even more to increase the credit gap, which at the same time would tend to increase the output gap. Hence, the central bank's possibilities to stabilise the output gap is countered by the supervisory authority's actions. The opposite applies in the

Figure 5. Effects of coordinating the decisions: responses to a positive demand shock
Percentage points respectively percentage deviation from steady state (output gap)



case of supply shocks. If the central bank attempts to mitigate a rise in the output gap by pursuing a tighter policy, this would be facilitated by the supervisory authority attempting to conduct a more restrictive policy to narrow the credit gap. Consequently, it is optimal to assign a higher weight on the output gap (and the credit gap) when the authorities' actions support each other's objectives. A similar story can also explain why the supervisory authority assigns a higher weight on the credit gap in response to supply shocks than to demand shocks.

Figure 5 shows the effects of the optimised policy rules, (18)-(21), following a temporary increase in demand. The fluctuations in the output and credit gaps are not notably reduced when the decisions are coordinated. However, the fluctuations in inflation become more subdued in the event of coordination. This is due to the central bank's relatively higher weight on stabilising deviations from the inflation target when the decisions are coordinated. Fluctuations in the policy rate and the capital buffer are also reduced when the decisions are coordinated. Consequently, welfare is higher when decisions are coordinated, since fluctuations in the policy rate, the capital buffer and inflation are more subdued, while fluctuations in the output and credit gaps remain approximately unchanged.

Summary and concluding comments

We have studied the linkages between monetary and macroprudential policies, by means of a dynamic general equilibrium model. A countercyclical capital buffer has been used to exemplify macroprudential policy. The primary objective of macroprudential policy is to increase the resilience of the financial system to shocks. However, the tools for macroprudential policy may also affect business cycle fluctuations. Monetary policy has to take this into account, but how and to what extent depends on a number of factors. The nature of the shocks driving the economic fluctuations is one such factor, which has been the focus of this analysis.

We have shown that when the economy is driven by supply shocks, the introduction of a countercyclical capital buffer does not affect monetary policy to any major degree. However, in the event of demand shocks, variations in the capital buffer may require a more resolute monetary policy response. This illustrates one reason why it is difficult to foresee the consequences for monetary policy from introducing the capital buffer. It also illustrates a more general macroeconomic principle, namely, that relationships between different variables cannot generally be described by simple rules of thumb.

Both monetary policy and the countercyclical capital buffer work through similar channels and have similar business cycle effects. Hence, the impact of both policy areas on financial imbalances may also resemble each other. We have shown that this is the case when the economy is driven by supply shocks.

The linkages between monetary and macroprudential policies have also been studied on the grounds of policy objectives, such as price stability, macroeconomic stability and

financial stability. These objectives are not independent of each other. A key question is therefore what the welfare effects will be if the central bank and the supervisory authority coordinate their decisions. Again, the answer to this question depends on the nature of the shocks driving the fluctuations. In cases in which the output gap and the credit gap move in the same direction, as in the event of supply shocks, coordination leads to more subdued fluctuations in these variables. In the case of demand shocks, the output and credit gaps move in opposite directions, coordination does not offer any major benefits in terms of more muted fluctuations in these particular variables. However, the two authorities do not need to act quite as forcefully to achieve this, which reduces the degree of uncertainty in the authorities' tools and increases welfare.

As yet, there are few academic articles – theoretical or empirical – that study the linkages between monetary and macroprudential policies. However, Angelini et al. (2012) is a recent study that has attempted to quantify the welfare effects of coordinating monetary policy and macroprudential policy, in the form of a countercyclical capital buffer. They have a model that resembles ours but it also includes a housing sector, which means that households are not only lenders but also borrowers. Among other things they find that there may be substantial welfare gains from coordination when shocks hit financial markets. Another recent study, Christensen et al. (2011), shows that the countercyclical capital buffer could play a positive role in terms of stabilising fluctuations in the economy, and notably so when they are due to changes in the banks' capital. The study also illustrates how the central bank's reaction could influence the positive effects of the capital buffer. These studies are relatively technical. For less technical and perhaps more easily comprehensible studies, see, for example, IMF (2012), Smets (2013), Svensson (2012) and Woodford (2012).

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Short-term funding in foreign currency by major Swedish banks and their use of the short-term currency swap market

Ida Hilander*

The author works at the Riksbank's Financial Stability Department.

The major Swedish banks' short-term wholesale funding is conducted almost exclusively in foreign currency. Instead of issuing short-term securities directly in Swedish krona (SEK), the banks have opted to convert part of their foreign funding to SEK on the currency swap market so as to finance SEK-denominated assets. Thus in this article, we study why the banks have acted in this manner. We study the banks' counterparties in short-term currency swaps and the motives of these players for using currency swaps. We also describe the resulting risks for the banks and their counterparties from the use of short-term currency swaps.[1]

In the article, we conclude that one of the reasons that the major banks[2] choose to issue foreign currency and convert it to SEK on the currency swap market is that their clients demand foreign currency to finance and currency hedge foreign assets. Because the banks exchange foreign currency for SEK with their clients via currency swaps, the clients gain access to their requisite foreign funding while the banks gain access to funding in SEK. For a protracted period, it has also been less costly for the banks to fund their short-term SEK requirements in this manner rather than issue SEK directly on the capital market.

By studying how foreign assets and liabilities are distributed among various players in the Swedish economy, we identify the players who may need to currency hedge foreign assets using currency swaps. Proceeding on this basis, we can conclude that financial institutions, primarily life insurance and pension companies, are the types of players with the greatest need for currency hedging.

We also state that these companies expose themselves to a refinancing risk because they use short-maturity swaps although they invest in long-term assets. These risks could be reduced through improved maturity matching between swaps and foreign assets. Such a change could also result in life insurance and pension companies being able to act more

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1 This article represents part of a survey of the Swedish currency swap market that commenced in 2011. The previous part focused primarily on how Swedish banks use long-term currency swaps to convert long-term funding in foreign currency to Swedish krona. Refer to Eklund, Milton and Rydén (2012).

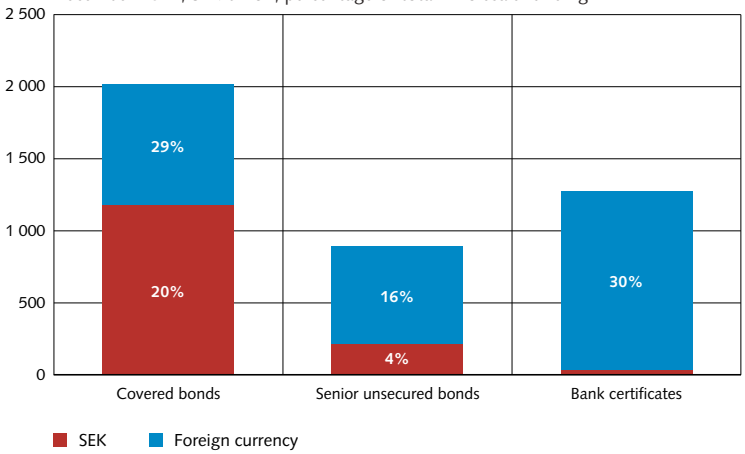
2 The major banks refer to Handelsbanken, Nordea, SEB and Swedbank.

prominently as counterparties to the major banks in the long-term currency swaps that the latter use to fund Swedish mortgage loans through covered bonds in foreign currency. The banks would then have less need to turn to foreign banks to conclude long-term currency swaps; and this could also partly diminish the need for short-term foreign funding in the Swedish economy.

The major Swedish banks funding in foreign currency

The major Swedish banks fund their assets partly through deposits and partly by issuing bonds and bank certificates on the financial markets. Of the total funding of the four major Swedish banks, wholesale funding accounts for approximately half, of which some 75 per cent consists of funding in currencies other than SEK (see Figure 1).

Figure 1. Wholesale funding by the major Swedish banks
December 2012, SEK billion, percentage of total wholesale funding



Sources: Bank reports and the Riksbank

The foreign currency-based wholesale funding of the major banks may be distributed among three categories (see also Figure 2). Firstly, the banks use foreign currency funding to fund part of their illiquid assets in foreign currency. These assets consist primarily of the lending conducted as part of the banks' foreign operations in, for example, the other Nordic countries. In addition, major Swedish enterprises often raise loans in foreign currency. This involves, inter alia, certain types of companies active in industries that have traditionally been closely linked to the US dollar (USD), such as shipping. Secondly, wholesale funding in foreign currency is used to fund liquid assets in foreign currency such as deposits in central banks and investments in foreign government bond holdings. These assets constitute a liquidity buffer that is included, inter alia, in the calculation of

the liquidity measure, LCR.[3] Finally, wholesale funding in foreign currency is also used to fund assets in SEK (see the blue rectangle in Figure 2). The Riksbank estimates that about 25 per cent of the major banks' foreign funding is used to fund Swedish assets. The banks use currency swaps to convert this funding to SEK, thus entailing that they conclude an agreement with a counterparty to exchange foreign currency for SEK over a predetermined period.[4]

Figure 2. Bank utilisation of wholesale funding in foreign currency

Source: The Riksbank

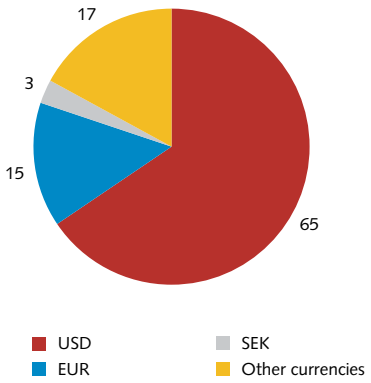
THE MAJOR BANKS' SHORT-TERM FUNDING IN FOREIGN CURRENCY

Bank certificates with a maturity of less than one year account for most of the short-term portion of the major banks' wholesale funding. Because the SEK-denominated certificate market is small, by far the largest share of Swedish banks' certificates outstanding is denominated in USD. Moreover, the major banks also issue certificates denominated in EUR and other currencies, including British pounds. At year-end 2012, certificates outstanding amounted to a value of SEK 1,300 billion, of which some 65 per cent was denominated in USD and 15 per cent in euro (EUR) (see Figure 3).

3 Liquidity Coverage Ratio (LCR) is a short-term liquidity measure defined by the Basel Committee entailing that banks must hold a sufficient liquidity buffer to cover outflows of liquidity throughout a predetermined stress period of 30 days.

4 For a more detailed explanation of how currency swaps function, see Appendix 1.

Figure 3. Bank certificates outstanding among the major Swedish banks, broken down by currency
December 2012, per cent



Note. The item "Other currencies" refers primarily to British pounds and Nordic currencies.

Sources: Bank reports and the Riksbank

It is no coincidence that the largest proportion of certificates outstanding of the major banks is denominated in USD; the US market for certificates emerged as early as the 1970s and has subsequently become the dominant market for these types of securities. US Money market funds are, inter alia, significant short-term funding counterparties for many banks. These funds manage substantial volumes deriving both from households and businesses and are essentially designed to function as conventional savings accounts. Consequently, they invest in interest-bearing assets in which the inherent risks are deemed as low, such as government securities and certificates issued by banks with a solid credit rating. Official regulations govern the funds' potential to assume interest rate, credit and liquidity risks.[5]

Accordingly, the money market funds accept only minor risks and consequently they can change their investment decisions promptly and exit from any market in which problems or uncertainty emerges. This occurred, inter alia, during the global financial crisis of 2008–2009 when US money market funds reduced their exposure to Europe, including Sweden, due to dwindling confidence in European banks. In pace with growing confidence in Swedish banks, the exposure of US money market funds to them regained impetus. At year-end 2012, the US money market funds' holdings of Swedish bank certificates corresponded to SEK 560 billion,[6] or to almost 70 per cent of the USD-denominated value of the major banks' certificates outstanding.

