

# The Riksbank's monetary policy measures during the financial crisis – evaluation and lessons learnt

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*What monetary policy measures – conventional and extraordinary – did the Riksbank take during the financial crisis 2008-2009 and what effects did they have? In this article we describe the sequence of events during which the repo rate was cut by 4.5 percentage points over the course of six months, and when the Riksbank provided loans to Swedish banks that amounted at most to just over 9 per cent of GDP. We also explain why the Riksbank took these measures and analyse their effects. Our analysis shows that these measures had the desired effect. Both money market and bond yields as well as variable mortgage rates declined and monetary policy expectations fell. An important experience of the financial crisis is how important it is for the Riksbank to be prepared to quickly take appropriate extraordinary measures when the need arises.*

When the US investment bank Lehman Brothers went bankrupt in September 2008, what had started out as a crisis in the US mortgage market became a global financial crisis – the most serious in the western world since the Great Depression of the 1930s. The uncertainty and suspicions regarding creditworthiness meant that financial market participants were unwilling to trade with one another and lend to one another. The crisis meant that asset prices around the world fell dramatically and the financial markets functioned poorly – some submarkets completely ceased functioning. Moreover, risk premiums rose substantially – it became both more expensive and more difficult to obtain loans.<sup>1</sup>

This situation presented monetary policy with unexpected challenges. Monetary policy affects the economy through a number of different channels, such as bank and market interest rates, exchange rates and credit granting. Under normal circumstances, changes in the policy rate affect first of all interest rate-setting and the financial conditions in the economy and then after that demand, production and inflation. The Riksbank also publishes a repo-rate path, that is a forecast of the future level of the repo rate that is compatible with the inflation target. In this way, the Riksbank can also attempt to influence

<sup>1</sup> A risk premium is the additional return an investor requires as compensation for taking a higher risk. Risk premiums can be divided up into different parts. The maturity premium compensates for the risk that interest rates will develop unfavourably during the period that an investor owns the instrument. The liquidity premium compensates for the risk of not being able to sell an investment for liquid funds at all or without making a substantial loss. The credit risk premium compensates for the risk that the counterparty will not be able to meet its obligations.

expectations of future repo rates and help to steer interest rate-setting in the economy at longer maturities. It is this chain of effects of repo-rate changes on the economy as a whole that is usually referred to as the monetary policy transmission mechanism.<sup>2</sup>

During the financial crisis 2008-2009, however, the shocks to the financial markets were so great that the impact of monetary policy was adversely affected. The increased risk premiums meant that the changes in the repo rate had less effect than normal on market rates – the transmission mechanism for monetary policy quite simply was not functioning well enough. The large cuts in the repo rate also meant that the level of the repo rate approached zero, which limited the Riksbank's capacity to use further repo rate cuts if necessary to facilitate credit granting and stimulate the economy. However, further monetary policy stimulation was necessary, as GDP continued to fall heavily at the beginning of 2009.

The Riksbank, like many other central banks, therefore needed to take what are known as extraordinary measures, which were also intended to promote financial stability. Among other things, the Riksbank offered its counterparties loans in SEK at longer maturities and also loans in US dollars, it approved a larger number of securities as eligible assets and extended the circle of counterparties.<sup>3</sup> The first loans were granted in October 2008 and after that loans were offered regularly until the end of October 2010.

These measures had several purposes. They were intended to safeguard the liquidity of the Swedish financial system, to make the financial markets function better and to facilitate credit granting and reduce various risk premiums that limited the impact of monetary policy. It is of course difficult in a crisis of the magnitude of the one we experienced in 2008-2009 to draw a clear line between the measures that were taken to safeguard financial stability and those taken for monetary policy purposes. Measures that mainly aimed to promote the functioning of the financial markets have also affected and improved the monetary policy transmission mechanism from the policy rate to the interest rates charged to households and companies. However, one of the extraordinary measures – lending at a low, fixed interest rate at a long maturity – had a clearly-stated monetary policy purpose.

In this article we focus on analysing the purpose and effects of the Riksbank's crisis measures from a monetary policy perspective. We begin by describing the monetary policy measures, both conventional and extraordinary, taken by the Riksbank during 2008-2010. After that we discuss the effects that the crisis measures implemented for monetary policy purposes were expected to have. In the third part of the article, we evaluate the actual effects of the three large loans issued by the Riksbank in July, September and October

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2 See Apel and Claussen (2012) for a more detailed description of transmission channels.

3 The monetary policy counterparties are the institutions that are allowed to use the Riksbank's credit facilities. A monetary policy counterparty must be a credit institution with a registered office or branch in Sweden that is a participant in RIX, the Riksbank's system for large-value payments. See Sellin and Åsberg Sommar (2012) for a more detailed description of the various counterparty categories that had access to the Riksbank's operations and extraordinary measures. A complete list of the Riksbank's counterparties is available on the Riksbank's website, [www.riksbank.se](http://www.riksbank.se).

2009 on different market rates, the rates charged to households and companies and on the exchange rate. We then move on to describe the process of phasing out the extraordinary loans and the effects it had. The final part of the article discusses in brief the lessons the Riksbank has learnt from its experiences of extraordinary measures.

#### THE FINANCIAL CRISIS HIT THE MARKETS HARD

The first phase of the financial crisis began in summer 2007 when housing prices in the United States began to fall. This had a negative impact on the financial institutions that had funded a large volume of mortgages. It was difficult to assess the size of the loan losses that might arise from the US mortgages when house prices fell and this created uncertainty among investors and banks.

In the middle of September 2008 the financial crisis reached full-scale impact on both Sweden and the rest of the world. When the US investment bank Lehman Brothers filed for bankruptcy, the market participants' lack of confidence in the creditworthiness of their counterparties became acute. Financial agents in many countries were affected, not just in the United States. This meant that access to credit on the financial markets declined around the world and some markets more or less ceased functioning. Many financial institutions that had earlier funded themselves cheaply through short-term loans now had problems renewing these loans, and if they obtained new loans, these were much more expensive than before. The basis spread – the difference between a three-month interbank rate and the expected overnight rate in three months' time – rocketed sky high (see Figure 1).<sup>4</sup> The international economic downturn that had already begun worsened. The downswing in world trade was particularly dramatic; it was initially larger than the decline in the Great Depression of the 1930s.

