

■ The transmission mechanism and the financial crisis

BY ELISABETH HOPKINS, JESPER LINDÉ AND ULF SÖDERSTRÖM¹

Elisabeth Hopkins works at the Modelling Division of the Monetary Policy Department. She has a licentiate degree in economics and has worked at the Riksbank since 1997.

Jesper Lindé is Head of the Trade and Financial Studies Section in the Division of International Finance at the US Federal Reserve. He has a PhD in economics and was until October 2008 Head of the Modelling Division at the Monetary Policy Department.

Ulf Söderström works in the Research Division of the Monetary Policy Department. He has a PhD in economics and has worked at the Riksbank since 2008.

Monetary policy affects inflation and economic activity mainly by having an impact on interest rates in financial markets, for example in the interbank market, the bond market and various loan markets. The financial turbulence that started in summer 2007 and thereafter developed into a financial crisis has affected price setting on many of these markets. In this article we discuss how the financial crisis has affected market interest rates.

Interest rates in the interbank markets rose steeply until the end of 2008. We analyse the factors behind this rise. Interbank rates are important in this context, since to a large extent they form the basis for other interest rates in the economy. We show that the rise in interbank rates was mainly due to international factors.

We then analyse whether the financial crisis has affected the impact of monetary policy on the economy; that is the monetary transmission mechanism.² The monetary policy expansion that has taken place since October 2008 has had a great impact on the interest rate level in the markets, even though some interest rate spreads today continue to be greater than before the outbreak of the financial crisis. So monetary policy is not without effect. But since much of the rise in interbank rates is due to foreign factors it may be difficult to reduce the spreads between these rates and other interest rates solely by means of Swedish monetary policy

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² In a separate article in this issue of Sveriges Riksbank Economic Review we describe in more detail how the monetary transmission mechanism works and how monetary policy affects the economy in more normal circumstances.

measures. Recent developments indicate that extensive global measures are required before the crisis in the financial markets can be alleviated.

Interest rate developments since 1996

Changes in the repo rate primarily affect rates in the interbank market, i.e. the rates paid by banks when they borrow from each other for shorter periods. Interbank rates with the shortest maturities are directly affected by monetary policy, while slightly longer interbank rates are also affected by expectations of future changes in the repo rate and compensation for risk. In a similar way, changes in the repo rate also impact rates for treasury bills and government bonds, which have even longer maturities. Changes in rates on the interbank market, treasury bills and government bonds then impact borrowing rates for the banks, such as interest rates on bank accounts and mortgage institutions' bonds. Changes in banks' borrowing rates in turn affect lending rates, such as those for bank loans, mortgages and corporate loans as well as interest rates on commercial paper and corporate bonds. In that way monetary policy affects many different interest rates in the economy, including those encountered by households and firms.

Most economic models (including the Riksbank's general equilibrium model Ramses) assume that a change in the repo rate will lead to a proportional change in all market rates. In that case the spreads between different interest rates are constant over time, and various interest rate spreads can be disregarded when analysing the effects of monetary policy on the economy.³ In normal circumstances this may be a reasonable assumption, since different interest rates tend to move in approximately the same way. However, in the financial turbulence that started in mid-2007 market rates seem to have been changed due to factors not directly dependent on monetary policy. In particular, many market rates rose in relation to interest rates on treasury bills and government bonds with corresponding maturities, increasing interest rate spreads.

In this section we illustrate how different market rates and interest rate spreads have developed in the last twelve years. For example, we show that many interest rate spreads were very low in the years before the start of financial turbulence. Consequently, to some extent financial turbulence has meant that these interest rate spreads have reverted to

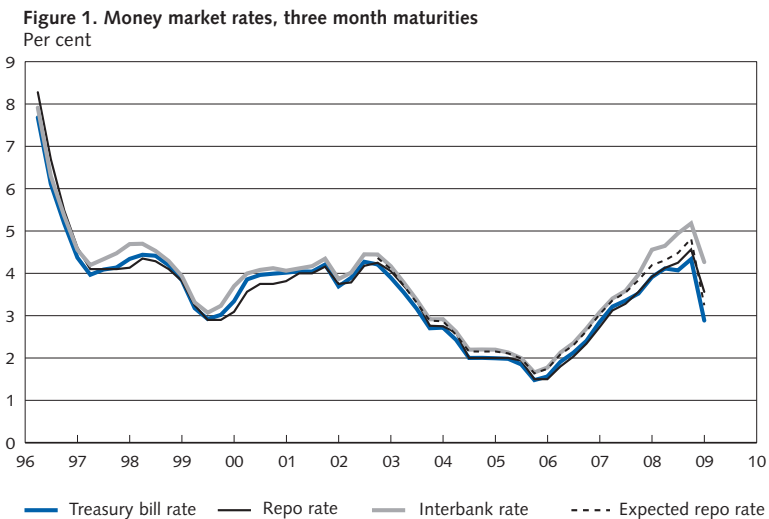
³ However, there are a number of papers that study models with several different interest rates in the economy. Bernanke, Gertler and Gilchrist (2000), for example, develop a model in which firms borrow funds to make investments. Since some firms are expected to fail, the interest on corporate loans is higher than the interest on government bonds. Christiano, Motto and Rostagno (2007) develop this model to contain an explicit banking sector. Goodfriend and McCallum (2007) also analyse a model with several different interest rates. Their model takes into account spreads between interest rates on loans against collateral of varying quality and interest rates on uncollateralised loans.

more normal levels. Other interest rate spreads rose in 2008 to levels that from a historical perspective are exceptionally high.

MONEY MARKET RATES

Figure 1 shows the movements of some money market rates from 1996 to the end of 2008. These are the Riksbank repo rate, interest on three-month treasury bills, the interbank rate (Stibor) with three months maturity and the expected repo rate in the coming three months.⁴ The four rates have followed each other closely during the period. In general the interbank rate was higher than the repo rate and the treasury bill rate, which reflects the fact that banks find it more risky to lend to another bank than to the Government. The treasury bill rate and repo rate are often very close to each other. This is because the treasury bill rate normally primarily reflects expectations about the repo rate in the next three months. The expected repo rate was slightly higher than the treasury bill rate during the period. This difference is to some extent due to market participants' demand for safe investments in the form of treasury bills.