5 US money market funds are regulated by the Investment Company Act.
6 In certain cases, the money market funds elect to invest their resources as deposits with banks instead of purchasing certificates. Such deposits are included in the above total. Volumes and percentages according to Crane Data, Investment Company Institute and Fitch Ratings.

THE MAJOR SWEDISH BANKS HAVE A FUNDING SURPLUS IN FOREIGN CURRENCY

Since the major Swedish banks use part of their foreign wholesale funding to fund assets in SEK, it could be said that they have a funding surplus in foreign currency. Alternatively, this may be viewed as a funding deficit in SEK that is instead covered by means of foreign-currency funding. At the close of 2012, the four major Swedish banks had a total of some SEK 5,000 million in SEK-denominated assets, of which approximately SEK 600 billion was funded by the banks first issuing foreign currency on the capital markets and subsequently exchanging this for SEK on the currency swap market (see Table 1).

Table 1. Total assets in SEK and foreign currency of the major Swedish banks
December 2012, SEK billion

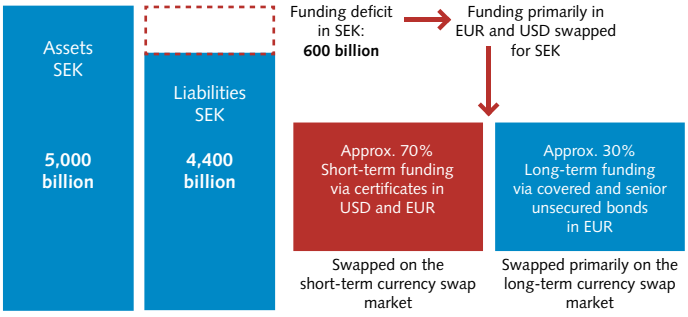
	SEK	FOREIGN CURRENCY
Assets	5 000	7 500
Liabilities	4 400	8 100
Funding surplus/-deficit	-600	600

Sources: Bank reports and the Riksbank

The Swedish banks issue foreign currency on the capital markets, both through long-term maturities by issuing bonds and through short-term maturities by issuing bank certificates (see Figure 1). Both long-term and short-term funding is used to a certain extent to fund SEK-denominated assets. The Riksbank estimates that some 30 per cent of the banks' funding surplus in foreign currency is made up of foreign currency bonds that are subsequently converted to SEK on the currency swap market (see Figure 4). In most cases, this involves covered bonds, notably in EUR, that the banks issue in order to fund Swedish mortgage loans. Currency swaps directly related to these operations frequently have long maturities.[7] The remaining 70 per cent of the funding surplus consists of short-term funding, denominated primarily in USD and EUR. This is subsequently swapped for SEK on the short-term currency swap market for use in the funding of Swedish assets. These assets could comprise, inter alia, corporate lending with short-term maturities and holdings of securities such as covered bonds. This article concentrates primarily on the short-term funding in foreign currency, which is converted to SEK using currency swaps (see the red area in Figure 4).

7 Read more about the long-term funding in foreign currency that is swapped for SEK in Eklund et al. (2012). A brief summary of this article is also enclosed in Appendix 2.

Figure 4. Aggregate use by major Swedish banks of currency swaps to fund assets in SEK



Note. The funding deficit in SEK matches the funding surplus in foreign currency.

Sources: Bank reports and the Riksbank

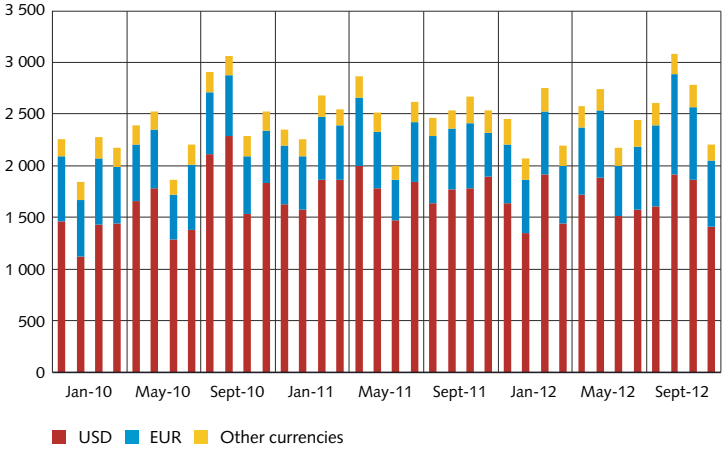
Breakdown of maturities, currencies and counterparties among short-term currency swaps undertaken by the major Swedish banks

Within the framework of this article, we have analysed data and conducted interviews in an effort to gain a deeper understanding of the configuration and functioning of the short-term currency swap market in Sweden. Interviews were made with the major Swedish banks and a number of non-financial enterprises and pension companies viewed as significant players on the Swedish currency swap market. The underlying data is based on information from the Riksbank's statistics on turnover (SELMA), as well as a compilation of data regarding the major Swedish banks' largest exposures and their most significant counterparties in currency swaps.

We noted earlier that the major Swedish banks use the currency swap market to convert foreign currency to SEK with an overall value of some SEK 600 billion. Of this amount, approximately 70 per cent is estimated to be funding converted to SEK using short-term currency swaps.[8] The statistics confirm that turnover on the Swedish market for short-term currency swaps is extensive. During the period 2010 to 2012, the monthly turnover of short-term currency swaps for the four major Swedish banks averaged more than SEK 2,500 billion (see Figure 5). This is considerable in relation to their funding deficit of SEK 600 billion and may be due to the fact that a significant share of the contracts has very short maturities. Approximately 50 per cent of the swap turnover among the major Swedish banks relates to overnight (o/n) or tomorrow next (t/n) maturities. The commonest maturity in this category is tomorrow next, entailing that a swap transaction commences one banking day after the parties conclude the swap agreement and is settled on the next banking day. As a result of the short maturities, such contracts are refinanced frequently, which in turn gives rise to a high monthly turnover.

8 Here, short-term currency swaps refer to swaps with a maximum maturity of one year. Short-term currency swaps are frequently referred to as *FX-swaps*.

Figure 5. Monthly turnover of Swedish short-term currency swaps for the major Swedish banks
SEK billion



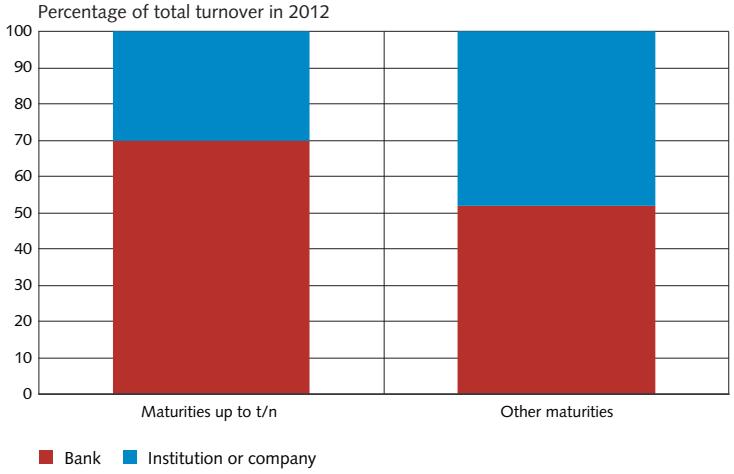
Note. The information in the diagram has been obtained from turnover statistics for Swedish currency swaps as reported to the Riksbank (SELMA). The underlying data has been limited to encompass swaps reported by Handelsbanken, Nordea, SEB and Swedbank. Thus, the diagram shows the total amount of swaps concluded by the major Swedish banks in which SEK has been bought or sold in exchange for other currencies. Figure 6 and Tables 2 and 3 are based on the same underlying data.

Source: The Riksbank (SELMA statistics)

When the major Swedish banks conclude currency swaps with overnight or tomorrow next maturities, other banks are the commonest counterparties (see Figure 6). One reason for this is that the banks use the shortest swaps to match their daily incoming and outgoing payments, that is, to manage cash flows. Short-term currency swaps with slightly longer maturities are frequently concluded with other types of counterparties. One explanation for this may be that these swaps relate in many cases to the bank clients' needs to borrow[9] foreign currency so as to currency hedge their foreign assets or cash flows and that this is usually done using slightly longer maturities.

9 The term "to borrow" a currency refers throughout the article to the receipt of a currency (spot) in a swap while simultaneously conveying another currency (selling a futures contract) during the course of the transaction's maturity.

Figure 6. Breakdown of counterparties in short-term currency swaps with various maturities
Percentage of total turnover in 2012



Note. The term "Other maturities" refers to maturities exceeding t/n but with a maximum of one year.

Source: The Riksbank (SELMA statistics)

Looking at the breakdown of currencies among the major Swedish banks' short-term currency swaps, transactions in which USD is swapped for SEK, or vice versa, account for the largest share of turnover (see Figure 5). This applies both to the absolutely shortest swaps and the slightly longer instruments. It is not surprising that USD swaps account for the largest percentage of turnover, since the major share of short-term wholesale funding by the banks also is conducted in USD. Statistics on turnover also indicate that other banks are the most common counterparties for the major Swedish banks in USD swaps (see Table 2). The major Swedish banks undertake some swaps with each other, but the foremost counterparties are foreign banks. As mentioned earlier, however, it should be noted that swaps undertaken among banks frequently have very short maturities, thus giving rise to high monthly turnover. Interviews and compiled data indicate that Swedish pension companies, including the national pension funds, are also significant counterparties to major Swedish banks in USD swaps and that these particular players account for a large share of the banks' total exposure in USD swaps.

Table 2. Counterparties to the major Swedish banks in short-term USD swaps
Percentage of total turnover, 2012

TYPE OF COUNTERPARTY	PERCENTAGE OF USD SWAPS
Other Swedish banks	76
Institutions or companies	24

Source: The Riksbank (SELMA statistics)

As regards the major Swedish banks' EUR swaps, the turnover statistics show that institutions and companies are the commonest counterparties (see Table 3). Just as in the case of USD swaps, this indicates that the major Swedish pension companies are significant counterparties. Data compilation regarding the major Swedish banks' largest and most significant counterparties also shows that many of the major counterparties in this case are Swedish non-financial enterprises. This probably reflects the fact that many major Swedish enterprises pursue extensive operations in EUR markets, including export and import activities via these markets, and thus need to manage part of the inherent currency risks.