#### *Extensive crisis measures*

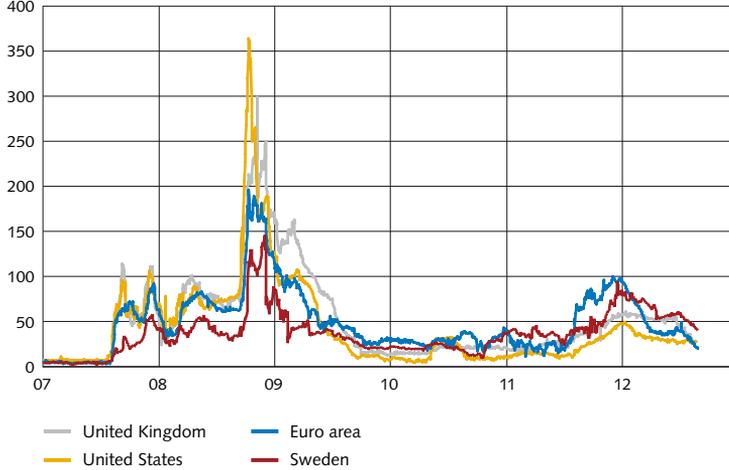
Public authorities around the world began to implement strong measures to stop the negative trend. In Sweden, the Riksbank, the Government and other Swedish authorities took a number of measures to alleviate the effects of the international financial crisis and to improve the functioning of the financial markets. Participants in the Swedish markets were also affected by the general shortage of funding in US dollars that arose after Lehman Brothers' collapse. At the end of September the Riksbank therefore began to offer loans in US dollars to Swedish banks, partly with the aid of funds from the foreign currency reserve and partly via a temporary lending facility offered by the Federal Reserve to the Riksbank and other central banks.<sup>5</sup> Soon after that the Riksbank also began to lend Swedish kronor

4 The interest difference given by the basis spread measures the investors' preferences to hold liquid funds in relation to fixing them for a period of three months. The rising interest difference means that the risk premium that reflects liquidity and credit risks has increased.

5 As the loan market in dollars is global, the Federal Reserve offered other countries' central banks the opportunity to mediate dollar loans to their counterparties. This led to liquidity assistance in US dollars reaching more parts of the global financial system and helped counteract the on-going liquidity crisis. See page 23 of the Riksbank's Annual Report 2009 for more information on the Riksbank's lending in foreign currency.

to facilitate the banks' slightly longer-term funding. For example, the banks were offered loans in SEK with maturities of three and six months. Ultimately, the Riksbank's measures were aimed at facilitating the supply of credit in Sweden and reducing the various risk premiums that were limiting the impact of monetary policy on the interest rates the banks charged companies and households.

**Figure 1. Difference between interbank rates and expected policy rates (basis spread), basis points**



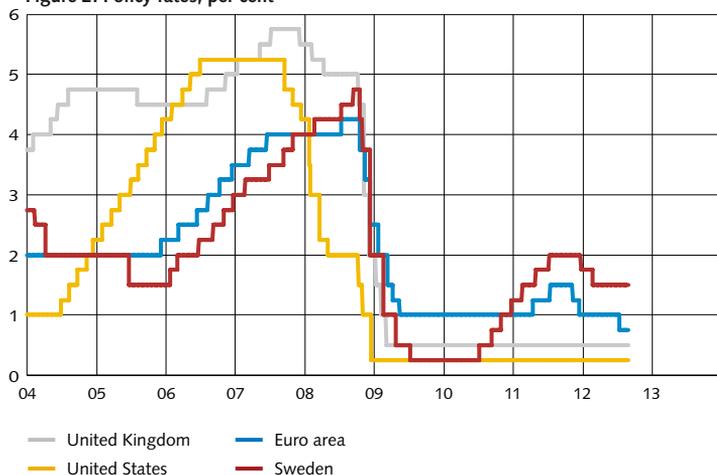
Note. The difference is calculated by subtracting the three month overnight index swap from the three month interbank rate.

Sources: Reuters EcoWin and the Riksbank.

### *Policy rate cut and fixed-rate loans introduced*

At the same time, there was also a radical change in the traditional monetary policy conducted in many countries around the world (see Figure 2). On 8 October 2008, the central banks in the United States, the United Kingdom, the euro area, Canada, Switzerland and Sweden cut their policy rates by 0.5 percentage points in a joint action. Further cuts followed as international economic activity continued to deteriorate and had a severe impact on the Swedish economy. Sweden was hit hard by the global recession and the ensuing collapse in world trade, as the Swedish economy is strongly export-dependent. After having fallen by almost 4 per cent during the final quarter of 2008, GDP in Sweden fell by a further 5 per cent in 2009.

Figure 2. Policy rates, per cent



Source: Reuters EcoWin.

Between October 2008 and July 2009 the repo rate was cut by a total of 4.5 percentage points, to the all-time low of 0.25 per cent. In July 2009, the Riksbank announced its intention to allow the repo rate to remain at this low level for more than one year, until autumn 2010. At the same time, the Executive Board of the Riksbank decided on the first loan motivated by monetary policy: the banks were offered SEK 100 billion in loans at a fixed, low interest rate with a maturity of around 12 months (we will refer to these loans hereafter as the fixed-rate loans). Behind this decision was an assessment that the monetary policy toolbox needed to be supplemented with extraordinary measures in a situation when the repo rate was approaching its lower bound and there was still a need for monetary policy stimulation. The Riksbank’s intention was that these measures would help reduce the large difference between the repo rate and the market rates charged to households and companies during this period, and in this way contributed to monetary policy having the intended effect.

In total, the Riksbank offered three fixed-rate loans with a maturity of around one year, totalling SEK 100 billion each during the period July to November 2009. The loans were allocated through interest bidding, that is, the Riksbank’s counterparties could bid for the loan by stating both the requested volume and interest rate. Technically, the Riksbank thus did not determine the fixed interest rate. However, the Riksbank did stipulate a minimum level for the interest rate that was equal to the repo rate with an addition of 0.15 percentage points, that is, 0.40 per cent. Although the counterparties showed a great interest in the loans offered – two of the three auctions were oversubscribed – the allocation interest rates nevertheless only were a few basis points above the lowest possible bid rate.<sup>6</sup> The Riksbank lent a total of SEK 296.5 billion in the three auctions of fixed-rate

6 The allocation interest rates were 0.45, 0.43 and 0.40 per cent.

loans. The total outstanding loan volume in Swedish kronor at both fixed and variable interest rates amounted at most to 9 per cent of GDP.

#### THE FIXED-RATE LOANS INTENDED TO SUPPORT MONETARY POLICY ...

The financial crisis meant that the transmission channels – primarily the interest rate channel – did not function normally. The fixed-rate loans were intended to counteract this and to contribute to monetary policy having the intended effect. To simplify, the expected effect of the fixed-rate loans on different market rates can be divided into two components: *liquidity effects* and *signalling effects*.<sup>7</sup>

##### *... through liquidity effects ...*

The Riksbank's fixed-rate loans in practice had two purposes: to increase the supply of funding for the bank system and at the same time reduce the banks' funding costs by making it cheaper for them to borrow from the Riksbank than via the market.

With the fixed-rate loan the Riksbank thus created a large surplus supply of kronor in the banking system, which was intended to have a number of different effects on market rates. For example, the increased access to relatively long-term and extensive funding was intended to reduce the banks' refinancing risk, that is, the risk that a bank that needs funding will not be able to obtain it through the capital markets. This could push down liquidity premiums and thus contribute to lower market rates, including lower lending rates to households and companies.

Another effect that was expected to ensue from the fixed-rate loans was that the banks would benefit from the arbitrage-like possibilities that these loans offered. By borrowing cheaply from the Riksbank and investing the money in, for instance, debt securities with a corresponding maturity but a higher interest rate (such as bank and corporate certificates, or mortgage bonds with maturities of up to one year), a bank could obtain a positive return. This type of investment could contribute to pushing up the price of these debt securities and consequently lead to the interest rate falling. Prior to the first fixed-rate loan, this type of potential arbitrage effect was expected to arise mainly in short-term government and mortgage bonds.