Periodically the interbank rate rose faster than the repo rate and treasury bill rate, increasing the difference against government bond rates. This was the case in 1997 and 1999, for example, and particularly since mid-2007.



Note. Quarterly averages. The interbank rate is Stibor, the expected repo rate is the rate for a Stina swap.

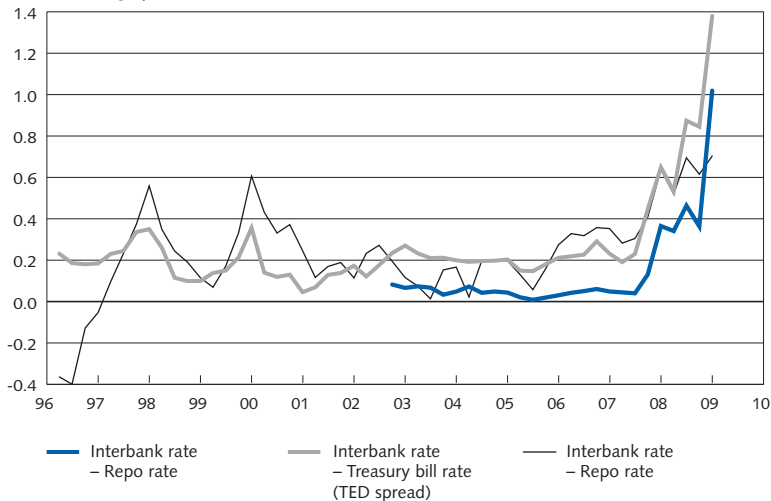
Sources: Reuters Ecowin and Sveriges Riksbank

⁴ The terms Stibor and expected repo rate are described in the box "Stibor and Stina swaps".

Figure 2 shows the difference between the interbank rate and the repo rate as well as the TED and basis spreads.⁵ Until mid-2007 the average quarterly TED spread was typically between 0.15 and 0.25 percentage points, with peaks in 1997 and 1999 of around 0.35 percentage points. In the latter part of 2007, however, the TED spread rose dramatically. In the fourth quarter of 2008 the average TED spread was about 1.35 percentage points. Since the end of 2008 interbank rates have fallen somewhat as the Riksbank has cut the repo rate (see Figures 9 and 10 later in the article). The spread against the treasury bill rate is, however, still higher than before the start of the financial turbulence. This indicates that the banks find it unusually risky to lend to each other. The development of the TED spread is therefore due in some part to the unusually high interbank rate, but also to the unusually low level of interest on treasury bills in relation to the repo rate.

The difference between the interbank rate and the expected repo rate, known as the basis spread, is probably a more accurate measure of the risk premium in interbank rates in the latest period. This has also risen steeply since 2007. Since mid-2007 the basis spread has risen from about

Figure 2. Interest rate spreads on the money market, three month maturities
Percentage points



Note: Quarterly averages. The interbank rate is Stibor, the expected repo rate is the rate for a Stina swap.

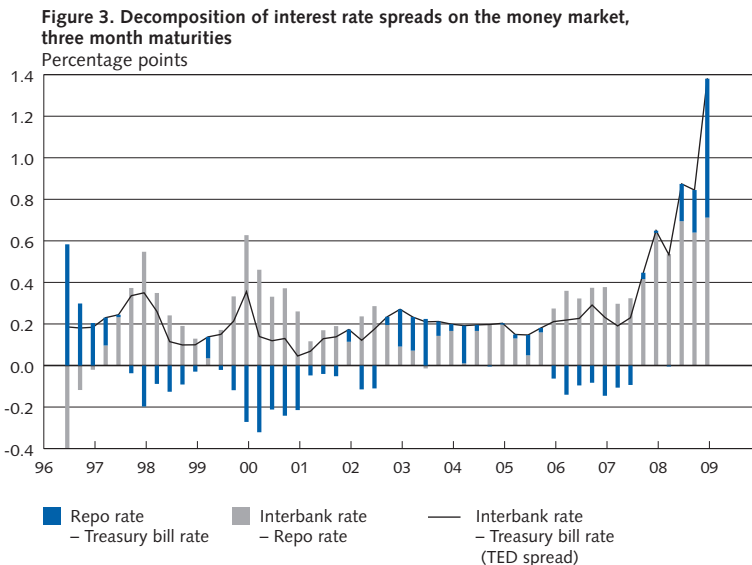
Sources: Reuters Ecowin and Sveriges Riksbank

⁵ The TED spread specifies the difference between the interbank rate and the expected repo rate. The basis spread specifies the difference between the three-month interbank rate and the expected repo rate. The term TED spread was originally used to describe the spread between the interest on an American three-month treasury bill (T-bill) and a "eurodollar contract" with the same maturity. Nowadays an interbank rate is usually used instead of the eurodollar rate.

0.05 percentage points to just over 1 percentage point. In the same period the difference between the interbank rate and the repo rate increased from about 0.3 to 0.6 percentage points. Since data on the expected repo rate are only available since the end of 2002 we focus on the TED spread in the following. As shown in Figure 2 the two interest rate spreads have exhibited a similar pattern during the financial crisis.

Figure 3 divides the total spread between the interbank rate and treasury bill rate into two components: the spread between the interbank rate and the repo rate and the spread between the repo rate and the treasury bill rate. The figure shows that the increase in the total spread can be explained partly by the fact that since mid-2007 the interbank rate has risen more than the repo rate, and partly by the fact that the treasury bill rate has risen more slowly than the repo rate. This may to some extent be because market participants have expected a transition to more expansionary monetary policy, but also because the risk appetite of market participants has fallen, which has led to increased demand for safe and liquid assets such as treasury bills. We will come back later to a more detailed analysis of the rise in the interest rate spread.

Thus interest rates on the interbank market seem to have risen more than can be directly explained by monetary policy.