Table 3. Counterparties to the major Swedish banks in short-term EUR swaps
Percentage of total turnover in 2012

TYPE OF COUNTERPARTY	PERCENTAGE OF EUR SWAPS
Other banks	35
Institutions or companies	65

Source: The Riksbank (SELMA statistics)

Finally, this survey also shows that it is possible to identify certain patterns in how the various counterparties of the major Swedish banks behave in the currency swap market. Pension companies generally need to borrow currency via currency swaps to enable them to currency hedge their foreign assets. Thus, the swaps undertaken among the banks and these players mean that, in most cases, the banks lend foreign currency and receive SEK in return. As a result, the major Swedish banks convey part of their foreign funding to these companies via the currency swap market. A similar pattern is also noted in the currency swaps undertaken by major Swedish banks and non-financial enterprises, although it is not as explicit as in the case of pension companies. The reason for this is that the companies frequently currency hedge cash flow in the form of incoming and outgoing payments and, consequently, may require to borrow SEK and foreign currency from Swedish banks. Swap transactions among Swedish and foreign banks ultimately entail that the Swedish banks lend SEK in an approximately similar volume as the opposite transactions. As noted earlier, this is because transactions among the banks are largely undertaken so as to manage cash flows in various currencies, thus leading to day-to-day variations in the requirement for a certain currency. Overall, the major Swedish banks are, however, net lenders of foreign currency, which means that their lending in foreign currency and receipts of SEK through currency swaps exceed the transactions done in the opposite direction.

Why is the Swedish market for short-term currency swaps so extensive?

There are several reasons underlying the Swedish banks' decision to fund part of their domestic assets using foreign currency swapped for SEK. Firstly, the banks wish to diversify their investment base. This is particularly relevant for long-term funding, since the Swedish bond market is relatively concentrated, with limited investor demand. As a result, the banks choose to issue bonds in foreign currency and subsequently convert the proceeds to SEK to fund lending in Sweden. Similarly, part of the short-term funding in foreign currency swapped for SEK may be attributable to the banks' attempts to gain a diversified investor base. By issuing certificates in USD and EUR, the Swedish banks can reach a broad group of investors and liquidity in these markets is, normally, highly favourable.

Secondly, the banks' securities issuance in foreign currency may satisfy the funding and currency hedging requirements for foreign assets among players in the Swedish economy. By issuing foreign currency and then lending further through currency swaps, the banks can supply their clients with foreign currency. The banks earn from this process; moreover, the SEK-based funding they receive is frequently less costly than issuing SEK directly on the capital market.

HOLDING FOREIGN ASSETS MAY RESULT IN A CURRENCY HEDGING REQUIREMENT

To understand how extensive the demand for foreign currency is in the Swedish economy, one may commence with an analysis of how assets and liabilities in foreign currency are distributed among different players (see Table 4). The analysis shows that Swedish financial institutions and non-financial enterprises alike have assets in foreign currency that far exceed their particular liabilities in foreign currency, totalling approximately SEK 4,800 billion. Hence, it may also be assumed that there is a potential need for currency hedging in Sweden corresponding to this amount.

Table 4. The aggregate currency position in Sweden
December 2012, SEK billion

	ASSETS IN FOREIGN CURRENCY	LIABILITIES IN FOREIGN CURRENCY	NET
Financial institutions (incl. pension companies and national pension funds)	2 190	32	2 159
Non-financial enterprises	2 574	499	2 075
Households	366	0	366
The Riksbank*	341	23	318
Kingdom of Sweden	87	194	-107
Potential demand for foreign currency	5 557	747	4 810
Swedish banks **	2 416	3 142	-726

Note. The statistics refer to transactions between players in Sweden and abroad. Assets in foreign currency include direct investments and portfolio investments abroad and other foreign currency-denominated investments. Foreign currency-denominated liabilities include portfolio investments and other investments. The Swedish players' liabilities and claims accruing to players abroad are excluded, as are derivatives.
* The Riksbank's liabilities in foreign currency are reported under "Kingdom of Sweden".
**The term "Swedish banks" refers to all Swedish monetary financial institutions (MFI), which thus include more players than the major Swedish banks and whose foreign currency surplus was estimated at SEK 600 billion earlier in the article.

Sources: Statistics Sweden and the Riksbank

To hedge their assets in foreign currency, companies and institutions in many cases need to turn to banks that can supply them with foreign currency. However, the Swedish bank sector's total foreign currency surplus does not match the potential demand for currency hedging of some SEK 4,800 billion, amounting instead to approximately SEK 730 billion. The primary factor underlying this difference is that Swedish players do not currency hedge all of their foreign assets. Accordingly, to gain an assessment of how large the total currency hedging requirement is in Sweden, certain assumptions must be made regarding the extent to which the various types of players currency hedge their foreign assets.[10]

CURRENCY HEDGING REQUIREMENTS AMONG PENSION COMPANIES

Swedish pension companies account for a substantial portion of the foreign assets of financial institutions, as noted in Table 4.[11] These companies essentially have only liabilities to savers and policyholders in SEK; however, to diversify their risks, they have elected to invest part of their Swedish pension resources in foreign assets. As a result, currency risks arise that, in many cases, the pension companies wish to limit, and thus they borrow foreign currency through currency swaps.

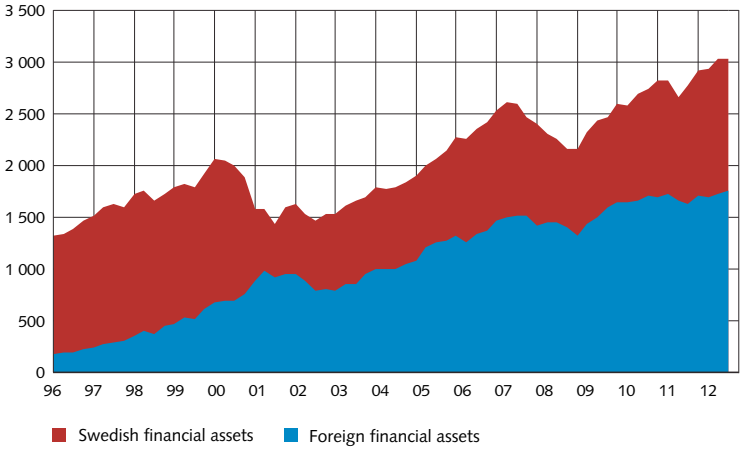
At year-end 2012, the pension companies' holdings of foreign assets accounted for almost 40 per cent of their total assets (see Figure 7). The percentage of their foreign assets has increased over the past 20 years, due largely to changes in the Swedish Insurance Undertakings Act and the National Pension Insurance Funds (AP Funds) Act in the mid-

10 The next two paragraphs present a number of assumptions regarding the extent to which the various Swedish players currency hedge their assets. These are solely assessments but they may nevertheless provide an indication of the magnitude of the total requirement for currency hedging in the Swedish economy.

11 In this context and in the remainder of the article, the term "pension companies" refers to life insurance, pension companies and the national insurance funds.

1990s and early 2000s, respectively. As a result, the pension companies gained the potential to start investing in foreign assets.

Figure 7. Financial assets of Swedish pension and insurance companies
SEK billion



Note. The figure illustrates assets among the Swedish insurance companies and the social insurance sector. It includes life insurance, pension companies and national pension insurance funds as well as unit-trust and non-life insurance.

Sources: Statistics Sweden and the Riksbank

The reason why the pension companies need to curtail their currency risks is that they have future, SEK-denominated commitments to their savers; there are also internal and external regulations limiting the pension companies' exposure to currency risks.[12] Accordingly, the companies usually currency hedge a considerable portion of their foreign assets.[13]

The Swedish national pension funds and pension companies have varying portfolio compositions and pursue different strategies, as well as being subject to different regulations. This means that they also currency hedge their foreign assets to varying degrees. However, in order to gain an assessment of how extensive the use of currency swaps is among pension companies and other financial institutions,[14] we have made, within the framework of this article, a number of general assumptions as to how these players currency hedge various types of assets. As regards holdings of foreign interest-bearing assets such as bonds, we assume that these are currency hedged in most cases. At year-end 2012/13, institutional holdings of bonds totalled some SEK 460 billion and, thus, we can assume that the currency-hedging requirement is an equivalent amount. There is probably

12 According to the National Pension Insurance Funds (AP Funds) Act, a maximum of 40 per cent of the national pension funds' assets may be exposed to currency risks. The currency risks of life and pension companies are curtailed, in part, by the "traffic light system", which is one of Finansinspektionen's supervisory tools, and, in part, by the companies' investment policies, which is subject to the approval of Finansinspektionen. The companies' internal regulations also limit the currency risks associated with their portfolios.

13 Pension companies also offer their clients unit-linked insurance. Foreign assets are generally not currency hedged within the framework of unit-linked insurance policies.

14 The term "Other financial institutions" refers to non-monetary credit market companies, securities funds, securities companies and fund brokers.

less need to currency hedge assets with uncertain cash flows, such as shares, and, thus, the companies frequently choose to currency hedge only part of these holdings. Based on the information from several pension companies and on our own estimates, we believe that an average of 20 per cent of the foreign shareholdings, which exceed SEK 1,700 billion, is currency hedged. Overall, this results in an estimated currency hedging requirement among pension companies and other financial institutions of some SEK 800 billion (see Table 5).

The interviews conducted indicate that the currency swaps in which pension companies are involved are largely short-term. The maturities vary but many companies appear primarily to use currency swaps with three-month maturities that are regularly renewed. This is despite the fact that the maturities of pension company investments are frequently long, indicating that currency hedging of assets should also take the form of long-term maturities. However, it must also be taken into consideration that longer maturity currency swaps can prove difficult to close out prematurely and that, accordingly, they are not appropriate for currency hedging of all asset types. The interviews also reveal that a number of pension companies have IT systems that impose certain restrictions on the potential to conclude longer maturity currency swaps. In many cases, it also appears that the practice has been to deploy currency swaps with short maturities.

CURRENCY HEDGING REQUIREMENTS AMONG NON-FINANCIAL ENTERPRISES

As shown by Table 4, the net foreign currency position of non-financial enterprises exceeds SEK 2,000 billion, which is approximately equal to the net position of the financial institutions. This sizeable amount is primarily due to the fact that there are many Swedish large international companies that own subsidiaries and other companies abroad, thus entailing that they hold assets in foreign currency.

Just as in the case of pension company holdings of foreign shares, it could be argued that the incentives for Swedish enterprises to currency hedge their asset holdings in foreign subsidiaries may be limited. This is also confirmed in interviews with a number of Swedish enterprises. Based on these interviews and on our own assessments, we assume that non-financial enterprises currency hedge 20 per cent of their foreign assets. As a result, we believe that the non-financial enterprise sector's currency hedging requirement is equivalent to some SEK 180 billion (see Table 5).

Non-financial enterprises also use short-term currency swaps to currency hedge cash flows. Consequently, the companies may have costs and income in foreign currency that need to be converted to SEK or vice versa. However, the net of these transactions in relation to total currency hedging is minor and thus we disregard this factor in estimating the total currency-hedging requirement.