##### *... and signalling effects*

The fixed-rate loans were implemented as a complement to the traditional monetary policy that entailed cutting the repo rate and at the same time signalling that the repo rate would be kept at a low level over the coming year. They were thus aimed at increasing confidence in the Riksbank's intention to really conduct an expansionary monetary policy until autumn 2010. One could say that the Riksbank "invested money" in its own forecast for the repo rate by lending money at a low and fixed interest rate with a maturity of one year. To

<sup>7</sup> A similar type of division of the effects can be found in other studies of various types of quantitative easing. See, for instance, Bauer and Rudebusch (2011).

make it easier to understand this reasoning, we first need to explain how the Riksbank's operational framework functions.<sup>8</sup>

The amount of kronor in the economy can only be regulated by the Riksbank, as the payment system is a closed system. If the Riksbank supplies liquidity in the form of loans to the banks, a surplus arises in the payment system (given that the system is in balance to start with). The Riksbank intends to balance the payment system every day, which is achieved through various market operations. The aim is to create good conditions to attain a stable overnight rate close to the Riksbank's repo rate. A surplus is balanced through weekly issues of Riksbank certificates or through daily fine-tuning transactions. The banks can thus choose to deposit their surplus with the Riksbank either in Riksbank certificates at the repo rate or in the daily fine-tuning operations at the repo rate minus 0.1 percentage points.

For the Riksbank the fixed-rate loans could have meant a loss if the repo rate was raised, as the surplus the loans created needed to be regularly drained off by means of the Riksbank's ordinary market operations, where the Riksbank pays an interest rate linked to the repo rate. However, the income from the fixed-rate loans was tied to the allocation interest rates in the auctions during the duration of the loan. As long as the Riksbank held to its forecast for the interest rate and held the repo rate unchanged at 0.25 per cent, the Riksbank was assessed to make a small profit, as the interest rate on the fixed-rate loans was around 0.4 per cent (that is, the Riksbank would have a positive net interest income). However, if the Riksbank were to abandon its forecast and raise the repo rate earlier than signalled, this could lead to losses for the Riksbank. In this way, the fixed-rate loans could strengthen the Riksbank's signalling that it was serious about holding the repo rate at a low level for a long period of time.

During spring 2009 monetary policy expectations, measured both as forward rates and according to surveys, were higher than the prevailing repo-rate path.<sup>9</sup> The Riksbank expected that the decision to offer fixed-rate loans would lead to confidence in the repo-rate path strengthening and to monetary policy expectations falling. This would mean that the fixed-rate loans contributed to forward rates and other market rates remaining low or falling further and ultimately easing the financial conditions for companies and households.

#### THE FIXED-RATE LOANS HAD EFFECTS ON INTEREST RATES

We have used a method usually called "event study" to measure the quantitative effects of the three fixed-rate loans.<sup>10</sup> The same type of evaluation method has also been used

8 For a detailed description of the Riksbank's operational framework, see Nessén, Sellin and Åsberg Sommar (2011).

9 There are different ways of measuring monetary policy expectations. One can use surveys to obtain answers on market agents' expectations directly. Another way is to use forward rates which are the market pricing of the monetary policy expectations.

10 See the appendix for a more detailed description of the evaluation method.

to study the effects of other central banks' extraordinary measures.<sup>11</sup> A first stage in the study is to identify occasions when new information on the fixed-rate loans became available. Such information has primarily come from the Riksbank's own announcements of its decisions, auction terms and auction results. But other news that might affect market agents' expectations of the Riksbank's measures may also have been significant. When a list of these occasions has been drawn up, a second stage involves analysing the list to see how various market rates and the exchange rate have developed at these points in time and in this way it is possible to quantify and summarize the liquidity and signalling effects of the fixed-rate loans on the financial markets.

The study focuses on measuring the impact of the fixed-rate loans on a number of different market rates, including forward rates, interbank rates and bond rates. Changes in interest rate differences (also called spreads), such as the difference between a two-year mortgage bond and a government bond, have also been studied.

It is not possible to entirely isolate the effects of the fixed-rate loans from other factors. The loans were part of the total monetary policy assessment, which also included the repo-rate decision at that time and the Riksbank's own repo-rate forecast (repo-rate path). Despite the measurement problems this entails, we have nevertheless assessed that the Riksbank's study provides a reasonable estimate of the interest rate effects the three fixed-rate loans caused.<sup>12</sup>

All in all, our analysis shows that the fixed-rate loans pushed down the short-term market rates by at most around 20 basis points. For example, the interbank rates and interest rates on bank certificates and commercial paper declined, which made short-term funding cheaper for both financial and non-financial companies. A study that quantifies the effects of the European Central Bank's (ECB's) fixed-rate loans in 2009 shows similar effects (ECB Monthly Bulletin November 2009).

The analysis also shows that interest rates on more long-term interest-bearing instruments, such as government and mortgage bonds, fell when the Riksbank published a repo-rate path with a forecast for a low repo rate over a long period of time and at the same time announced a fixed-rate loan. The largest effects observed were on bonds with maturities of up to two years, where rates fell in total by at most 40 basis points. Lower policy rate expectations and lower liquidity risk premiums appear to have been some important factors behind the lower bond yields, but it is difficult to completely isolate the individual effect from the fixed-rate loans as other simultaneous events may have affected the Swedish money and bond markets. On the other hand, the announcement of the fixed-rate loans appears to have had fairly little effect on the exchange rate.

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11 See, for example, Gagnon et al. (2010) and Krishnamurthy and Vissing-Jorgensen (2010) for estimates of the effects on US asset prices of the Federal Reserve's various quantitative easing measures. See the article "Central Bank Communication in Periods of Heightened Uncertainty" in the ECB Monthly Bulletin November 2009 for estimates of the effects on financial markets of the European Central Bank's fixed-rate loans.

12 For further discussion of the measurement problems, see the appendix.

### *Money market rates fell*

The money market is the market for short-term loans with maturities of up to one year. We have analysed the effects on interbank rates by studying the so-called STIBOR rates at different maturities.<sup>13</sup> These interbank rates are used to a great extent as reference rates for many types of financial contract, for instance, for many bank loans and pricing of loans through commercial papers. This gives the potential effects of the fixed-rate loans on interbank rates an even broader impact that can contribute to lower interest rates for both companies and households (see below).

The interest rate changes for interbank rates with different maturities are shown in Figure 3. We report two different estimates of the total effect, one where we include all nine events that are linked to the fixed-rate loans (red bar) and one where we only include the three occasions when the respective fixed-rate loans were announced for the first time (blue bar). The general result for the study as a whole is that most of the effects arose at the time of the three announcements of the respective fixed-rate loans.

The interbank rate that has a maturity from tomorrow until the next day is called tomorrow-to-next (T/N) and has a very high correlation with the Riksbank's repo rate. In total, the T/N rate declined by 0.33 percentage points between June and December 2009, that is, during the period when the Riksbank offered its three fixed-rate loans. 0.25 percentage points of the total decline in the T/N rate can be attributed to the repo-rate cut of 0.25 percentage points in July 2009. This means that the other 0.08 percentage points were probably linked to the strong increase in the banking system's liquidity as a result of the fixed-rate loans.