Note: Quarterly averages. The interbank rate is Stibor.

Sources: Reuters Ecowin and Sveriges Riksbank

Stibor and Stina swaps

Stibor stands for Stockholm Interbank Offered Rate and measures interbank rates, that is the rates paid by banks when they borrow from each other for shorter periods. Stibor is not a true transaction based interest rate. Instead, the major commercial banks specify the interest rate for which they are prepared to lend money without collateral at short maturities (between one day and twelve months). Stibor is compiled by Nasdaq-OMX as an average of the offered rates (with the exception of the highest and lowest quotes). This is done every day at 11.00, and the Stibor Fixing is published at 11.05 for eight maturities from one day up to twelve months. Despite the fact that Stibor rates are not true market listings, and even if trade on the interbank market is largely concentrated on maturities of one week or less, Stibor is used as a basis for many different financial contracts. The level of the interbank rate is therefore an important indicator of the general interest rate level for short-maturities.

The expected repo rate is measured using the interest on a Stina swap, where Stina stands for Stibor Tomorrow/Next Average. It is based on the tomorrow/next rate, which runs from the next day to the following day. This rate historically lies close to the repo rate. A Stina swap is a contract in which one party pays a fixed interest rate to a counterparty and then receives the average tomorrow/next rate for an agreed maturity. That is to say, if the contract is determined for example for three months, party A undertakes to pay the three-month rate in force today to party B. Party B in turn undertakes to pay the tomorrow/next rate applicable every day for these three months. The interest rate on a Stina swap therefore reflects the market expectations for the tomorrow/next rate for the maturity. And since the tomorrow/next rate is close to the repo rate the interest rate on the Stina swap can be seen as a measurement of the expected repo rate for the period.

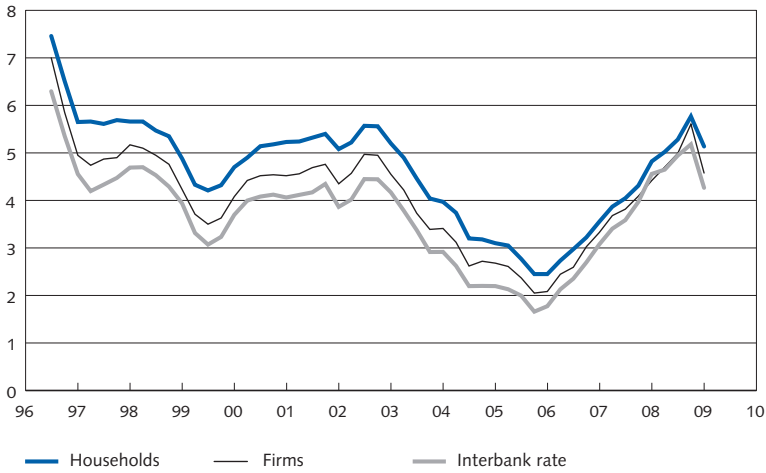
LENDING RATES WITH SHORT MATURITIES

The three-month interbank rate is a measure of the banks' short-term funding costs. It is shown in Figure 4 together with the mortgage institution rates for loans to households and firms with maturities up to three months. How changes in the interbank rate spill over to changes in lend-

ing rates to households and firms is the next step of the transmission mechanism. Figure 5 shows the spread between these lending rates and the interbank rate.

The mortgage institutions' lending rate to households is normally higher than that to firms. The most natural explanation for this is that the credit risk for lending to households is higher than for lending to firms. But it is also conceivable that transaction costs for lending to households

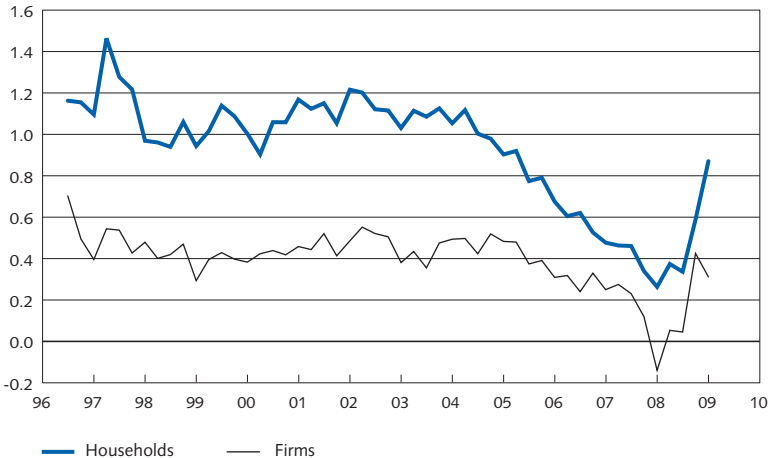
Figure 4. Mortgage institution lending rates to households and firms and the interbank rate, three month maturities
Per cent



Note: Quarterly averages. The interbank rate is Stibor.

Sources: Reuters Ecowin and Sveriges Riksbank

Figure 5. Spread between mortgage institution lending rates and interbank rate, three month maturities
Percentage points



Note: Quarterly averages. The interbank rate is Stibor.

Sources: Reuters Ecowin and Sveriges Riksbank

are greater than for lending to firms. The loan volume per firm is usually greater than per household, which can mean that the average cost of a loan to a household is higher than for a loan to a firm. Finally this may also be due to greater competition in the corporate loan market than in the household loan market.

Until the end of 2003 interest rates to households were on average 1.1 percentage points over the interbank rate, while the interest rate to firms was 0.45 percentage points over the interbank rate (see Figure 5). From 2004 the interest rate to households started to fall in relation to both the corporate rate and the interbank rate, and about one year later the corporate rate also started to fall. In the general rise in interest rates that started in late 2005, lending rates did not rise as fast as the interbank rate, so the interest rate spreads narrowed considerably. This may possibly have been because mortgage institutions eased credit terms, consciously took greater risks or estimated that the risks of lending had decreased.