TOTAL CURRENCY HEDGING REQUIREMENT IN SWEDEN

We can confirm that there is a considerable currency-hedging requirement in the Swedish economy. However, the real requirement is less than the potential volume as indicated by

the aggregate foreign currency position. Typically, neither households nor the Riksbank or the State currency hedge their foreign exposures. Consequently, financial institutions – particularly pension companies – primarily account for the currency-hedging requirement. But also non-financial enterprises account for some of the requirement. On the basis of the assumptions described above, we estimate that that the overall currency-hedging requirement of Swedish players exceeds SEK 950 billion (see Table 5). Of this total, Swedish banks are believed to account for some SEK 730 billion, while the remainder derives from foreign banks. One reason why the foreign banks participate in these swaps is that they have clients who need to currency hedge assets in SEK. This may involve, inter alia, a non-Swedish pension company that holds Swedish government bonds and, thus, wishes to borrow SEK via currency swaps to currency hedge the bonds. Because the non-Swedish banks initially lend money to Swedish players via currency swaps, they simultaneously receive SEK. In turn, these SEK proceeds may be lent on to foreign players needing to currency hedge Swedish assets.

Table 5. Estimated demand for currency hedging
December 2012, SEK billion

	TYPE OF ASSET	AMOUNT	PERCENTAGE, CURRENCY HEDGING	AMOUNT, CURRENCY HEDGING
Financial institutions (incl. pension companies and national pension funds)	Shares	1 726	20 %	345
	Interest-bearing assets	459	100 %	459
Non-financial enterprises	Direct investments	2 369	20 %	474
	Interest-bearing investments	204	100 %	204
Total				1 482
Total demand (less liabilities in foreign currency)				951
Supply, Swedish banks				726
Supply, foreign banks				225

Note. Table 4 shows the volume of the players' liabilities in foreign currency.
Sources: Statistics Sweden the Riksbank

WHY FOREIGN BANKS PARTICIPATE IN THE SWEDISH CURRENCY SWAP MARKET

The foreign banks can thus function as intermediaries between the foreign companies who need to borrow SEK and the Swedish enterprises with the opposite requirement, that is, the need to borrow foreign currency. Another reason that foreign banks participate in the Swedish currency swap market is that they also regularly act as intermediaries when Swedish banks issue covered bonds in foreign currency, which will subsequently be used to finance Swedish mortgage loans. In such cases, the Swedish banks need to conclude long-term currency swaps to transform their issued currency to SEK. The Swedish pension companies need to conduct reverse swaps; that is, to offer SEK for foreign currency so as to currency hedge their foreign assets. In most cases, however, the pension companies

wish solely to conclude currency swaps with short maturities. Consequently, it is instead common practice that Swedish banks borrow SEK from foreign banks in exchange for foreign currency in long-term currency swaps.[15] In many cases, the foreign banks have no natural access to SEK but instead fund the transaction by, in turn, borrowing SEK in a short-term swap. Through this transaction, the pension company's need to borrow foreign currency can be met. Thus, the foreign bank conducts a maturity transformation on behalf of the Swedish players (see Figure 8).

Figure 8. Participation of foreign banks as intermediaries in the Swedish currency swap market

Note. The transaction commences with the Swedish bank issuing a covered bond in EUR with a maturity of five years. To exchange EUR to SEK, the Swedish bank subsequently concludes a long-term swap with a five-year maturity with a foreign bank. In turn, the foreign bank funds this transaction by concluding a currency swap with a three-month maturity with a pension company.

Source: The Riksbank

Risks associated with the use of short-term currency swaps by Swedish players

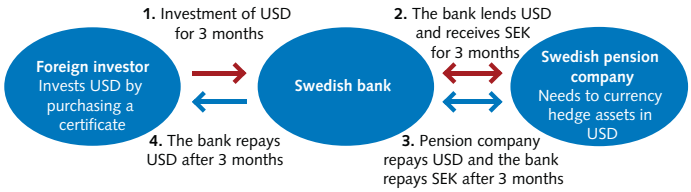
Normally, the fact that Swedish banks fund part of their Swedish assets via currency swaps does not give rise to liquidity risks in foreign currency. Instead, the liquidity risks that may arise resemble those that would emerge when the bank fund the Swedish assets directly using Swedish funding, that is, liquidity risks in SEK. If a bank issue foreign currency using a bank certificate and subsequently lends this on through a currency swap, the bank will regain the foreign currency when the swap matures. The bank can then use the foreign currency to repay investors in the certificate when it matures (see Figure 9). However, this requires that the maturity of the currency swap does not exceed that of the certificate issued by the bank. If the swap's maturity is longer, similar refinancing risks arise as in the case the maturity of the bank's lending exceeds the maturity of the funding.[16]

Although the funding of Swedish assets by means of currency swaps does not entail liquidity risks in foreign currency for the banks, it may nevertheless contribute to problems if stress emerges in the financial markets. The use of currency swaps is extensive in Sweden, which entails that various players in the financial system are interconnected, resulting in a risk of contagion. In particular, this contributes to growing linkage between Swedish banks and pension companies.

15 It is also relatively common for Swedish banks to act as counterparties to each other in long-term currency swaps. See Eklund et al. (2012).

16 For a more detailed discussion of the risks entailed in foreign currency-based securities funding by banks, see Sveriges Riksbank (2013).

Figure 9. Securities-based funding in foreign currency and associated swap transactions



Note. The transaction begins with a Swedish bank issuing a certificate in USD with a three-month maturity, which is purchased by a foreign investor. The bank subsequently concludes a currency swap with a three-month maturity with a Swedish pension company, through which the Swedish bank lends USD to the pension company and in return receives SEK. When the swap contract matures, the pension company repays USD to the bank and the bank immediately repays SEK to the pension company.

Source: The Riksbank

WHAT HAPPENS IF THE BANKS' ACCESS TO FOREIGN FUNDING DETERIORATES?

Due to the considerable use of foreign wholesale funding among the major Swedish banks, they could easily be affected by disruptions in international financial markets. The clearest risk arises because the banks partly use short-maturity funding in foreign currency to fund long-term illiquid assets in the same currency. Should the banks fail to renew this funding, they could rapidly experience liquidity problems and, ultimately, the Riksbank could be required to provide liquidity support in the foreign currency concerned to ensure the banks' ability to fulfil their commitments.

As we noted earlier, the portion of foreign funding swapped for SEK does not normally give rise to foreign currency liquidity risks for the banks. This funding is used to fund SEK-denominated assets, thereby providing access to the SEK-based financing the banks need to fulfil their commitments. Access to SEK cannot really disappear since the Swedish financial system is a sealed krona system. Nevertheless, if access to foreign funding deteriorates, one could expect the banks to be impacted, since they would no longer be able to "create" short-term SEK funding in the conventional manner using currency swaps.[17] If the major banks' access to foreign wholesale funding deteriorates, this would probably also affect their counterparties in the currency swaps. The banks' diminished access to foreign currency would probably prompt them to impose higher charges on lending foreign currency through swaps; and if access to funding were to become acute, it is even possible to imagine the banks refraining from swap transactions with their clients. Since pension companies and non-financial companies usually use relatively short-maturity currency swaps to borrow foreign currency, they frequently have a continuous need to renew these contracts in order to manage their currency risks. In turn, this entails that these players could quickly be adversely impacted if the banks' funding position worsens.

17 Although a shortage of SEK in the Swedish banking system cannot arise, a lack of confidence among banks could nevertheless lead to the banks experiencing krona-related liquidity problems.

If we suppose that foreign currency funding problems could be quarantined within Swedish banks, then Swedish pension companies and enterprises would probably increasingly turn to foreign banks to borrow foreign currency via currency swaps. However, this requires that there are foreign banks that are still willing to conclude such swap contracts. If the situation in the financial markets become very severe, one could expect Swedish enterprises and pension companies to encounter difficulty in finding counterparties who are willing in the first place to lend foreign currency against SEK in currency swaps. As a result, the currency swaps outstanding would no longer be renewed, and instead would fall due for payment on maturity. In this event, Swedish enterprises and pension companies would need to repay the foreign currency received from their swap counterparties, with no possibility to conclude new swap contracts.

In such a situation Swedish enterprises would be able to conduct conventional currency exchange transactions to obtain foreign currency and continue funding their foreign assets, but such funding would expose them to currency risks. To avoid these risks, they would probably be compelled to sell part of their foreign assets. Pension companies would probably be the player most severely affected in such a situation: firstly, they currency hedge a substantial volume of foreign assets and, secondly, they are subject to internal and external ceilings regarding their portfolios' currency exposure level. Consequently, this could prompt them to dispose of parts of their foreign share and bond holdings and instead acquire Swedish assets.[18] A fall in asset prices ahead of these premature disposals could lead to substantial losses for pension companies and might also be expected to fuel a negative spiral, with continuously falling prices and escalating financial uncertainty.

A situation marked by deteriorating access to foreign funding for Swedish banks arose recently, namely, during the financial turbulence of 2008–2009. The liquidity problems facing the banks induced the Riksbank to boost liquidity – both in SEK and USD – in the banking system. Due to growing illiquidity among the banks, costs also rose for Swedish enterprises and pension companies from their currency hedging of foreign assets and, in certain cases, they could no longer renew all their currency swaps as they matured. This challenging situation eased fairly soon, however, after the Riksbank launched its lending programme. This provision of funds helped the banks gain the requisite USD funding, also permitting them to lend USD on to clients via currency swaps. Consequently, it did not lead to an acute situation involving, inter alia, major foreign asset disposals by Swedish pension companies. Nonetheless, this episode showed that there were also players outside the banking system that experienced USD shortages due to poor access to USD funding among the banks.

18 Another alternative for pension companies would be to use the repo market to gain access to foreign currency, whereby they could pledge their foreign securities and receive liquid assets in return.

Conclusions

In this article, we have stated that Swedish banks have elected to fund part of their SEK-denominated assets by issuing securities in foreign currency and then converting to SEK on the currency swap market. Some 30 per cent of these securities are long-term bonds, while the remaining 70 per cent consist of short-term securities. One of the reasons that Swedish banks fund their SEK assets in this manner is to broaden their investor base.

Another factor is that the banks' issuances in foreign currency can satisfy the requirements to fund and currency hedge foreign assets among players in the Swedish economy. We estimate that the overall currency-hedging requirement of Swedish institutions and enterprises totals approximately SEK 950 billion. Accordingly, these players need to borrow foreign currency to be able to currency hedge their foreign assets. As a result, a business opportunity arises for Swedish banks in the form of their capacity to issue securities in foreign currency and subsequently conclude currency swaps and lend on currency to those demanding it. This particularly results in some of the banks' short-term funding in foreign currency being conveyed further to other players in the economy.

It is estimated that financial institutions – notably pension companies – account for some 80 per cent of the total currency-hedging requirement in Sweden. The reason for this is that they have chosen to diversify their investment portfolios by investing in foreign currency assets. To be able to manage the associated currency risks, they must borrow foreign currency via currency swaps. The geographic diversification of pension companies offers positive effects thanks to risk diversification, in addition to greater potential to gain a healthy return on public pension savings. Meanwhile, the extensive use of currency swaps contributes to tighter linkage between the banks and pension companies in the Swedish financial system. Since the pension companies usually borrow foreign currency via short-maturity currency swaps, they also face a continuous need to renew their swap positions to continue to currency hedge their foreign assets. In turn, this means that the currency swap market becomes a channel through which potential bank funding problems could rapidly infect pension companies, who may then find it more difficult to manage their currency risks.[19] The next stage could well result in pension companies having to dispose of portions of their foreign assets, and thereby also risk incurring losses.[20]

Pension companies could reduce their refinancing risk in foreign currency by improving the maturity matching between foreign assets and the currency swaps used to hedge them. If pension companies begin to demand more long-term swaps, the major Swedish banks could also be compelled to extend the maturities of their foreign wholesale funding. Otherwise, the banks could be exposed to a refinancing risk, since they would be lending foreign currency using long-maturity swaps while funding this activity on a short-term basis.