The more long-term interbank rates with three and six month maturities fell by a total of 0.30 and 0.37 percentage points respectively in connection with the relevant announcements. To adjust for the effect of the repo-rate cut on 2 July and to focus on the liquidity effects of the fixed-rate loans, we need to analyse the various spread measures, the basis spread and the FRA-RIBA spread, which are shown in Figure 3.<sup>14, 15</sup> These measures give the difference between the interbank rate and the average expected

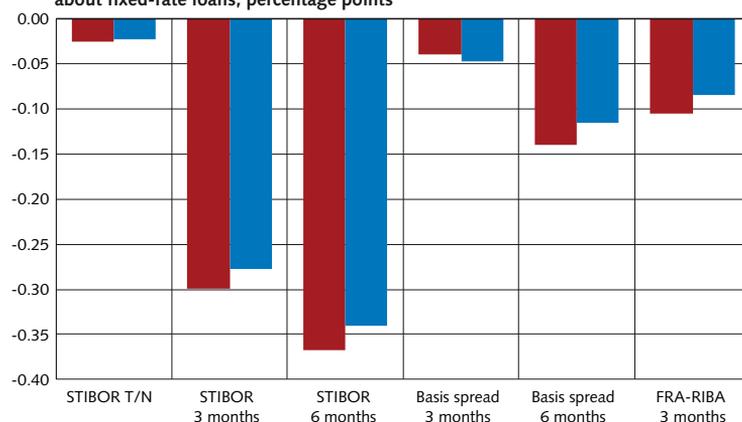
13 It is difficult to find a reliable, precise and frequent data material for interest rate listings on short-term credit markets other than for STIBOR. The STIBOR rates are five banks' (during this period they were six banks) daily assessment of the current interest rate situation for non-secured loans at various maturities on the interbank market. Although the STIBOR rates are not common market rates, and have their limits with regard to exactly reflecting actual interest rates for non-secured loans, the changes in STIBOR rates nevertheless follow fairly closely the changes in most interest rates on related markets.

14 The basis spread is the difference between the STIBOR interbank rate and the STINA rate with the same maturity. We analyse maturities of three months and six months. STINA is an interest rate derivative contract where two parties exchange a fixed interest rate flow and a variable interest rate flow respectively with one another. The variable interest-rate flows are based on the interest rate for the short term tomorrow-to-next, which is closely-related to the Riksbank's repo rate. The market-listed fixed interest rate in the STINA contracts reflects the average expected overnight rate during the term of the contract.

15 FRA and RIBA are two different types of forward contract. In a forward contract two parties agree on an interest rate at a point in the future. The time interval and the price (interest rate) in the contract are determined when the contract is entered into and will depend to a great extent on the counterparties' interest rate expectations. An FRA (Forward Rate Agreement) contract refers to a forward contract for a future three-month STIBOR, while a RIBA contract refers to future repo rates. See the note to Figure 3 for a definition of the basis spread.

overnight rate during the same time to maturity. This difference represents the lender's interest compensation for lending surplus liquidity (compensation for liquidity risk) and for lending to a borrower that might default on payment (compensation for credit risk). The spread measures declined by around 0.04-0.14 percentage points at the times when the fixed-rate loans were announced. From June to December 2009 these spreads declined by 0.19-0.36 percentage points, but during such a long time period other factors than the fixed-rate loans may also have played a role. For example, the corresponding spreads in other countries also declined during this period, which indicates that the global financial risk declined then. This probably contributed to risk in the Swedish banking system also declining after being at a higher level throughout the global financial crisis. Nevertheless, the announcement of the fixed-rate loans appears to have contributed to bringing down short-term interest costs for banks and companies that use market funding.

**Figure 3. Aggregate effect on short-term interest rates and spreads after announcements about fixed-rate loans, percentage points**



- Effects from all announcements related to the three fixed-rate loans
- Effects from announcements of the decisions to offer the three fixed-rate loans

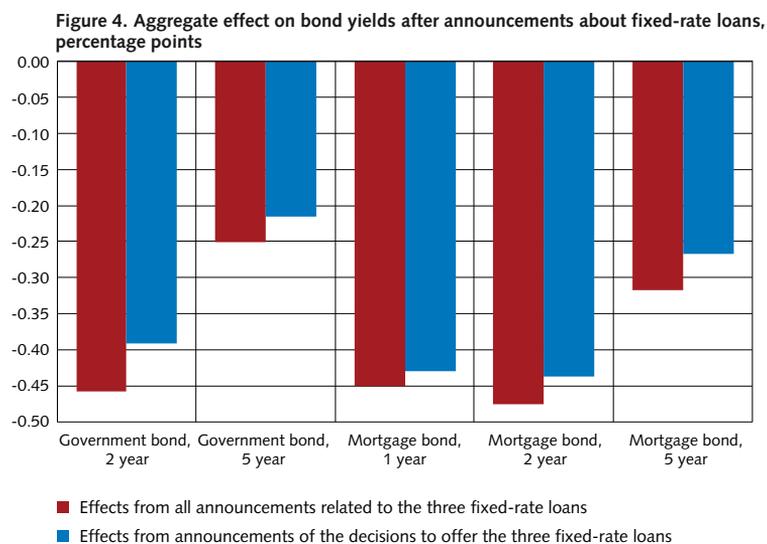
Note. Basis spread is the difference between STIBOR interbank rate and STINA rate. FRA-RIBA spread is the difference between the shortest forward contract for STIBOR 3 months (an FRA contract) and the corresponding forward contract for the repo rate (RIBA). The spread reflects the expected interbank spread for a horizon of up to three months. News related to the fixed-rate loans refers to announcements of new loans, terms for loans or auction results. See Appendix Table A1.

Source: The Riksbank.

### Bond yields also fell

The fixed-rate loans were also expected to have some effect on some of the long-term interest-bearing securities, such as government bonds and mortgage bonds. As the fixed-rate loans had a maturity of one year, it is reasonable to expect that their possible effects were greatest on bonds with maturities of around two years or less. We have therefore analysed changes in both of the bonds' yield levels and different measures of the interest differences (spreads) that could be related to liquidity and credit risks.

Figure 4 shows the total yield changes for government and mortgage bonds when the fixed-rate loans were announced. Government bond yields with a maturity of two years and five years fell by a total of 0.46 and 0.25 percentage points respectively. The repo-rate cut in July 2009 explains, as far as we can judge, at most 0.10-0.20 percentage points of the total change in these yields. The changes in bond yields can probably be explained by both liquidity and signalling effects. However, it is not possible to entirely refine these effects and state how much the respective effects contributed to the total fall in bond yields.



Note. The bond rates are zero coupon rates with a constant maturity, calculated from interpolated yield curves. Mortgage bond rates are based on interest rate data for Stadshypotek covered bonds. News related to the fixed-rate loans refers to announcements of new loans, terms for loans or auction results. See Appendix Table A1.