Interest rate spreads were smallest at the end of 2007, when interest on loans to households was only 0.26 percentage points more than the interbank rate and the corporate rate was 0.14 percentage points lower than the interbank rate. In 2008 interest rate spreads again increased, and the spread for corporate loans is now close to the historically normal level, while that of loans to households is still low from a historical perspective. Thus the rise in short-term lending rates reflects a return to more normal levels, after a period of very low interest rates in 2006 and 2007.

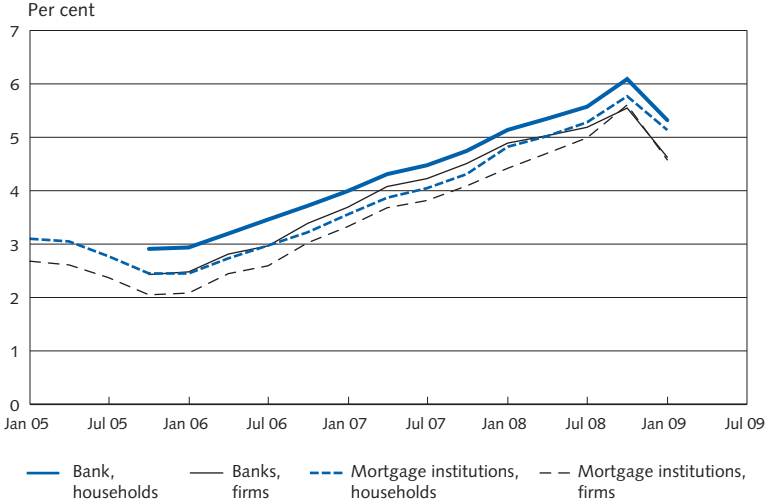
As we can see in Figure 1 the interbank rate has risen more than the government bond rates in the past year. Since the interbank rate affects lending rates this contributed to lending rates also rising more than government bond rates so that the spread between short-term lending rates and the repo rate and three-month treasury bill rate respectively has increased. Figure 4, however, shows that the greater spread in relation to government bond rates is due to a great extent to the rise in the interbank rate, making banks' borrowing more expensive.

Households and firms borrow not only from banks' mortgage institutions, but also directly from the banks. However, we only have access to data on banks' lending rates from the end of 2005. Figure 6 therefore compares mortgage institution lending rates to households and firms with maturities of up to three months with banks' lending rates with the same maturity for this period. The banks' lending rates are typically higher than those of the mortgage institutions, since mortgage institutions require housing as collateral for their loans. Otherwise the different lending rates follow the same pattern. The conclusions concerning mortgage institution lending rates probably also apply to banks' lending rates to households and firms.

LENDING RATES WITH LONG MATURITIES

Finally, Figures 7 and 8 show five-year interest rates for mortgages, mortgage bonds (i.e. mortgage institutions' borrowing rate with longer maturities) and government bonds. For natural reasons the mortgage rate is higher than the rate for mortgage bonds, which in turn is typically higher

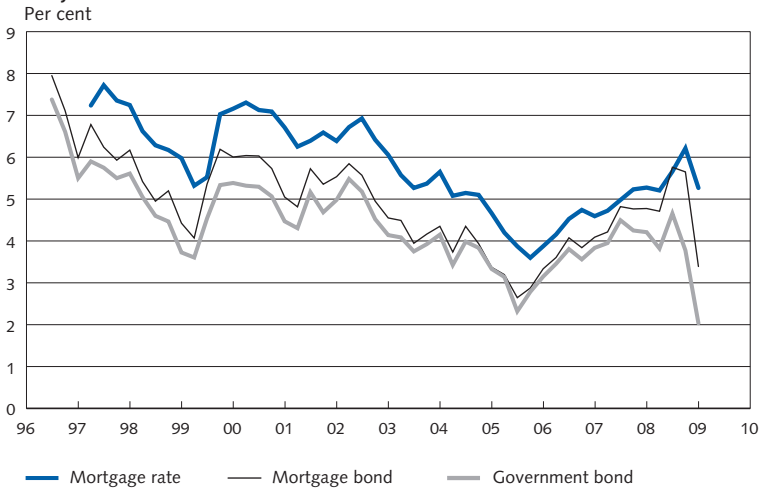
Figure 6. Mortgage institution and bank lending rates to households and firms, three month maturities



Note: Quarterly averages.

Source: Reuters EcoWin

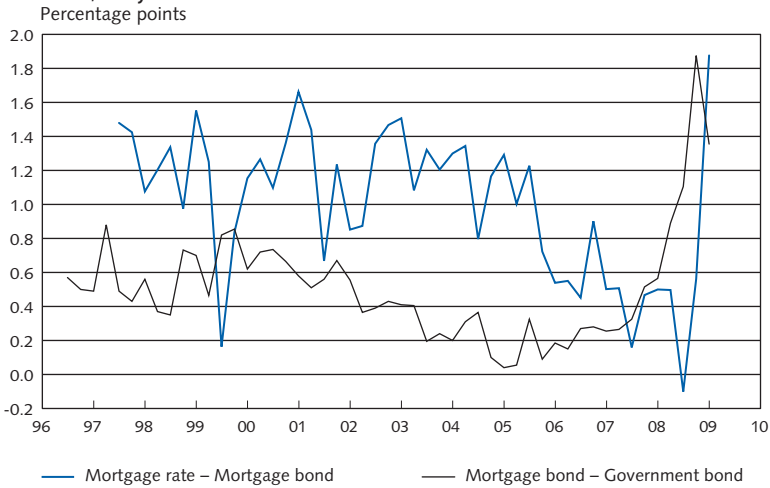
Figure 7. Interest rates on mortgages, mortgage bonds and government bonds, five year maturities



Note: Quarterly averages.

Sources: Nordea, Reuters EcoWin, SBAB, SEB, Spintab, Stadshypotek and Sveriges Riksbank

Figure 8. Interest rate spreads between mortgages, mortgage bonds and government bonds, five year maturities



Note: Quarterly averages.