19 If the funding problems alone were to hit the Swedish banks, it is conceivable that the pension companies would turn to foreign banks to borrow foreign currency via currency swaps.

20 There may also be other possibilities open to the pension companies. For example, internal regulations could be revised to permit greater currency exposure and, thus, the companies would not need to dispose of assets.

However, the major Swedish banks already hold a portion of long-term wholesale funding in foreign currency, which could match the pension companies' requirements to borrow foreign currency using long-term maturity swaps. The banks issue covered bonds in foreign currency to finance Swedish mortgages; and since they wish to exchange the foreign currency for SEK, they need to find counterparties willing to lend SEK in long-term swaps. Nowadays, foreign banks typically do so. If instead Swedish banks could borrow SEK on long maturities from pension companies, who in return could borrow foreign currency from the banks, the requirements of the banks and the pension companies alike could be matched without involving foreign banks. Moreover, such matching could somewhat reduce the need for short-term foreign funding in the Swedish economy. This is because the foreign funding that the banks lend on to pension companies via swaps could in such cases derive to a greater extent from covered bonds with longer maturities rather than from short-term bank certificates.

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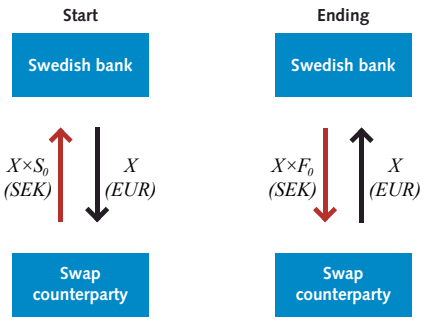
Appendix 1. How the banks' currency swaps function

Using currency swaps, the banks can gain access to a currency without having to issue the currency directly on the capital market. For example, we can assume that a bank has issued a EUR-denominated certificate with a three-month maturity, but actually has a SEK-denominated funding requirement with a similar maturity. The bank can then choose to sell these euros on the spot market and simultaneously conclude a contract to sell SEK against EUR at a predetermined price three months ahead. By this means, the bank has created funding in SEK with a three-month maturity via a short-term currency swap in which the currency risk is eliminated.[21] A currency swap is thus an agreement between two parties to simultaneously buy and sell one currency against another at two different dates.

Figure A1 shows the configuration of flows in a short-term currency swap. The nominal amounts are exchanged both when the contract is concluded and when the swap matures. In this case, the Swedish bank exchanges X EUR for SEK at the current (spot) exchange rate, S_0. At the same time, the Swedish bank and its counterparty conclude a contract to the effect that the Swedish bank will buy back X EUR three months later. Application of the forward rate on the date the contract is concluded determines the SEK-denominated amount that the Swedish bank will have to pay when the contract expires. In turn, the forward rate is set by the interest rate differential between the two currencies that the parties exchange in the swap.[22]

Figure A1. Schematic representation of the flows in a currency swap



Note. X is the nominal amount involved in the swap, S_0 is the spot price between SEK and EUR when the contract is concluded. F_0 is the forward rate that is set when the parties conclude the swap contract and is based on the interest rate differential between the two swapped currencies on this date.

21 Short-term currency swaps are frequently referred to as *FX-swaps*.

22 $F_0 = S_0 \times \frac{(1+Rate_{EUR})}{(1+Rate_{SEK})}$

Appendix 2. Long-term funding in foreign currency by the banks and their use of the long-term currency swap market

This article focuses primarily on short-term funding in foreign currency by Swedish banks and the use of currency swaps. However, to provide a comprehensive picture of how the banks convert their foreign funding to SEK, we present in this appendix a brief description of how the banks swap their long-term funding in foreign currency to SEK. The description below is based on part of the Riksbank's survey of the currency swap market conducted during 2011.[23] It focuses on swaps between EUR and SEK, since the largest portion of the banks' long-term wholesale funding in foreign currency is in EUR.

THE BANKS' ASSETS DETERMINE THE REQUIREMENT TO SWAP LONG-TERM FUNDING IN FOREIGN CURRENCY

All four major banks issue some of their bonds in foreign currency, notably in EUR. These bonds are used, in part, to fund assets in the same currency and, in part, to fund Swedish assets. The bonds in foreign currency used to fund Swedish assets are primarily EUR-denominated covered bonds, which are used to finance Swedish mortgages. To be able to fund Swedish mortgages in this manner, the banks need to convert EUR to SEK. This is done by the banks concluding currency swaps through which they provide EUR and receive SEK. In most cases, these swaps have maturities that resemble those of the issued bonds (that is, long-term maturities).

The main reason for the Swedish banks partly funding assets in SEK by means of bonds in foreign currency is that the Swedish bond market is relatively concentrated, with limited demand. Since bond holders are spread abroad, the banks can widen their investor base and also reduce their dependence on the domestic market. However, the scope of the banks' foreign operations differs, entailing that the banks swap their foreign funding for SEK to varying degrees. Handelsbanken and Swedbank have a sizeable share of their lending in SEK, and thus swap more than half of their foreign currency bonds for SEK. On the other hand, SEB and Nordea primarily use their foreign currency bonds for funding their lending in foreign currency. At the same time, this means that these banks have SEK-denominated deposits and bonds that already largely cover their long-term funding requirements in SEK.

THE BANKS' COUNTERPARTIES IN CURRENCY SWAPS

When the Swedish banks issue covered bonds in foreign currency and then wish to convert this to SEK on the currency swap market, they frequently turn to foreign banks. Data shows that more than 60 per cent of long-term swaps, in which Swedish banks borrow SEK in exchange for EUR, are conducted with foreign banks as counterparties. In addition, the Swedish banks are to a relatively significant extent counterparties to each other in these

23 For more information, see Eklund et al. (2012).

types of swaps. Finally, other players also act to a certain extent as counterparties to the Swedish banks in long-term currency swaps; this involves Swedish and foreign companies, including pension companies (see Table A1).

Table A1. Counterparties to the Swedish banks in long-term EUR swaps
December 2012

TYPE OF COUNTERPARTY	PERCENTAGE OF EUR SWAPS
Other Swedish banks	23
Swedish institutions or companies *	9
Foreign banks	63
Of which, Nordic banks	38
Other foreign players or companies	4

Note. The table is based on data covering the banks' gross exposure to their ten major counterparties in long-term currency swaps, in SEK/EUR. *The item "Swedish institutions or companies " includes the Swedish National Debt Office, Swedish life insurance and pension companies and Swedish non-financial enterprises.

Source: The Riksbank (SELMA statistics)

Foreign banks that do not pursue significant operations in Sweden do not generally have any natural access to SEK – nevertheless some of them are counterparties to the Swedish banks in long-term swaps. This is possible because these banks can, in turn, finance long-term swaps by means of the short-term currency swaps that they often conclude with Swedish banks or pension companies. Thus, in these cases, the foreign banks perform a maturity transformation on behalf of the Swedish banks.

Online Intermediation and the Terms of Consumer Credit

Gustav Alfelt, Marieke Bos and Kasper Roszbach*

Gustav Alfelt works in the Research Division of the Monetary Policy Department at the Riksbank. Marieke Bos works at Stockholm University and is a visiting scholar at the Swedish Institute for Financial Research (SIFR). Kasper Roszbach is Head of the Financial Stability Department at the Riksbank.

Many developed countries have experienced substantial growth in consumer, that is, uncollateralized, credit over the last two decades. Part of this growth has been driven by technological changes, such as the ability of banks to have automated evaluations of loan applicants (credit scoring), lowered entry barriers due to internet technology, and the emergence of internet-based market places for banks. The uptake of different types of credit varies greatly across the income distribution. This is likely to have consequences for households' responsiveness to financial shocks, for example shocks to interest rates and the supply of credit. In this article we briefly describe how web-based intermediation of credit to households works. Using data from a Swedish internet-based marketplace for consumer credit we provide some descriptive statistics on how much credit households apply for and what quantities, durations and interest rates they are offered.

Developments in consumer credit markets

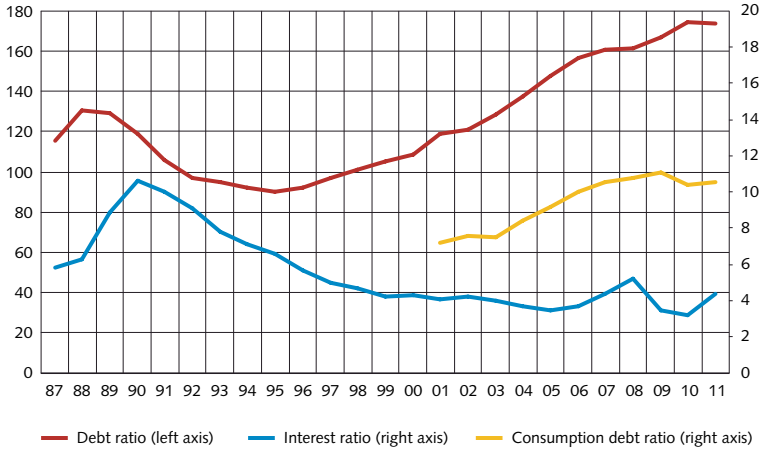
The objective of this article is to provide a basis for improving our understanding of consumers' credit decisions and the factors that determine their terms of credit. For this purpose, we exploit data from a relatively new web-based intermediary that enables consumers to receive and evaluate offers from multiple banks on a single credit application. This setting facilitates direct competition between banks and allows us to cast new light on two little-studied aspects of consumer credit markets. First, we provide new data that, to our knowledge, for the first time provides quantitative evidence on the span of interest rates that households are offered when credit bids are made by multiple banks. Second, we show that the terms of credit vary widely between households, for example by income and age.

The article is organized as follows. First we depict the development of different types of consumer credit relative to income in Sweden. Secondly, we continue with a brief description of the workings of web-based intermediation of credit to households. In the next section we characterize the households that apply for credit through the internet-based marketplace and compare them with the general Swedish population. Fourthly we illustrate what credit quantities and durations households apply for as well as what they are offered and choose. In the last section we conclude.

* Most of this article was written while Roszbach was in the Monetary Policy Department. The authors gratefully acknowledge Eric Frohm, Anders Bjällskog and Jakob Winstrand for their help and Kristian Jönsson, Tomas Edlund and Claes Berg for their comments.

Many developed countries have witnessed an enduring, strong growth of consumer credit in the last two decades. In Sweden, total outstanding credit obligations as a share of disposable income have on average increased from 100 per cent in 1992 to 170 per cent in 2011 (see Figure 1). Although households' total interest expenditure simultaneously fell from nine to four per cent of their yearly disposable income, their uptake of consumption credit has risen from six to nine per cent of disposable income over the last decade.

Figure 1. Swedish household debt, interest expenditures and consumption, 1987-2011
Per cent



Note. Swedish household debt as a percentage of disposable income (red line, left axis) and after tax interest expenditures as a percentage of disposable income (blue line, right axis) over the period 1987-2011. Consumption debt as a percentage of disposable income (yellow line, right axis).