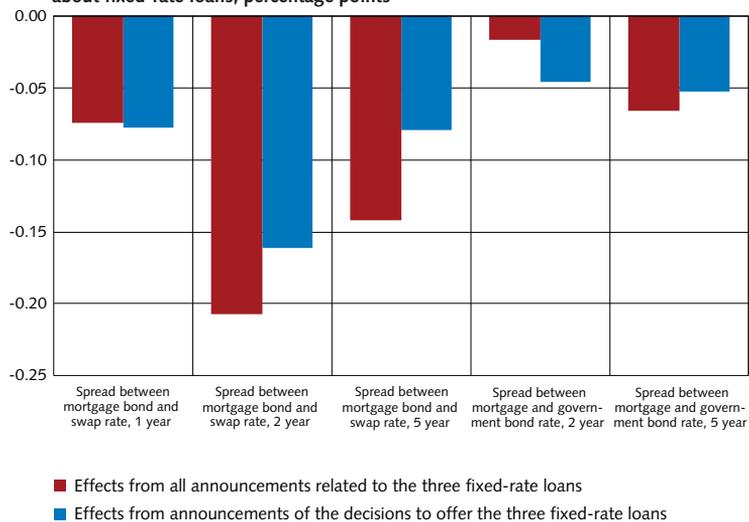
Source: The Riksbank.

Mortgage bond yields fell slightly more than government bond yields. For maturities of one, two and five years the decline was 0.45, 0.47 and 0.32 percentage points respectively. However, the effects of the fixed-rate loans on mortgage bond yields can have received additional impetus from the ECB's purchases of covered mortgage bonds that was begun on 6 July 2009 and continued over the whole of the following year. Although the ECB's purchases only concerned the markets for covered bonds issued in euro, they may have

made the total funding situation for Swedish banks and mortgage institutions who also obtain funding through issues in euro marginally easier.<sup>16</sup>

Figure 5 shows how the interest difference (spread) between mortgage bonds and corresponding interest swaps changed in connection with the fixed-rate loans.<sup>17</sup> The spreads for maturities of one, two and five years declined by 0.07, 0.21 and 0.14 percentage points respectively. Most of the total decline in interest rate differences between mortgage bond yields and swap rates for maturities of one and two years that were noted between June and December 2009 took place in connection with the announcement of the fixed-rate loans (see the blue bar). This decline should also have affected mortgage rates charged to households. The interest rate difference is namely an important measure of the additional cost that banks or mortgage institutions have to pay to convert long-term funding costs to, for instance, a three-month rate and are thus an important factor that affects the mortgage rates charged to households.<sup>18</sup>

**Figure 5. Aggregate effect on mortgage bond yield spreads after announcements about fixed-rate loans, percentage points**



Note. The bond rates are zero coupon rates with a constant maturity, calculated from interpolated yield curves. Mortgage bond rates are based on interest rate data for Stadshypotek covered bonds. News related to the fixed-rate loans refers to announcements of new loans, terms for loans or auction results. See Appendix Table A1.

Source: The Riksbank.

16 The holder of a covered bond has special preferential rights in the event of a bankruptcy.

17 An interest rate swap is a bilateral agreement to exchange a specific interest rate in return for another interest rate for a predetermined period according to specific conditions. A large share of the banks' and mortgage institutions' mortgages to households have a short-term fixed interest period of three months. This means that the banks have a large share of their income from mortgages based on a three-month interest rate. At the same time, the banks' own borrowing at long maturities is through issues of mortgage bonds. A bank can use an interest rate swap to convert the fixed interest cost to a three-month rate to match its funding costs so that they correspond to the interest income. The bank's total funding costs will then be the three-month interest rate plus the interest difference between, for instance, a five-year mortgage bond yield and a swap rate with the same time to maturity.

18 For a more detailed explanation, see the article "The relationship between the repo rate and interest rates for households and companies" in the Monetary Policy Report, February 2012.

### *Household mortgage rates fell when funding costs decreased*

One aim of the Riksbank's fixed-rate loans was to try to lower the general level of interest rates in the Swedish economy by affecting the market rates that determine the banks' funding costs. Variable mortgage rates fell by 0.42 percentage points, from 2.26 per cent in June before the first fixed-rate loan to 1.84 per cent in December after the last fixed-rate loan, which is more than the 0.25 percentage points by which the repo rate was lowered during the period.<sup>19, 20</sup> As our analysis shows, the fixed-rate loans helped to hold down, for example, interbank and mortgage bond rates, which led to lower costs for the banks and mortgage institutions for the funding of new household mortgages. Above all, the fixed-rate loans helped to delay the increase in the banks' funding costs. The higher funding cost that became established after 2010 is partly due to the fact that the price of risk is now higher than it was before the financial crisis. For a detailed discussion of this we refer to the article "The latest developments on the short-term interbank market" in the Financial Stability Report 2011:1.<sup>21</sup>

### *Monetary policy expectations fell*

To estimate the signalling effect of the fixed-rate loans, we study the development of the market's pricing of monetary policy expectations.<sup>22</sup> Pricing is defined here as market-listed forward rates – or more specifically FRA and RIBA contracts. Figure 6 shows the sum total of changes in interest rates for a range of forward contracts for the three days on which the new fixed-rate loans were announced (2 July, 3 September and 22 October 2009). The figure shows five different forward contracts and specifies the changes in both RIBA and FRA contracts that measure the expected repo rate one to two years ahead.

FRA and RIBA rates can also be affected by factors (so-called risk premiums) other than monetary policy expectations, but for the daily changes we measure we assume that these factors are constant.<sup>23</sup> If we thus assume that the risk premiums in the FRA and RIBA rates

19 See the financial market statistics that Statistics Sweden gathers from financial institutions on behalf of the Riksbank.

20 Mortgage rates are not market rates that react immediately to new information but can be adjusted with a time lag of a few days. It is therefore not meaningful to study the immediate effects of the announcement of the fixed-rate loans on mortgage rates.

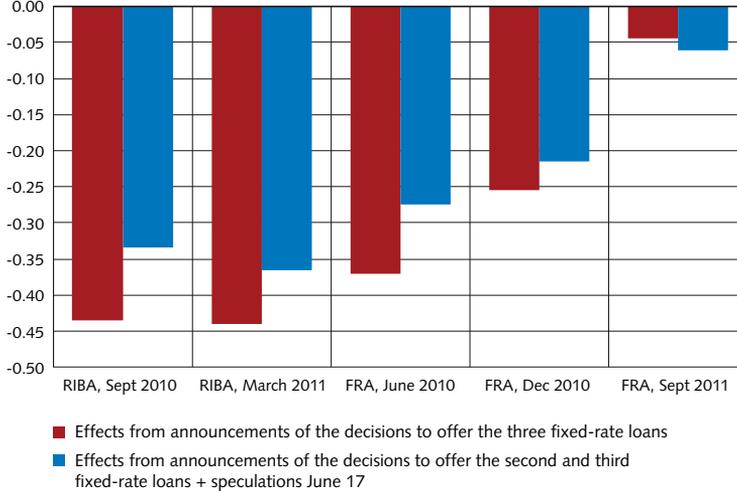
21 For a more detailed discussion of the pricing of mortgages we refer to the article "The relationship between the repo rate and interest rates for households and companies" in the Monetary Policy Report published in February 2012.

22 One way of continuously measuring monetary policy expectations is to use market-listed forward rates. Forward rates are interest rates determined today for investments or loans that will not be executed until a date in the future (settlement date) and which will then run for a predetermined duration. The forward rate can be regarded as the sum of the expected average repo rate from the settlement date to the due date, a maturity premium that compensates for interest rate risk and other risk premiums depending upon liquidity and credit risks. The market's monetary policy expectations are calculated as the forward rate adjusted for these premiums. A less continuous way of measuring monetary policy expectations is to conduct surveys.