Sources: Nordea, Reuters EcoWin, SBAB, SEB, Spintab, Stadshypotek and Sveriges Riksbank

than the government bond rate. The first interest rate spread corresponds approximately to the banks' margin on long-term mortgages, while the second interest rate spread reflects the fact that investors require a higher risk premium to lend to mortgage institutions than to the government.

The interest rate spread between mortgage bonds and five-year government bonds was usually between 0.4 and 0.8 percentage points until 2003. In the same period the spread between the mortgage rate and the mortgage bond rate normally varied between 0.8 and 1.5 percentage points. However, when interest rates started to fall in 2002, the mortgage bond rate fell faster than the government bond rate and the mortgage rate fell even more sharply. Consequently, interest rate spreads fell to historically very low levels. The mortgage bond rate was at times lower than the government bond rate, while mortgage rates at their lowest were only 0.4 percentage points higher than the mortgage bond rate.

In mid-2007 the interest on mortgage bonds and mortgages started to increase in relation to government bonds. This was mainly because the government bond rate fell in the second half of 2007, while the mortgage rate and mortgage bond rate continued to climb. This can again be explained by the fact that market participants were more negative towards risk and sought safer investments. At the end of 2008 all these interest rates fell back, but bond rates fell faster than mortgage rates. Consequently, at the end of 2008 the difference between the mortgage rate and the mortgage bond rate, and in particular the interest rate spread

between mortgage bonds and government bonds, was great compared with historical levels.

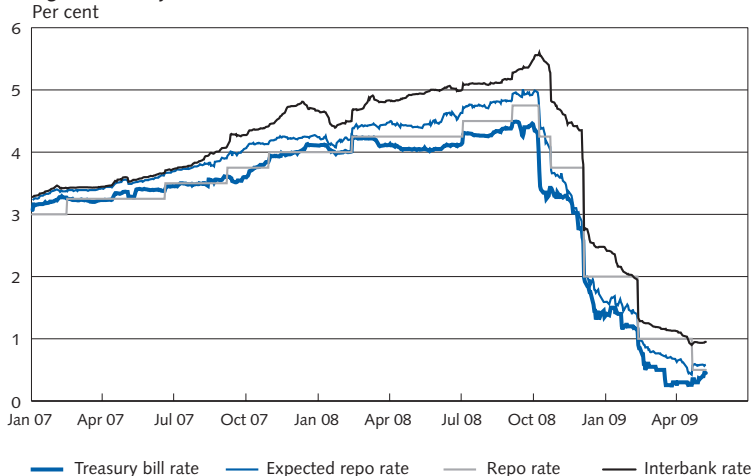
WHAT HAS HAPPENED ON THE FIXED INCOME MARKET?

To sum up, this review shows that market interest rates in 2007 and 2008 seem to have moved in a way that is to a lesser degree dependent on monetary policy. But this development started already in 2003–2004, when many market rates fell to historically very low levels in relation to interest rates on treasury bills and government bonds. The financial turbulence that started in the second half of 2007 has led to a rise in many market rates in relation to treasury bill and government bond rates. But at the same time treasury bill and government bond rates have also fallen to low levels, which probably reflects the fact that market participants are seeking safer assets. In most cases the rise in market rates has led to the normalisation of interest rate spreads in relation to government bond rates, and a return of banks' lending rates to more normal levels compared with the cost of banks' funding. One exception is the spread between the interbank rate and the treasury bill rate, which reached very high historical levels (see Figure 2). In the next section we attempt to explain why this interest rate spread has increased so substantially.

Why have interest rate spreads grown?

As we saw in the previous section, the spread between the interbank rate and the treasury bill rate increased from an average level of about 0.2 percentage points per quarter until mid-2007 to 1.35 percentage points at the end of 2008. If daily data is analysed instead, the rise is even more marked, which can be seen in Figures 9 and 10. The interbank rate peaked at a level almost 2.2 percentage points higher than the treasury bill rate. At the same time the banks' and mortgage institutions' lending rates have returned to more normal levels in relation to their borrowing rates; levels similar to those up to 2003. Since the banks' lending rates to a large degree are determined by their funding costs, including the interbank rate, we mainly need to understand the rise in interbank rates to be able to explain the rise in the banks' lending rates. This section aims therefore to explain why the interbank rate has risen so steeply since mid-2007 compared with the treasury bill rate.

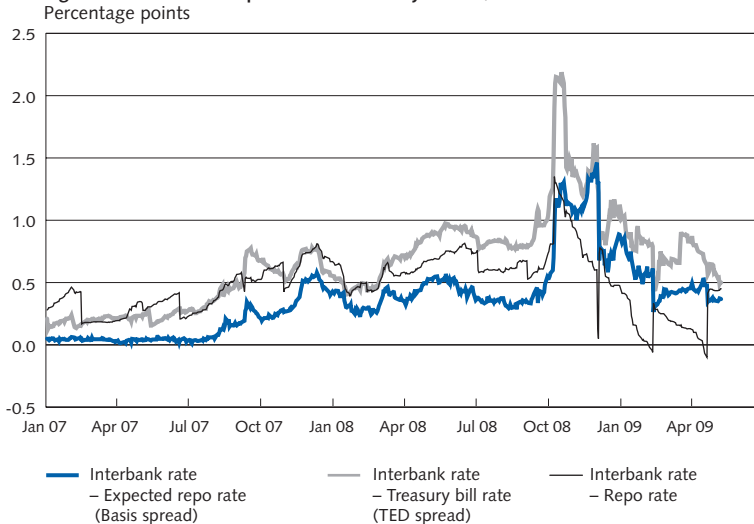
Figure 9. Money market rates, three month maturities



Note: Daily data. The interbank rate is Stibor, the expected repo rate is the rate for a Stina swap.

Sources: Reuters Ecowin and Sveriges Riksbank

Figure 10. Interest rate spreads on the money market, three month maturities



Note: Daily data. The interbank rate is Stibor, the expected repo rate is the rate for a Stina swap.

Sources: Reuters Ecowin and Sveriges Riksbank

IS THE INCREASE UNUSUALLY GREAT?