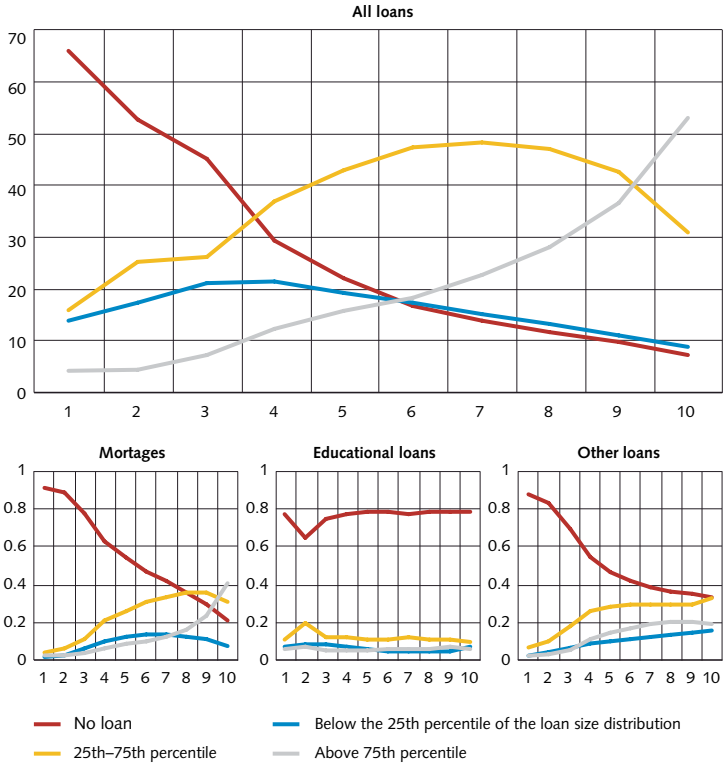
Sources: The Riksbank, Statistics Sweden and Finansmarknadsrapporten 2012

The steep increase in household indebtedness, combined with historically low interest rates, has created concerns among policy makers about both the risk of a credit-driven inflation of asset prices and the sustainability of these debt levels.

To be able to formulate effective policy measures in order to avoid excessive, that is, unsustainable, debt accumulation, it is important to understand the mechanisms behind consumers' credit decisions and any variation in the debt service that results from these decisions. For a start, it is important to realize that different types of debt matter more to some households than to others. There are, for example, large disparities over the income distribution in the types of debt that households hold. Figure 2 shows how lower-income households hold a substantially smaller share of their debt as mortgages and more as consumption credit (i.e. credit card-, installment-, educational loans and lines of credit). As disposable income increases, households hold steadily increasing shares of their debt in mortgages. This situation is to some extent comparable to, for example, the United States, where richer households concentrate debt in mortgages, while lower income households

hold greater shares of their debt as credit cards and uncollateralized consumer credit (see Survey of Consumer Finances, 2010). The heterogeneity in the debt-to-income ratios across credit types is substantial over the income distribution.

Figure 2. Relative importance of different types of credit among Swedish households in 2011
Frequency, per cent and income decile



Note. Households are sorted by disposable income and assigned to deciles. The relative importance of the type of credit is expressed, first, in the share of households that have the type of loan (y-axis) and second, the size of the loan; different line colors indicate different credit size quartiles[1], with the largest loan size in grey, and the smallest in blue. Other loans consists of credit card, installment and lines of credit.

1. Hedborg et al. (2013) divided the different loan sizes in quartiles: "All loans together": 1-25th percentile: (SEK 1-80 000), 25-75th percentile: (SEK 80 001-708 894), 75th-percentile: (SEK 708 895-); "Mortgages": 1-25th percentile: (SEK 1-242 060), 25-75th percentile: (SEK 242 061-900 000), 75th- percentile: (SEK 900 001-); "Educational loans": 1-25th percentile: (SEK 1-40 808), 25-75th percentile: (SEK 40 808-187 991), 75th - percentile: (SEK 187 992-); "Other loans": 1-25th percentile: (SEK 1-3 786), 25-75th percentile: (SEK 3 787-88 216), 75th- percentile: (SEK 88 217-).

Source: Hedborg et al., Strategi för att motverka överskuldsättning, SOU 2013:78

Access to credit is associated with both opportunities and risks. On the one hand it has facilitated households' ability to smooth consumption in the face of unexpected fluctuations in income. On the other hand readily available credit also exposes households to the risk of over-indebtedness, potentially leading to short-term or even long-term financial hardship. Baugh, Ben-David and Park (2014) show for the United States that households, on average, are financially constrained and exhibit myopic behavior. Dick and Lehnert (2010) document a link between credit supply in the United States and rising personal bankruptcy rates. They found that deregulation increased both lending and bankruptcy rates, but also led to lower loss rates on loans due to the adoption of new credit scoring technologies. In general, however, our understanding of whether and under precisely what conditions markets over-supply or under-supply credit, and why they do so, is still incomplete. For an overview of the current literature on this topic see Zinman (2013).

Although it is beyond the scope of this article to assess whether households on average gain or lose from the improved access to credit, the above data do strongly suggest that experiences differ substantially across different segments of the population. Such differences between households can influence households' sensitiveness to financial shocks, for example shocks to interest rates or the supply of credit.

Internet-based intermediation of credit

The intermediation of credit through the internet is a relatively new phenomenon and originated in the late 1990s. Initially, internet-based intermediation of credit was typically institution-specific, that is, applications for a credit card or line of credit went through a bank's website. Competition therefore mostly consisted of applicants searching online for alternative offers. Comparison sites, like Lending Tree in the United States, where one compares non-binding contract terms from different suppliers before applying, started out around 1998.

Peer-to-peer lending (P2P), a practice of lending money by individuals to other, unrelated, individuals or "peers" without going through a traditional financial intermediary started out in 2005. P2P allows for competition between individual credit suppliers when making credit offers.

In Sweden, a market for web-based intermediation of credit has existed since 2007. Online intermediation platforms and comparison sites have some important differences. One important difference is that comparison sites, like *Lending Tree* in the United States or *Compricer.com* and *Prisjakt.se* in Sweden, tend to provide generic, non-binding information on the terms of credit that banks offer to help people decide where to apply. Web-based intermediation platforms, like *Freedom Finance*, enable individuals to file a single loan application and receive multiple customized, binding offers from a range of banks. Below, we describe briefly how an online intermediation platform works and present some descriptive statistics about the applicants and their terms of credit.

HOW DOES WEB-BASED CREDIT INTERMEDIATION WORK?

Three Sweden-specific conditions that facilitate web-based intermediation of credit and the entrance of new market participants in general are the existence of a broadly-used personal national registration number, the existence of a centralized credit register (UC AB), and the availability of official register data on income, taxation, real estate property, past payment behaviour and register-based credit scores for all Swedish residents. As a consequence, online credit applications can be concise and processed as well as evaluated in a uniform way by all participating financial institutions.

People who apply for credit through the web-based intermediary face a number of choices: for example, they can either apply for new credit or to consolidate their current debts. In the latter case, consumers submit their current outstanding debt, including the credit terms and the amount of credit they apply for. The application includes between 10 and 15 entries. One group of entries concerns the characteristics of the desired loan, including the total amount, the amount to be consolidated, and the duration (3-12 years). A second group relates to information about the applicant, such as the personal national registration number, civil status, number of children, type of employment, duration of current employment, home ownership and an estimate of the applicant's share in the cost of living. Finally, the applicant can choose to have a co-applicant.[1]

After filing, the intermediary forwards the credit application to all participating banks and opens up a 48-hour "evaluation window" at the credit bureau. While this window is open, all participating banks can request a copy of the applicant's credit report. Participating banks then have a fixed time window, currently 24 hours, to analyse an applicant and to decide what, if any, credit offer to make. Banks register their bids in the web interface and applicants receive a text message to notify the receipt of an offer.

Offers stay available for 30 days or until the applicant accepts an offer, upon which remaining offers are deleted automatically. To facilitate a comparison each offer is characterized along a fixed set of contract features: amount, duration, interest rate, effective interest rate, fees and repayment structure. Once an offer has been accepted, the contracting bank will take over all communication with the applicant. In cases where an application concerned debt consolidation, the granting bank amortizes the existing loans directly.

Who receives credit offers?

The data we use in this article contains all the information on the individuals' credit applications, their relevant background information and all information on the credit contracts offered by the participating banks. We use a sample of 6 891 credit applications filed between November 7 and December 7, 2012. As Table 1 shows, 65 per cent of the applicants received at least one offer. Unfortunately, other than the number, we lack

1 Employment options are entrepreneur, fixed employment, temporary employment, paid by the hour, unemployed, retiree, or student.

further information on the rejected applicants. In addition, rejection rates are likely to vary substantially across credit types due to selection effects, making it difficult to compare these numbers with a common benchmark.[2]

Table 1. Summary statistics for total sample of 6 891 credit applications

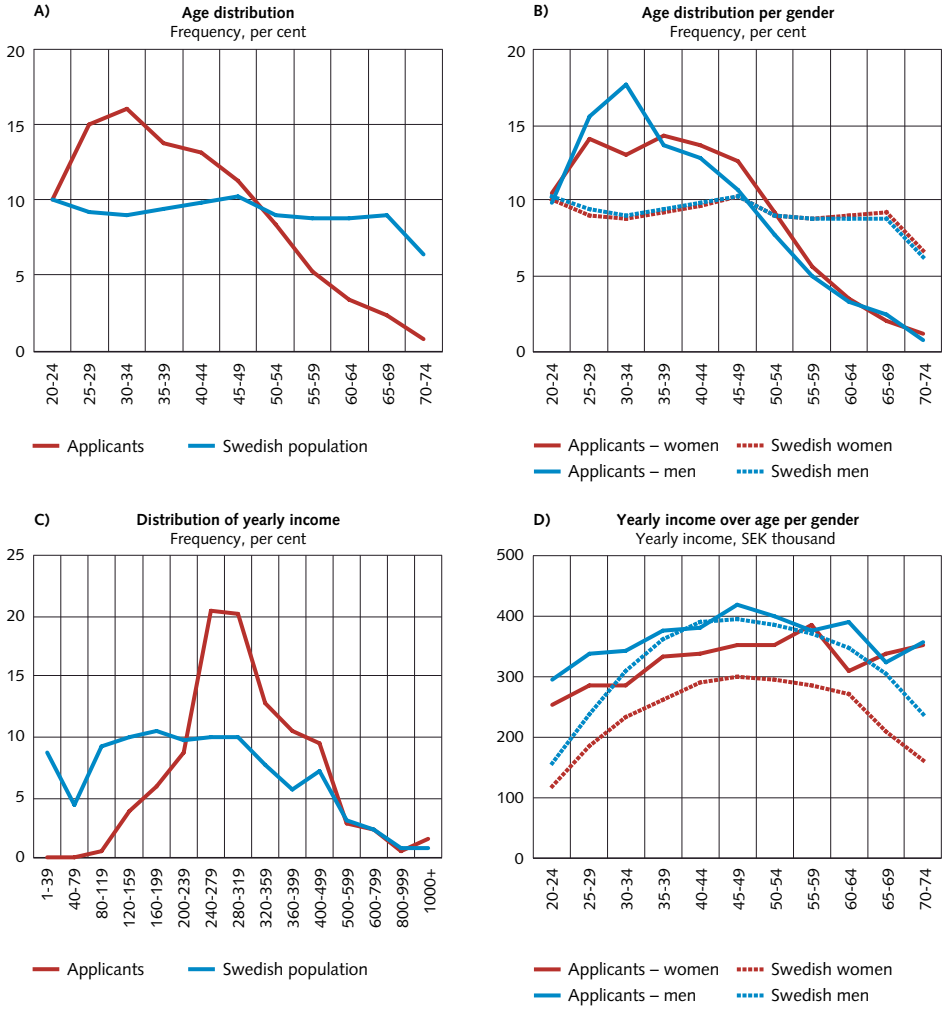
Individuals with zero offers	per cent	35.5
Individuals with at least one offer	per cent	64.5
Individuals that do not choose an offer	per cent	24
Individuals that choose an offer	per cent	76
Average loan volume requested	SEK	101 205
Averge loan volume offered	SEK	83 111
Average chosen loan volume	SEK	84 456
Average offered interest rate	per cent	13.1
Average chosen interest rate	per cent	12.4
Average requested duration	months	91.1
Average offered duration	months	84.2
Average chosen duration	months	87.5

Since our main interest lies in the terms of credit and the impact that contestability may have on these terms, we will concentrate on the applicants that received at least one offer.