23 In the case of FRA rates this assumption could be misleading as they are forward contracts for future STIBOR with a maturity of three months and even future STIBOR can be affected by the fixed-rate loans via liquidity effects. The signalling effect may therefore be overestimated when it is measured in terms of FRA rates. However, the results show the opposite as the changes in the FRA rates are smaller than the changes in the RIBA rates.

were unchanged on the days in question, the result shown in Figure 6 can be interpreted such that the monetary policy expectations one to one and a half years ahead fell by a total of 0.25-0.45 percentage points (see the red bars). However, the total effect on forward rates over a horizon of approximately two years (FRA September 2011) was only a decrease of 0.05 percentage points.

**Figure 6. Aggregate effect on forward rates after announcements about fixed-rate loans, percentage points**



Note. FRA is a forward rate for STIBOR three-month rate and RIBA is a forward rate for a three-month average of the repo rate.

Source: The Riksbank.

In connection with the first announcement of a fixed-rate loan on 2 July 2009, the Riksbank also cut the repo rate by 0.25 percentage points. This cut was almost 0.20 percentage points more than the market participants had expected on average. Part of the change in short-term forward rates that followed directly afterwards was therefore due to this surprising decision and thus had nothing to do with the fixed-rate loan. In total, forward rates fell by 0.15-0.18 percentage points on 2 July and it is probable that a large part of this change can be related to the unexpected repo-rate cut. It is therefore probable that, as an isolated event, the announcement of the first fixed-rate loan had a rather limited impact on monetary policy expectations. Another factor that contributed to this is that already in mid-June the market participants had begun to speculate about the Riksbank’s possibilities to use fixed-rate loans to support a low repo-rate path after the ECB announced fixed rate loans with a maturity of one year in early May 2009. The signalling effect of the fixed-rate loan may thus have been taken into account in the forward rates

already before the announcement on 2 July. For example, forward rates fell by 0.07-0.10 percentage points already on 17 June when evident speculation began.<sup>24</sup>

If we instead put together the interest rate changes in 17 June with the effects in connection with the announcements of the last two fixed-rate loans we get a potentially better measure of the total signalling effect. This is because we exclude the effects of the repo-rate cut on 2 July and take into account the fact that the first fixed-rate loan may have been partly or wholly expected since 17 June. The total effect is then 0.22-0.37 percentage points, as shown in the blue bars in Figure 5. Irrespective of which of these measurement methods we use, the results show that the fixed-rate loans had noticeable effects on monetary policy expectations.

#### *Small effects on the exchange rate*

In addition to their effects on market rates, the fixed-rate loans may have had signalling effects on the exchange rate. However, as the foreign exchange market reacts to an extensive flow of information during the day it is difficult to prove that the change in the exchange rate on a day on which the Riksbank announced a fixed-rate loan is related to this announcement.

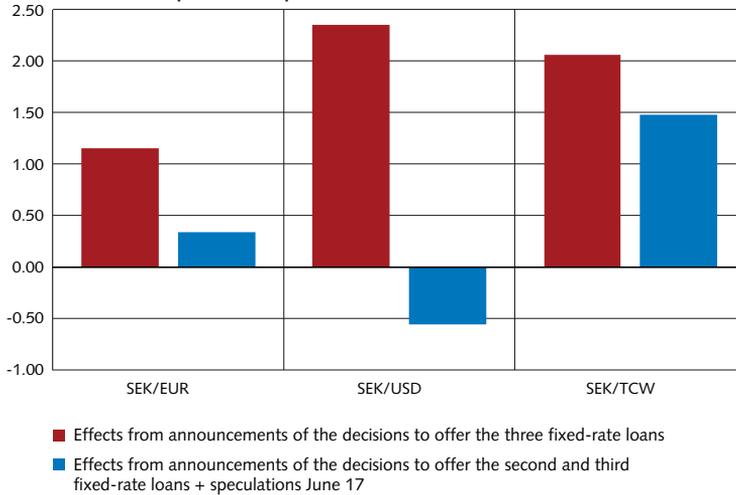
Our analysis of the changes in the TCW index and in the exchange rate for the krona in relation to the euro and the US dollar shows that that the effect of the fixed-rate loans on the exchange rate was in general not particularly significant.<sup>25</sup> However, we can note that the exchange rate for the krona was affected, above all in connection with the announcement of the first fixed-rate loan in July 2009. On this day, the krona weakened by 1.1 per cent against the euro and by 3 per cent against the US dollar. The effect on the exchange rate was not as great when the other two fixed-rate loans were announced, which means that the overall measure shown in Figure 7 is entirely dominated by the effect in July. The weakening of the krona on 2 July 2009 may also have been an effect of the fact that the repo rate was surprisingly cut to 0.25 per cent on the same day. We cannot therefore fully isolate and identify the effects of the fixed-rate loan on the krona in this case. The available data thus indicates that the fixed-rate loans did not have any tangible effect on the krona.

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24 We have identified this date on the basis of speculation in market newsletters and a statement by the National Institute of Economic Research that the Riksbank would probably implement quantitative measures of kind in 2009.

25 The TCW index is an index that measures the value of the krona against a basket of other currencies.

**Figure 7. Aggregate effect on exchange rates after announcements about fixed-rate loans, krona depreciation in per cent**



Note. Positive (negative) effect means that the Swedish krona depreciated (appreciated). SEK/TCW is a weighted currency index for the Swedish krona which weights the exchange rate versus Sweden's most important trading counterparties.

Source: The Riksbank.

#### THE RIKSBANK PHASED OUT THE EXTRAORDINARY MEASURES IN 2010

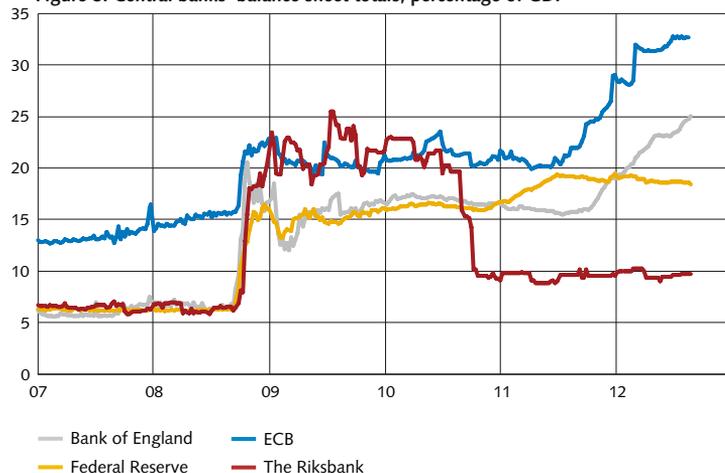
The functioning of the financial markets improved during the course of 2010. For example, access to funding on the private markets improved once again for the Swedish banks and other market participants. The Swedish economy also developed much better than expected. GDP increased by 6.1 per cent in 2010, more than cancelling out the decrease in the preceding year. The upturn was broadly based and could be noted in all parts of the components of GDP. The labour market also developed better than expected and unemployment began to fall.