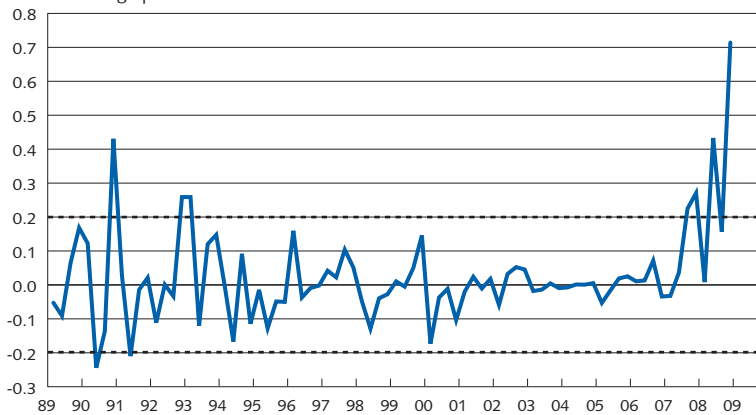
We start by examining whether the increase in the interest rate spread is unusually great from a historical perspective. We set up a simple statistical model for the spread between the interbank rate and the three-month treasury bill rate. The model describes how the interest rate spread develops over time as a function of the previous period's interest rate

spread and an unexplained disturbance. We first estimate the model for the period from the second quarter of 1987 up to the second quarter of 2007. We then use the model to make forecasts up to and including the end of 2008. The difference between the model's forecasts and the actual outcomes gives the series of disturbances needed to explain the observed interest rate spread.⁶

Figure 11 shows the disturbances (residuals) in our estimated model since 1987. The horizontal lines represent a 95 per cent confidence interval for the estimated disturbances. This means that we expect the disturbances to be outside the confidence interval once every 20 quarters. We see in the figure that this happens four times in the 20 years until mid-2007.

We also see, however, that many of the disturbances since mid-2007 ended up outside the confidence interval and that they were very great. The probability of getting such a sequence of disturbances is very low. For example, in the third and fourth quarter of 2007 the disturbances are 0.22 and 0.27 percentage points respectively. Given the observed disturbances until the second quarter of 2007 the probability of such great disturbances occurring two quarters in a row is less than one in 10 000. The disturbances in 2008 are even greater, so the probability of such a

Figure 11. Disturbance terms in a model for spreads between the interbank rate and treasury bill rate, three month maturities
Percentage points



Note: The broken lines represent a 95 per cent confidence interval.

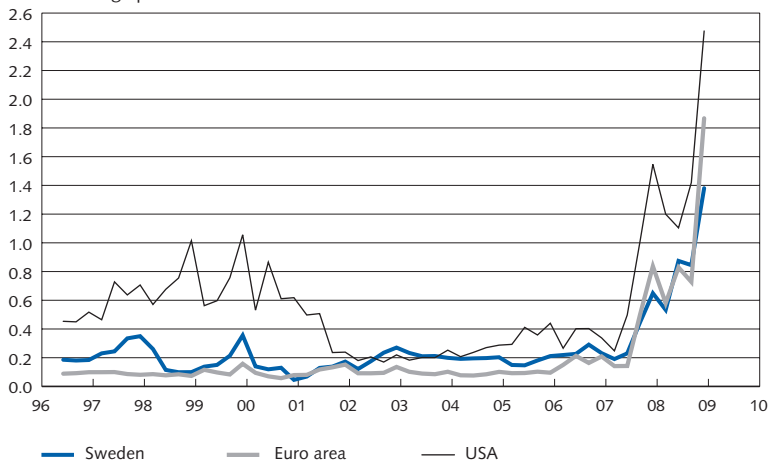
⁶ The model can be expressed as $\delta_t - \delta = \rho (\delta_{t-1} - \delta) + \alpha d_{y2:4} + \varepsilon_t$, where δ_t is the interest rate spread in quarter t , δ is its mode, $d_{y2:4}$ is a dummy variable that takes the value one for the fourth quarter of 1992 and minus one for the first quarter of 1993 and ε_t is a residual (or disturbance). We estimate the model with the help of quarterly data from the fourth quarter of 1987 up to and including the second quarter of 2007 and make forecasts for the period from the third quarter of 2007 up to and including the fourth quarter of 2008. The estimated coefficients are $\rho = 0.72$ and $\alpha = 0.72$, which are both statistically significant at the one per cent level. The explanatory power of the regression (adjusted R^2) is 0.52.

sequence is even smaller. So there are strong indications that the interest rate spread has increased to an unusually great extent from a historical perspective.⁷ We have made the same analysis of the spread between mortgage institution lending rates to firms and households and the treasury bill and government bond rates. The disturbances in 2008 are unusually great for these interest rate spreads too, though the results are not as strong as for the spread between the interbank rate and the treasury bill rate.

HOW CAN WE EXPLAIN THE INCREASE?

To attempt to explain the unusually great historical increase we need to take into account both domestic and international factors. The financial crisis is mainly rooted in problems in the US housing market that spread across the world. So it is natural to assume that the Swedish interest rate spreads to some extent are determined by international factors. This is suggested in Figure 12, which shows the Swedish three-month interest rate spread together with the interest rate spreads in the USA and euro area. The increase in the Swedish interest rate spread has not been as substantial as the increase in the international spreads. This is probably because foreign banks have been more exposed to the financial crisis than banks in Sweden. But the Swedish interest rate spreads may possibly to

Figure 12. Spread between interbank rate and treasury bill rate in Sweden, the USA and the euro area, three month maturities
Percentage points



Note: Quarterly averages. The euro area before 1999 refers to Germany, the interbank rate for Sweden is Stibor, the interbank rate for the euro area (Germany) and the USA is Libor.