From Table 1 we can see that the average requested loan amount (SEK 101 205) is above the average offered loan amount of (SEK 83 111), indicating that consumers are, on average, rationed in their credit demand. Furthermore, the average offered interest rate of 13.1 per cent is in line with interest rates that are charged on credit card debt (see Figure 7). Lastly, the average requested loan duration is seven and a half years, which is almost half of the maximum duration of 12 years that a consumer can request.

2 Roszbach (2004), using Swedish credit card application data reports an acceptance rate of about 50 per cent.

Figure 3. Age, gender and income distribution of indivduals who received at least one credit offer

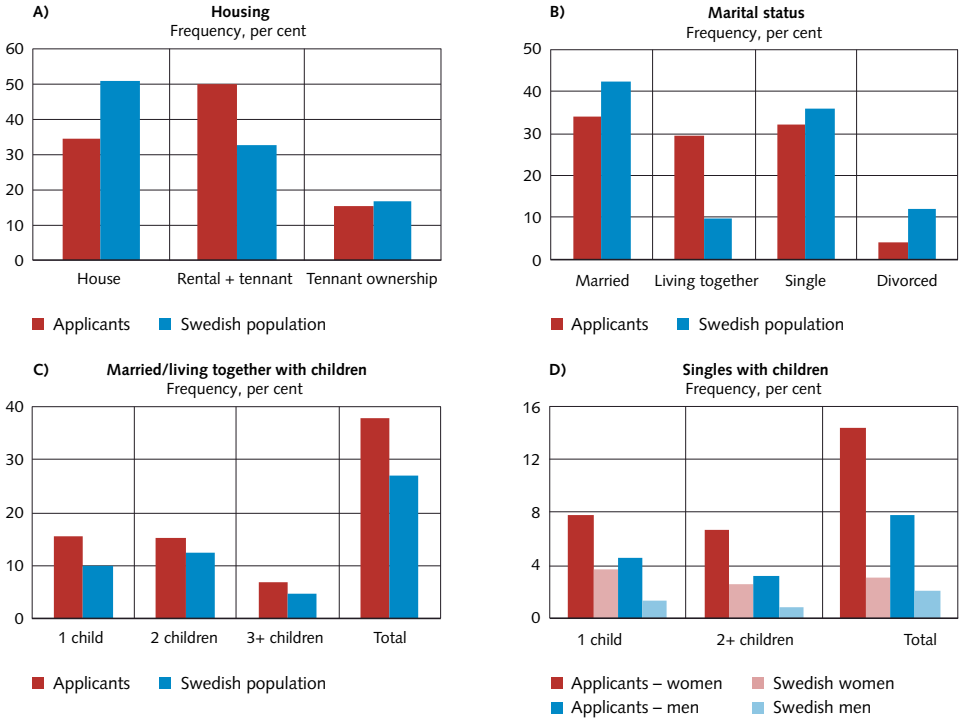


Note. Applicants at the financial intermediary are compared with the Swedish population aged 20 years or older along the distribution of three characteristics: age, gender and income. In panels A-C, the vertical axis displays the percentage share of people that fall in the interval displayed on the X axis. In panel D, the average income per age cohort is displayed.

As shown in Figure 3, panel A, younger people (20-45) are overrepresented while older cohorts (55-70) are underrepresented among the applicants – and recipients of an offer for credit through the financial intermediary relative to the composition of Sweden's population. In line with life-cycle theories, it should, however, be expected that the younger cohorts are in need of more credit than the older cohort, given the stage of their careers and the typical time of family formation. Moreover, the intermediary is web-based and the familiarity with online transactions may add to this differential. Figure 3, panel A, clearly marks the over-representation of men aged 25-34. Banks in general prefer clients with a stable income; the banks participating in the intermediary discourage the unemployed and students with no other form of income than their student grants and loans from

applying. Panel C demonstrates that individuals with an income below the median are thus underrepresented. Panel D demonstrates that women in the applicant pool overall have a somewhat higher income than in the population in general. For men this is only the case for the very youngest cohorts.

Figure 4. Representativeness of indivduals who received at least one credit offer



Note. Applicants at the financial intermediary are compared with the Swedish population with respect to three characteristics: home ownership, their marital status and parental status. Within panel C and D. 2+ and 3+ children are defined as two or more and three or more respectively. The vertical axis displays the percentage share of people that display a characteristic.

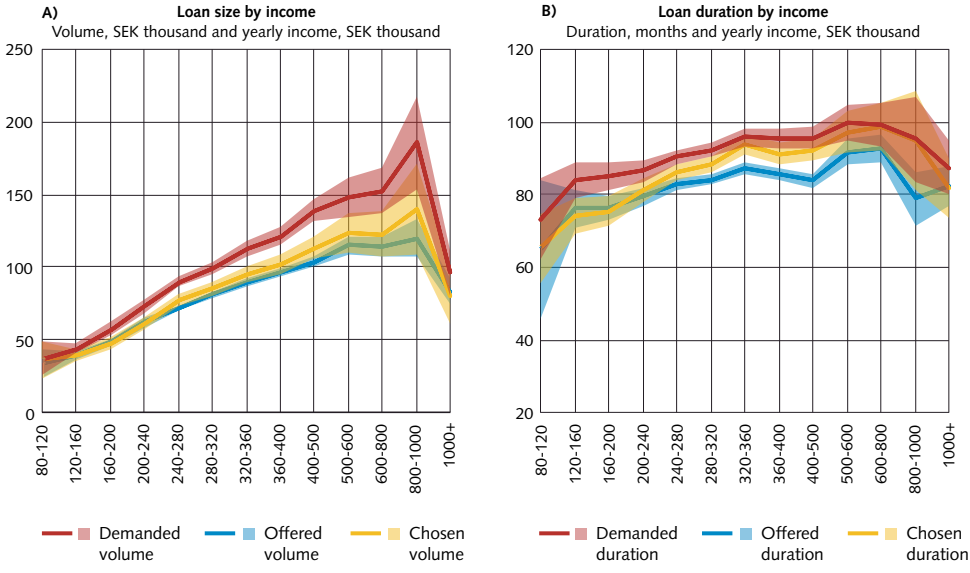
Continuing with Figure 4, Panels A-B, we see that applicants who receive at least one credit offer are substantially less likely to be home-owners or married and more likely to live together without being married. This finding is partly explained by the overrepresentation of younger cohorts. Panel C illustrates that those receiving offers are more likely to have children, while Panel D marks one of the more substantial differences between the customer base and the Swedish population: More than 14 per cent of the customer base consists of single women with children, compared to three per cent in the population. A possible explanation of this differential may lie in the fact that a recent divorce can bring about a short-term mismatch between financial obligations and income, thereby increasing the demand for credit to smooth consumption. Agarwal and Bos (2011) also document that a recent divorce correlates positively with an increase in both credit demand and application rejections.

Demand, supply and choice of credit and credit terms

In this section we describe some differences between the demand for, as well as the supply and choice of credit volumes, loan durations and interest rates.

As mentioned in Table 1, 65 per cent of all applicants receive at least one offer from the participating banks. Applicants that receive an offer demanded on average a loan of SEK 101 205 and a duration of 91.9 months (7.6 years). Of those who receive offer(s), 24 per cent choose not to accept any of the proposed credit contracts.[3] For those who accept one of the offers, the average granted loan amounts to SEK 84 456 and has a duration of 87.5 months (7.3 years). Figure 5 shows that both the demanded, offered and chosen volume increases close to monotonically as applicant income rises.[4] However, in the lower income ranges applicants solicit loans of approximately 30-50 per cent of their disposable annual income, while people in the upper income ranges apply for loans of up to about 20-30 per cent of their disposable income.

Figure 5. Demanded, offered and chosen loan size and loan duration by income



Note. The graphs show, plotted against different disposable income intervals of the applicants, the mean (solid lines) and 95 per cent confidence interval of the mean for (Panel A) the solicited, offered and chosen loan size and (Panel B) the requested, offered and chosen loan duration.

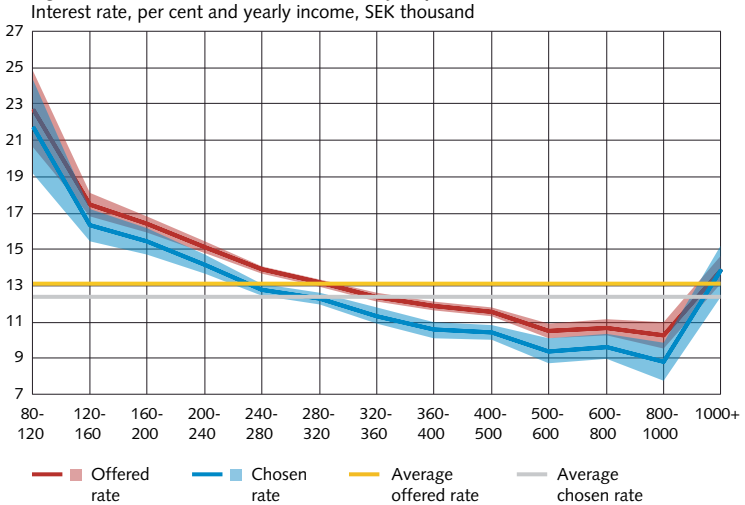
3 Irrespective of the actual gender of the applicants we will refer to them as "she" in what follows to avoid a cumbersome use of he/she.

4 In the highest income interval the number of observations is very small.

On average, loan applicants are rationed since their requested loan size is greater than the loan offered by the banks. The volume chosen by the consumers is located inbetween the requested and offered. Since individuals tend to pick the larger volumes, the average chosen volume is higher than the average offered volume. Furthermore, it is notable that the offered and chosen volumes are nearly identical in the lower income ranges, but diverge as income increases. Loan durations display much less variation over the income distribution and are on average around 90 months. Only in the lower part of the income distribution are loans with maturities of 50-80 months more common.