The Riksbank therefore began to signal its exit strategy, that is its plans for a gradual phase-out of its extraordinary lending. Already in the winter of 2009, the Riksbank began to gradually raise the interest rates on the variable-rate loans that it continued to offer the banks for stability reasons. The maturities of these loans were also gradually shortened in 2010. In this way, the Riksbank was able to gradually prepare the banks for a return to a normal situation without extraordinary lending when the time came to repay the major fixed-rate loans in the summer and autumn of 2010. As the banks' access to market funding improved and the Riksbank's lending became less favourable, the banks chose not to extend their borrowing from the Riksbank. The final outstanding fixed-rate loan was repaid in October 2010, thus bringing to an end the Riksbank's extraordinary lending.<sup>26</sup>

<sup>26</sup> Only a few small variable-rate loans remained outstanding after this. The final outstanding variable-rate loan was repaid in January 2011.

Figure 8 clearly shows that the Riksbank’s extraordinary lending first led to a substantial increase in the Riksbank’s balance sheet and then to a rapid decrease in the autumn of 2010.

Figure 8. Central banks’ balance sheet totals, percentage of GDP



Sources: Bureau of Economic Analysis, Eurostat, Office for National Statistics, Statistics Sweden and the respective central banks.

In parallel with the phase-out of the extraordinary lending, monetary policy as a whole also began to return to a more normal situation. The Riksbank had left the repo rate unchanged at 0.25 per cent since the beginning of July 2009. In July 2010, the repo rate was raised for the first time to 0.5 per cent and this was followed by another three increases, each of 0.25 percentage points. At the end of 2010, the repo rate was 1.25 per cent.

The Riksbank communicated its exit strategy well in advance. In practice, the extraordinary measures were phased out in a relatively simple way. As the Riksbank’s fixed-rate loans fell due in 2010 and the loans were not renewed, the Riksbank had largely wound up its extraordinary measures. Technically, the Riksbank’s exit strategy was thus uncomplicated, even though the loans that fell due comprised relatively large sums in relation to GDP. Unlike many other central banks, the Riksbank did not use the purchase of securities as a crisis measure, which probably also made it easier to plan and implement the phase out of the extraordinary measures.

#### UNCERTAINTY CREATED FRICTIONS DURING THE PHASE-OUT OF THE EXTRAORDINARY MEASURES<sup>27</sup>

When the Riksbank ended its extraordinary lending it was reasonable to expect that interbank rates and yields on the bond market would rise once again. The aim of offering

<sup>27</sup> See also the articles “Temporary market turbulence following the phase-out of the Riksbank’s loan facilities” in Financial Stability Report 2010:2 and “The latest developments on the short-term interbank market” in Financial Stability Report 2011:1.

the fixed-rate loans had been to push down these rates by reducing the liquidity-risk premiums. When the final fixed-rate loan fell due in October 2010, interbank rates and mortgage bond rates did indeed increase, but temporary frictions also arose that led to increased volatility on, above all, the short-term money markets. The increased turbulence on the interbank markets also affected other markets for a short while, which resulted in higher market rates. Why did these frictions arise despite the fact that the Riksbank had clearly communicated its exit strategy in advance at the same time as the banks had good access to alternative funding?

Liquidity in the banking systems decreased rapidly when the banks repaid the fixed-rate loans, which primarily affected the most short-term interbank market, that is the overnight market. It was expected that there could be an effect on the interbank market, but the extent of this effect was difficult to assess in advance.

During the period in which the Riksbank provided large amounts of liquidity, trade on the overnight market fell drastically as the banks no longer needed to borrow money from each other overnight. When the loans subsequently matured and liquidity decreased, the banks were once again forced to manage their short-term funding by balancing out their daily surpluses and deficits with each other. During this transition, uncertainty arose about what sums, and at what interest rates, the banks were prepared to lend to each other from one day to the next without collateral. After having been very low and stable in relation to the repo rate since the autumn of 2008, the overnight rate therefore increased. Uncertainty on the overnight market affected other markets and also pushed up the more long-term money market rates.

The increased uncertainty lasted for a few weeks after the final major fixed-rate loan matured in October 2010. After this, the banks agreed on the new conditions that would apply on the overnight market. This reduced the uncertainty about the price of, and access to, overnight loans. This in turn led to a gradual stabilisation of the situation on the other money and bond markets.

#### *The measures hid a change in the risk behaviour of financial agents*

Alongside the increased uncertainty, there were other factors that can explain the frictions that arose. The substantial liquidity surpluses that prevailed when the fixed-rate loans were in place had hidden a new phenomenon. The financial crisis had prompted a change in the risk behaviour of the Swedish banks. It is clear that in connection with the outbreak of the crisis the banks became more aware of the risks in the banking system at the same time as their need to maintain substantial reserves of liquid funds as part of their liquidity management process had increased. The effects of this new behaviour did not become clear until the surplus liquidity decreased and the banks once again needed to borrow and lend money from and to each other on the interbank and overnight markets to a greater extent. The consequences of increased risk awareness and larger liquidity buffers were a higher price for liquidity in the form of higher liquidity-risk premiums. Prior to the financial crisis these premiums were very low. It was not surprising that average risk premiums on

the Swedish money and bond markets increased after the phase-out of the Riksbank's extraordinary measures. However, the adjustment to the new situation was probably more volatile than the market participants had expected. Changes in liquidity management and increased risk awareness are not unique to Swedish banks. Market participants abroad have also demonstrated this behaviour and now wish to hold more liquid funds than before the start of the financial crisis.

However, it was not only the change in the banks' risk behaviour with regard to liquidity management that caused the increased volatility on the market. The banks themselves were well prepared to repay their loans to the Riksbank and had access to long-term market funding. But there were a number of other market participants that had benefited from the low and stable interbank rates that the surplus liquidity contributed to. Arbitrage-like possibilities had arisen that enabled these participants to use inexpensive funding at short maturities to invest in more long-term assets, for example mortgage bonds. When the short-term interbank rates subsequently increased and the inexpensive funding was no longer available, this type of investment was no longer favourable and the participants chose to sell their holdings, which led to falling prices and higher interest rates.

It is of course natural for a certain degree of friction to arise as the market adjusts from a situation with great liquidity surpluses in the banking system to a more normal situation. However, the types of friction that arose in connection with the phase-out of the Riksbank's measures clearly demonstrate that all the market participants were not fully prepared for the consequences of the phase-out. This is despite the fact that the Riksbank communicated the phase-out in advance and conducted a dialogue with the banks ahead of the phase-out. One of the lessons learned from the Riksbank's exit strategy is thus that one can expect it to be difficult to foresee the chain reaction that can occur when, after a long period of time, one draws in a substantial liquidity surplus and returns to a more normal way of managing liquidity.