Source: Reuters EcoWin

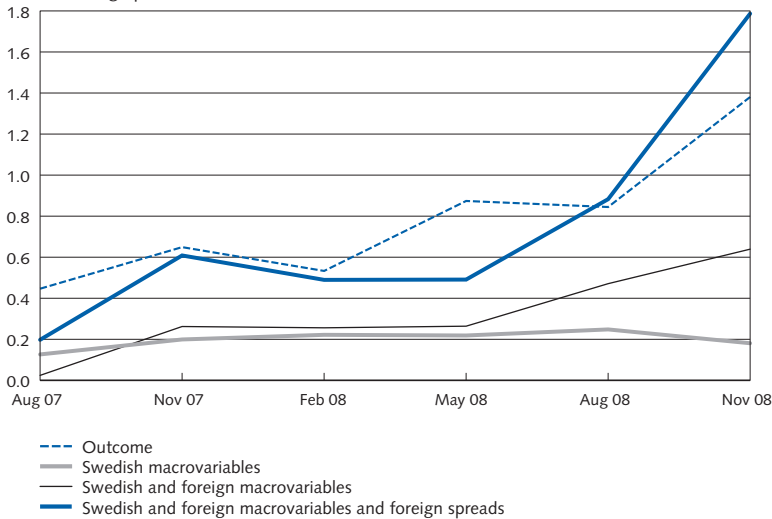
⁷ An analysis of the American interest rate spread gives similar results, see Taylor and Williams (2009).

some extent also be due to Swedish conditions, such as fluctuations in the Swedish business cycle. In this sub-section we therefore examine how important Swedish and international factors have been for the increase in the Swedish interest rate spread.

We use an econometric model that explains the interest rate spread using Swedish macroeconomic variables (the repo rate, GDP growth and CPI inflation), foreign macrovariables (a weighted average of the same variables for Sweden's most important trade partners and the Swedish real exchange rate) and interest rate spreads in the USA and the euro area. We first estimate the model for the period from the first quarter of 1993 up to and including the second quarter of 2007. We then use the model to forecast the Swedish interest rate spread from the third quarter of 2007 to the fourth quarter of 2008.⁸

Figure 13 shows the actual increase in the interest rate spread since mid-2007. It also specifies the extent to which the increase can be explained by Swedish macrovariables (excluding the exchange rate), foreign macrovariables and foreign interest rate spreads respectively. Measured as a quarterly average the interest rate spread has increased by

Figure 13. Outcome and forecast for spread between interbank rate and treasury bill rate, three month maturities
Percentage points



Note: Quarterly averages.

⁸ Our model can be expressed as $\delta_t - \bar{\delta} = \alpha_1(L)(z_t - \bar{z}) + \alpha_2(L)(z_t^* - \bar{z}^*) + \alpha_3(\delta_t^* - \bar{\delta}^*) + \varepsilon_t$, where δ_t is the Swedish interest rate spread in quarter t , z_t is a vector with Swedish macrovariables, z_t^* is a vector with foreign macrovariables and δ_t^* is a vector with the interest rate spreads in the USA and the euro area. The coefficients $\alpha_i(L)$ and $\alpha_j(L)$ are lag polynomials with four lags, so the regression contains the macrovariables in quarters t to $t-4$. All variables are measured as deviations from their modes ($\bar{\delta}$ and $\bar{\delta}^*$) and average values respectively (\bar{z} and \bar{z}^*) over the period from the first quarter of 1993 up to and including the second quarter of 2007. The models with all variables have an explanatory power (adjusted R^2) of 0.48.

about 1.1 percentage points since mid-2007 (from 0.25 to 1.35 percentage points). This increase cannot by and large be explained by developments in the Swedish economy: the Swedish variables contributed to the interest rate spread by 0.20 percentage points during the whole period. About half of the increase, 0.65 percentage points, can, however, be explained by Swedish and foreign macrovariables together. When we also include foreign interest rate spreads in the regression the model produces a forecast for the interest rate spread that is higher than the actual spread; about 1.75 percentage points. Thus, when we analyse quarterly averages the entire increase in the interest rate spread can be explained by a small number of variables, and Swedish factors do not seem to have contributed much to the increase. The increase rather seems to be largely due to developments in other countries, and in particular to developments in foreign financial markets.

Empirical studies of the American interest rate spread indicate that the wider spread in the USA can be explained by an increase in counterparty risk in the banking sector. This means that the American interbank rates seem to have risen because lending between banks has become more risky as uncertainty about the macro economy, financial markets and possible credit losses has increased.⁹ Our results indicate that this uncertainty has also spilled over into the Swedish financial markets. It may be because Swedish banks also conduct business abroad and therefore invest in the same assets as foreign banks. When the risk of such investments grew, Swedish banks were also affected. But they were affected somewhat less than foreign banks, which was probably because the Swedish banking sector as a whole was less exposed to the riskiest assets.

Has the financial turbulence affected the monetary policy transmission mechanism?

Since summer 2007 interest rates on the interbank market and banks' lending rates have increased substantially compared with the repo rate and treasury bill rate. We have shown that the increase in the spread between interbank rates and treasury bill rates is to some extent due to the fact that the latter have fallen to low levels compared with the repo rate. We have also shown that the increase in the interest rate spread to a great degree was driven by foreign factors rather than Swedish conditions.

If market rates largely reflect other factors than Swedish monetary policy there is, however, a risk that the Riksbank's changes in the repo

⁹ See Taylor and Williams (2009) and Wu (2008).

rate will not affect market rates in the way that can normally be expected. Consequently the effect on the rest of the economy will not be that expected either. In that way financial turbulence could weaken the monetary policy transmission mechanism. But even if the interest rate spread in Sweden can largely be attributed to foreign factors the Riksbank could counter the increase in interbank rates by cutting the repo rate. Recent developments also indicate that monetary policy still has a great effect on the interbank rates and consequently the other market rates.

If we go back to Figures 9 and 10 we can see how the monetary policy decisions have affected the interbank rate and three-month treasury bill rates. The increases in the repo rate in 2007 did not have any great effect on market rates, but seem to have been predicted by the market participants. On the other hand, the tightening in February 2008 seems to have been unexpected. This led to major upward adjustments of the treasury bill rate (which rose by 0.24 percentage points), the interbank rate and the expected repo rate (which both increased by 0.17 percentage points). In the same way, market rates rose somewhat after the repo rate increases in July and September in the same year.