In Figure 6 we present information on the interest rates that applicants are offered and choose; applicants cannot specify a preferred interest rate in a loan application. The unweighted sample average of the offered rate is 13.1 per cent, while the corresponding accepted rate is 12.4 per cent. These rates can be compared with population-wide average interest rates charged on credit card debt of 10-14 per cent, and on consumption debt of 5-8 per cent over the period 2006-2013, as displayed in Figure 7.[5] Here, we do not investigate further if rates offered are higher or lower than on credit supplied through conventional channels. Instead we concentrate on the differences in rates within the sample.

Figure 6. Offered and chosen interest rate by disposable income
Interest rate, per cent and yearly income, SEK thousand



Note. The graph shows the mean (solid lines) and 95 per cent confidence interval of the average offered and average chosen interest rates, plotted against disposable income of the applicants.

5 Aggregate credit market statistics on, for example, interest rates average out rates for a wide range of credit types. One therefore needs to be cautious in comparing these rates to the loans offered through internet intermediaries. Consumption credit, which offers lower average rates, can for example include loans collateralized by, for example, purchased electronics. Some credit card issuers can charge substantially higher rates than those mentioned here, but rates may sometimes apply only to credit that is not paid back within 30 or 45 days.

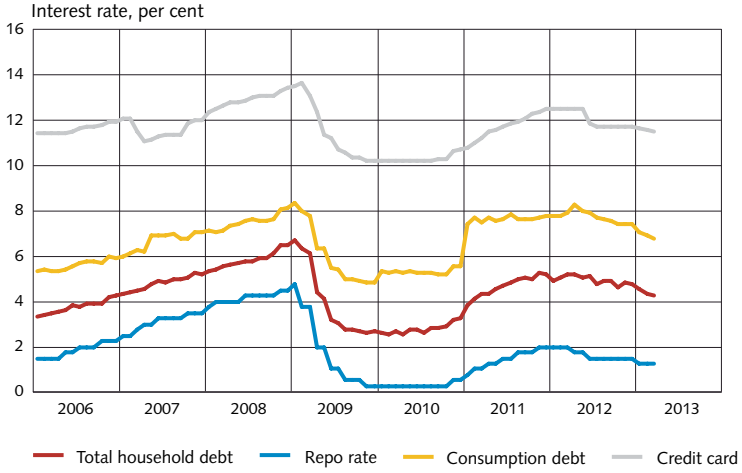
Figure 6 shows that not only the quantity of credit varies with income, but also the offered and chosen interest rates. While quantities increase sharply with income, rates fall rapidly as disposable income rises. Whereas people in the lowest income ranges pay interest rates between 19 and 24 per cent, the cost of credit is between 8 and 13 per cent for most customers in higher income categories. It should be observed, though, that we do not have any information on applicants' creditworthiness and thus cannot control for the correlation between income and riskiness. Part of the negative relation between income and interest rates is likely to be explained by an average positive relationship between income and repayment ability.[6]

It is worth noting in Figure 6 that offered and chosen rates are very close to each other in the lower part of the income distribtion, with overlapping confidence bands. In the middle range of the income distribution, however, there is less variation in the offered rates, consistent with the presence of more competition for these individuals. The data thus suggest, in other words, that there are signs of market segmentation or reduced competition in the lower and higher income segments.

The presence of large variations in interest rates across households has a number of potentially important implications and raises several questions related to the calibration and effectiveness of economic policy. If households pay widely varying interest rates on their credit, they have similarly varying sensitivities to changes in interest rates. For example, if low-income households already pay high interest rates, and are less exposed to the real estate and mortgage market, it is possible that they will respond less to changes in the level of interest rates. As a result, changes in interest rates will affect these households' consumption and smoothing patterns differently.

6 Roszbach (2004), however, finds that income and default risks are negatively related for a sample of provided-in-store loans.

Figure 7. Interest rates in Sweden, 2006-2012
Interest rate, per cent

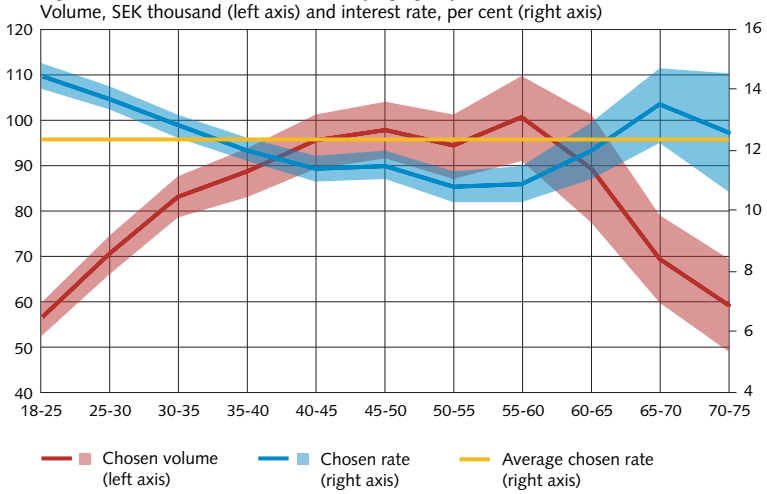


Note. The graph plots interest rates charged by Swedish MFI on new consumer loans, sorted by type of consumer loan. Total household debt includes mortgages (not depicted separately). Credit card interest payments are defined as the interest consumers pay on their credit card debt that is outstanding when the zero interest grace period has ended. The consumption debt rate is defined as the average rate on all consumption loans granted to households, excluding debt granted to entrepreneurs. Rates are weighted by volume of the loans.

Sources: The Riksbank and Finansmarknadsrapporten 2012

In Figure 8, we display the loan data against another commonly used characteristic, age. As one would expect given the positive relation between income and credit, interest rates not only correlate negatively with income, but also with the size of the loan. Although low rates on larger loans may seem counterintuitive at first sight, this is consistent with the notion that people aged 30-60 years, probably with safer or better jobs, borrow more, and at a more favorable rate. Figure 9 lends some support to this notion, as interest rates tend to fall with the length of job tenure. Up to 40 years, every additional year of employment is associated with an additional drop in rates of about 10 basis points. Figure 10 provides further indications that such a mechanism is at work: as the age of borrowers increases, their income rises and the interest rates they pay tend to fall. However, once people pass the age of 50-60, their income starts falling again and the interest rates they pay move upwards.

Figure 8. Loan rates and size of loans, by age groups
Volume, SEK thousand (left axis) and interest rate, per cent (right axis)



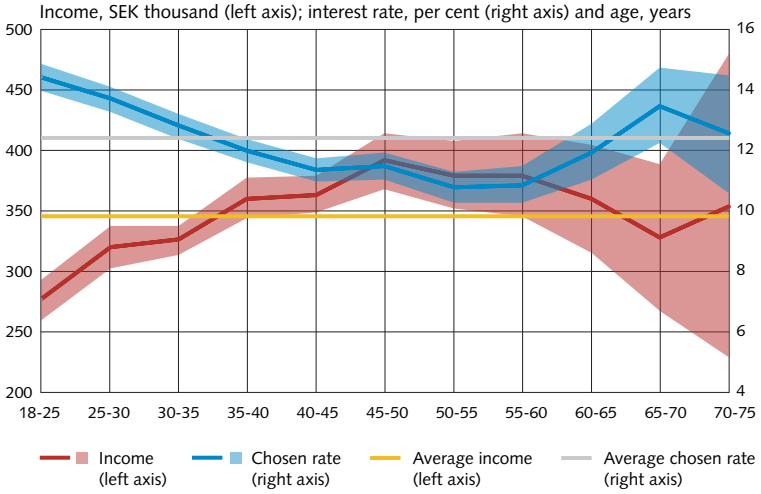
Note. The graph displays the mean (solid lines) and the 95 per cent confidence interval of the average chosen loan sizes and average chosen interest rates over the age distribution. Note that the top 1 per cent of the income distribution is excluded.

Figure 9. Loan rates and size of loans, by co-applicant age groups
Interest rate, per cent and employment length, years

Note. The graph displays the mean (solid lines) and the 95 per cent confidence interval of the average chosen interest rates over the duration of employment.

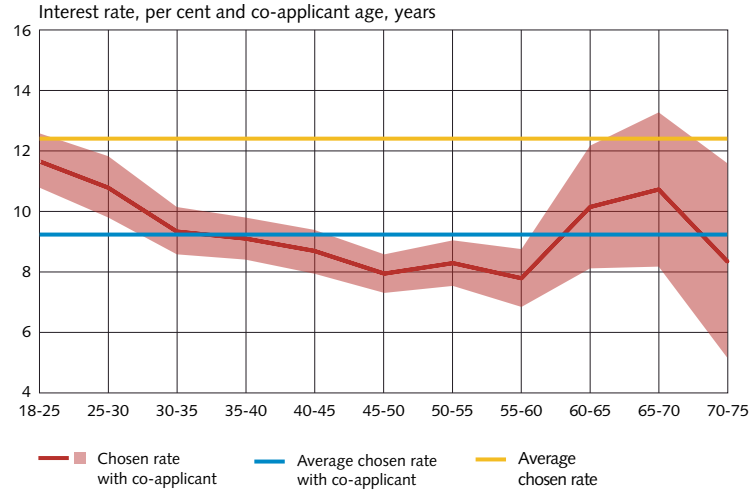
Finally, Figure 11 shows that having a co-signer on a loan contract can provide substantial financial benefits. Applicants with a co-signer, for example a parent or a partner, pay on average 300 basis points lower interest rates than their single-signing peers. Co-signed rates tightly follow a path that resembles the rates charged to the co-signer, most likely because the availability of a co-signer decreases the credit risk for the bank. However, when the applicant or the co-signer approaches retirement the rate starts rising again.

Figure 10. Loan rates and income by age groups
Income, SEK thousand (left axis); interest rate, per cent (right axis) and age, years



Note. The graph displays chosen interest rate and yearly income by age of the applicant.

Figure 11. Loan rates by co-applicant age groups
Interest rate, per cent and co-applicant age, years



Note. The graph displays the chosen interest rate for individuals applying for credit with a co-applicant by age of the co-applicant.

Concluding remarks

The internet-based intermediation of credit is a relatively new phenomenon that has potentially big implications for how credit is allocated across households. We show that not only the amount of credit, but also the interest rate charged can vary widely across households. In the particular sample we study, lower income households that are likely to be associated with higher repayment risk, pay substantially higher interest rates than higher income households. Interest rate differentials can be up to 15 per centage points. This raises several questions for economic policymakers. For example, if the variation in interest rates paid on consumer credit is large, how does this affect the transmission of changes in interest rates? Moreover, if low-income households already pay high interest rates, and are less exposed to the real estate and mortgage market, will they be likely to respond less to changes in the level of interest rates? To what extent the benefits of better access to credit, even at high rates, outweigh the risk of over-indebtedness or financial distress by households remains unclear. Zinman (2013) reviews the extant literature on this complex trade-off. We hope that future research, some using the data presented in this article, can analyse some of the questions that have a bearing on monetary policy, macroprudential policy and the trade-offs that consumers face.

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Sveriges Riksbank
SE-103 37 Stockholm

www.riksbank.se
Tel +46 8 787 00 00
Fax +46 8 21 05 31