#### *Effective measures require preparation and quick action*

The Riksbank's operational framework for the implementation of monetary policy has demonstrated that it works well in both normal conditions and in situations like the recent financial crisis. In normal cases, the Riksbank uses only a few instruments to implement monetary policy. However, during the financial crisis the Riksbank made a number of changes to the framework and took a number of extraordinary measures – primarily lending in Swedish kronor and US dollars to the banks. Other central banks took similar extraordinary measures. The major difference compared to other central banks is that the Riksbank did not purchase securities as a crisis measure. Although the alternative of purchasing debt securities such as government bonds or mortgage bonds was also investigated and discussed at the Riksbank. However, the assessment of the Executive

Board was that the fixed-rate loans in combination with other monetary-policy measures would be adequate to manage the situation at that time and that further measures were not necessary.<sup>28</sup>

Our evaluation of the effects of the fixed-rate loans shows that during 2009 the loans led to more favourable financial conditions in Sweden. Despite the fact that the repo rate had reached what was perceived as its lowest bound, the Riksbank was able to counteract a weak development of the economy by making monetary policy more expansionary. Money market rates and bond yields, as well as variable mortgage rates, were lower as a result of the fixed-rate loans. Our conclusion is that this type of fixed-rate loan can have an impact on market rates, at least in a situation in which the financial markets are not functioning smoothly.

However, experience from the financial crisis shows how important it is that the Riksbank is prepared to quickly take appropriate extraordinary measures when the time arises. Nor can one rule out the possibility that other measures, for instance, the purchase of securities, might be necessary in the future. A further important lesson is that changes and new measures require some preparation before they can be implemented in practice. For example, this can mean it is necessary to work out new routines, agreements and systems. It is thus an advantage if the Riksbank has an infrastructure in place in normal times so that the need for a long period of preparation is reduced in a situation in which there is a need to carry out extraordinary measures quickly. The Riksbank therefore decided in spring 2012 to supplement the monetary policy toolbox by once again acquiring a limited bond portfolio in Swedish kronor. This measure meant that the Riksbank ensured it had the systems, routines, and knowledge needed to be equipped to implement extraordinary measures at short notice in the future.

The winding up of the crisis measures also provided important experience. The Riksbank communicated its exit strategy in good time, in the hope of preparing the banks for a situation without liquidity assistance. As the banks gained better access to market funding once again and the loans from the Riksbank became more expensive and were offered at shorter maturities, the banks were encouraged to let the loans with the Riksbank mature. The banks' transition from extensive liquidity assistance to full market funding thus took place gradually and was relatively undramatic.

The volatility on the money and bond markets that arose after the Riksbank wound up its extraordinary measures in autumn 2010 lasted for a few weeks before the situation stabilised. However, the short-term money market is still, in autumn 2012, showing higher volatility and higher interest rates than prior to the financial crisis. This is probably partly due to the banks becoming more aware of the risks in the banking system, at the same time as their need to hold larger reserves of liquid funds as part of their liquidity management have increased. Moreover, the current debt crisis in Europe has contributed to higher risk premiums and increased market unease, which also affects the Swedish money and bond

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28 See the minutes of the Executive Board's monetary policy meeting on 20 April 2009.

and foreign exchange markets. There are thus several reasons why risk premiums are still higher than they were prior to the outbreak of the financial crisis. Nor does it appear likely that they will return to the low levels we saw before the financial crisis broke out.<sup>29</sup>

It should be emphasised that the Riksbank chose to phase out its extraordinary measures during a period of relatively favourable conditions. The situation on the financial markets had improved, the Swedish economy was recovering at a good pace and other central banks were still providing the markets with large liquidity surpluses. An important experience of the Riksbank's work with its exit strategy is thus that despite the preparations it may be difficult to foresee the full consequences of phasing out extraordinary measures.

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<sup>29</sup> New regulations also play an important role for future risk premiums. See, for instance, the article "Basel III – Effects on the Swedish banks and Sweden" in the Financial Stability Report 2010:2.

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## Appendix: Description of the method to estimate the effects of the fixed-rate loans

A method of the “event study” type studies the immediate price effects of the publication of new information. The method is used in this study to summarise interest rate changes at specific measured points in time that can be linked to days when new information related to the fixed-rate loans was published. The total sum of interest or exchange rate changes during the days is assumed to reflect the total effect the fixed-rate loans have had on financial prices. The same type of evaluation method has also been used to study the effects of other central banks’ extraordinary measures (see, for instance, Gagnon et al., 2010 and Krishnamurthy and Vissing-Jorgensen, 2010). Data for market rates and exchange rates has been gathered from Reuters EcoWin.

We have compiled a list of news that can be linked to the Riksbank’s fixed-rate loans. Such new information has primarily arisen from the Riksbank’s own announcements and statements on the fixed-rate loans, such as the announcement of decisions, auction terms and auction results. The list has also been supplemented with some news about the ECB’s measures, which could also have affected Swedish market rates. However, it appears that these news items do not coincide with any of the measurement points linked to the fixed-rate loans. Table A1 lists all of the dates and events. In total, nine days of news are identified as being directly linked to the Riksbank’s fixed-rate loans and consist of announcements from the Riksbank itself.<sup>30</sup>

There are some properties and potential problems with the chosen method that need to be taken into account. As decisions on the three fixed-rate loans were announced in connection with the monetary policy meetings, we cannot completely isolate the effects of the fixed-rate loans, as the loans were presented as part of the monetary policy assessment, which also includes the current repo-rate decision and repo-rate path. Furthermore, the overall effects are calculated by measuring the change in market rates during a whole day.<sup>31</sup> This is a sufficiently long period for the market agents to have time to act on the new information and for the market rates to have time to adapt. But at the same time, it leads to a risk that non-relevant events during the measurement day may affect market rates and thus the results. Studies using a much greater number of observations than in our case assume that disturbances from non-relevant events will be positive and negative by turns, which means they offset one another and do not have a decisive effect on the total interest rate effect. However, we have checked the few observation dates for such exogenous events and our assessment is that these events have not affected the results in any decisive way, despite the small number of observations.

30 This does not include the payment dates for the fixed-rate loans, that is the days when the money was actually paid out by the Riksbank. In terms of signalling, these days are not of interest as all events around these transactions are finally determined and published two days before.

31 One alternative would have been to use intraday data, but there was no such reliable and adequate data available at the time of this study.

The interpretation of the estimated effects should also take into account the fact that some of the effects of the fixed-rate loan could have gradually had an impact over a longer period of time and not just on the actual observation dates. The estimated effect in this study could therefore be less than the total effect of the fixed-rate loan.

**Table A1. News and events related to the fixed-rate loans**

	<b>Related news and events</b>	<b>News on the fixed-rate loans</b>
07-05-2009	ECB announces 'fixed rate loan' 12 m & purchase of covered bonds	
17-06-2009	Speculation that the Riksbank may offer fixed-rate loans	
24-06-2009	ECB announces results of auction 12 m	
02-07-2009	Riksbank announces fixed-rate loans 12 m + cuts repo rate to 0.25%	*
06-07-2009	ECB initiates programme for purchase of covered bonds	
09-07-2009	Riksbank announces terms for auction	*
13-07-2009	Riksbank announces results of auction	*
15-07-2009	Payment of first loan	
03-09-2009	Riksbank announces new fixed-rate loan 12 m	*
10-09-2009	Riksbank announces terms for auction	*
14-09-2009	Riksbank announces results of auction	*
16-09-2009	Payment of second loan	
22-10-2009	Riksbank announces new fixed-rate loan 12 m	*
29-10-2009	Riksbank announces terms for auction	*
02-11-2009	Riksbank announces results of auction	*
04-11-2009	Payment of third loan	

Note. Dates marked with an asterisk are used to calculate the accumulated effects on interest rates and spreads in Figures 3, 4 and 5.