Since the start of financial turbulence in mid-2007 the interbank rate has, however, risen more than the treasury bill rate and the expected repo rate. The spread between the interbank rate and government bond rate increased from about 0.3 percentage points in July 2007 to more than 1 percentage point at the beginning of October 2008, while the spread between the interbank rate and expected repo rate increased from about zero to 0.6 percentage points. The repo rate reduction early in October led to a steep fall in the treasury bill rate (by 0.35 percentage points) and in the expected repo rate (by 0.24 percentage points), but it had no effect on the interbank rate, which rose somewhat instead. This monetary policy expansion thus had little or no effect on the interbank market. The spread between the interbank and treasury bill rates initially increased from 1.5 to 1.9 percentage points, and subsequently somewhat more in the following days. The spread between the interbank rate and the expected repo rate increased to just over 1.1 percentage points.

The spread between the interbank and treasury bill rates did not decrease until the Riksbank cut the repo rate once more by 0.5 percentage points at the end of October. The interest rate on the interbank market then fell by 0.45 percentage points. The interest rate spread in relation to treasury bills then decreased from 1.8 to 1.4 percentage points, but it still remained at a very high level. The spread between the interbank rate and the expected repo rate did not change much, however. It decreased by about 0.1 percentage points.

The vigorous monetary policy stimulus in December, when the Riksbank cut the repo rate by 1.75 percentage points to 2 per cent, had a great effect on both the interbank rate and the treasury bill rate. The three-month treasury bill rate and the expected repo rate started to fall already in the middle of November, when it was regarded as increasingly probable that the Riksbank would cut the repo rate in December. The interbank rate also fell somewhat in November. At the beginning of December the interbank rate fell substantially (by 0.45 percentage points) when the Riksbank announced that the monetary policy meeting had been moved from 16 December to 3 December, and when the decision was published it fell by a further 1.07 percentage points. The treasury bill rate, which was more than 1.10 percentage points lower than the repo rate before the December decision, fell by 0.7 percentage points when the decision was announced.¹⁰ The expected repo rate also fell steeply by about 0.6 percentage points.

After the cut in the repo rate to 2 per cent in December 2008 the treasury bill rate stabilised around 1.5 per cent and the interbank rate around 2.5 per cent. At the end of 2008 the interest rate spread was therefore around 1 percentage point, which is the same level as at the beginning of October 2008, while the spread between the interbank rate and the expected repo rate was around 0.8 percentage points, which was about 0.3 percentage points higher than at the beginning of October. In the first months of 2009 the interbank rate has continued to fall faster than both the treasury bill rate and the expected repo rate. The interbank rate fell by 0.6 percentage points after the repo rate was cut by 1 percentage point in February 2009. The interest rate spread in relation to treasury bills was then about 0.4 percentage points and in relation to the expected repo rate 0.3 percentage points, which were the lowest levels since February 2008. The interest rate cut in April 2009 of 0.5 percentage points brought no major changes in the interbank rate, while both the treasury bill rate and expected repo rate rose by about 0.1 percentage points. This reduced the spread between the two interest rates and the interbank rate by about the same.

This review thus shows that the Riksbank can still affect the level of market rates, even if the spread between market rates and the repo rate in the present circumstances seems also to be influenced by other factors. The high interest rate spreads mean, however, that the Riksbank needs to set a lower repo rate to achieve the same desirable level of market rates than in more normal circumstances. This may be a problem when the

¹⁰ The treasury bill rate did not fall until the day after the decision in December. That is why the interest rate spread first narrowed considerably before increasing again.

repo rate approaches zero and cannot be reduced any more, since the general interest rate level then is higher than would have been the case in more normal circumstances in the financial markets. It may therefore be desirable for the Riksbank and other institutions to take other steps to reduce interest rate spreads. The article by Söderström and Westermark in this issue of Sveriges Riksbank Economic Review discusses in more detail how monetary policy can be conducted when the key interest rate is zero.

Summary and conclusions

Monetary policy mainly affects the economy by changing the general interest rate level. A tightening of monetary policy (an increase in the repo rate) leads to higher interest rates in the economy, which in turn reduces the aggregate demand for goods and services through a number of different channels. We describe these channels in detail in a separate article in this issue of Sveriges Riksbank Economic Review.

From mid-2007 to the end of 2008 many market rates moved in a way that did not seem to be directly due to monetary policy. This applied to interest rates in the interbank market, treasury bill rates and banks' and mortgage institutions' lending rates to households and firms. The interbank rates rose steeply as a result of the international turbulence in the financial markets, and there is much to indicate that the increase in Swedish interbank rates to a large extent was due to international rather than Swedish factors. Treasury bill rates fell steeply, probably more than can be attributed to the effect of monetary policy. This can possibly be explained by increased demand from market participants for safe and liquid assets. The banks' and mortgage institutions' lending rates also rose in relation to interbank market rates and interest rates on treasury bills and government bonds. But these interest rate spreads grew from very low levels in 2004–2005, and are now back to historically normal levels.

Even if interbank rates rose compared with the repo rate and treasury bill rates, and this increase is mainly due to international factors, Swedish monetary policy still appears to have a great effect on interest rates in the interbank market and hence on other market rates. The monetary policy stimulus that has taken place since October 2008 has had a great impact on fixed income market rates, even though some interest rate spreads continue to be greater than before the outbreak of financial turbulence. Consequently, our conclusion is that monetary policy has not become ineffective in the financial turbulence and subsequent financial crisis. However, our analysis indicates that it is difficult to reduce interest rate spreads using only Swedish monetary policy measures. Recent developments indicate that extensive global measures are required before the

crisis in the international financial markets can be alleviated, and that the repo rate level therefore needed to be cut drastically to achieve a desirable interest rate level in the interbank market. As the repo rate is now approaching its lower limit and cannot be reduced much more, it may be relevant for the Riksbank to take other steps to try to influence the interest rate level in the Swedish economy.

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