

As the Riksbank's repo rate rapidly neared zero during the autumn of 2008, the question of how far the repo rate can be lowered was brought to the fore. Even though the economic situation has called for very expansive monetary policy, circumstances may exist that limit how far the repo rate can be lowered. This commentary discusses issues that a central bank needs to consider as the policy rate approaches a very low level. Our review indicates that the present repo rate of 0.25 per cent has not affected the functioning of the financial markets in a manner that could undermine the effects of monetary policy.

The lower limit of the Riksbank's repo rate

Meredith Beechey och Heidi Elmér

The authors work in the Monetary Policy Department.

Over the last year, the Riksbank has sharply lowered the repo rate. The major economic downturn following the financial crisis has justified very expansive monetary policy. As the repo rate has rapidly fallen to almost zero, the question of how far the repo rate can be lowered has arisen.

Since July 2009, the Riksbank's repo rate has been 0.25 per cent – an unusually low level from a historic perspective. Other central banks have also sharply lowered their policy rates and some have issued statements to the effect that their policy rate has probably reached its floor. The arguments behind these assessments vary, as do the conclusions drawn regarding at which level where the practical limit for the policy rate may lie. In normal cases, changes in interest rates are not associated with any particular costs. However, when interest rates become particularly low, issues arise that must be considered in conjunction with monetary policy decisions.

In this economic commentary, we take up various issues that a central bank needs to consider when investigating the lower limit of the policy rate. Above all, there are two central aspects: the importance of preserving the efficacy of the monetary-policy transmission mechanism and good functioning of financial markets. We will illustrate a number of areas in which a very low repo rate also leads to very low or negative market and bank interest rates. We start by investigating whether any particular circumstances arise in conjunction with a very low repo rate that could potentially result in problems or costs. We then investigate whether the prevailing very low level of interest rates has led to any disruptions of Swedish financial markets. Our review indicates that the present repo rate of 0.25 per cent has not affected the functioning of financial markets in a manner that could undermine the effects of monetary policy.

Where is the lower limit for the Riksbank's repo rate?

Even though the economic situation has called for very expansive monetary policy, circumstances may exist that limit how far the repo rate can be lowered. Households and companies can always choose between placing their wealth in a bank account, in various financial and real assets or holding it as cash. The theoretical literature frequently assumes that nominal interest rates cannot be negative. The argument behind this assumption is that banknotes and coins offer no nominal return or interest whatsoever, nor is cash associated with any expenses. This makes it more attractive to hold cash if nominal interest rates are negative. If nominal interest rates are negative, households and companies may instead withdraw their money and store it "under the mattress" at an interest rate of zero.¹

However, in practice the mattress is not a realistic alternative for storing and handling large amounts of cash. Costs for storage, security and handling imply that the public may be willing to accept a slightly negative interest rate or account fees equivalent to a negative return. However, the amount households and companies are prepared to pay to avoid cash-handling remains highly uncertain. Consequently, it is difficult to

¹ For a more detailed discussion of the theory, see "Monetary Policy with a Zero Interest Rate" by Ulf Söderström and Andreas Westermarck, in *Sveriges Riksbank Economic Review* (2009:2).

know where the threshold is below which the public will begin to store and use large amounts of cash. All in all, these circumstances have presumably led central banks to consider a nominal interest rate of close to zero as a lower limit for the policy rate. However, this restriction does not necessarily mean it is unproblematic to have a policy rate of exactly zero or lower. In practice, a central bank that lowers its policy rate to particularly low levels needs to heed circumstances that are do not normally need to be considered.

How do monetary policy and the transmission mechanism work when the policy rate is very low?

Monetary policy affects the economy through a number of different channels, such as bank and market interest rates, exchange rates and credit provision. These channels together form what we usually designate as the monetary policy transmission mechanism.² The policy rate has a direct impact on the interbank market's overnight rate – that is, the rate at which the banks lend to and borrow from each other. Changes in the overnight rate also spread to interest rates with longer maturities in the interbank market and to other money and bond markets, as well as to the banks' own lending rates. When the Riksbank changes the policy rate, this change spreads to interest rates with other maturities and credit risk, as well as, finally, to the interest rates offered to households and companies by financial institutions. Monetary policy thus changes the general interest rate environment, as well as the availability and cost of credit. This, in turn, affects economic activity and inflation.

The extent of the impact a change of repo rate has via the transmission channels depends on the prevailing economic situation. The normal channels have continued to function during the financial crisis to a certain extent. For example, banks' lending rates and long-term, risk-free interest rates (government bond rates) have fallen and the Swedish krona has weakened as the repo rate and expectations regarding the repo rate have fallen since the autumn of 2008. At the same time, risk premiums (for example, the difference between interest rates on government bonds and corporate bonds) have risen steeply. This increase has partially offset the effects of the lower policy rate and lower risk-free interest rates. The increase in risk premiums is due, among other factors, to the large degree of uncertainty surrounding economic developments, the increased risk of bankruptcies, the downgrading of credit ratings and companies' impaired access to funding.

During the crisis, investors have been exceptionally hesitant towards making investments in debt securities with credit risk. This has led to disruptions in credit availability. Companies have encountered difficulties in obtaining funding via capital markets and have often had to pay higher prices than before the crisis. In addition to such disruptions that arose during the financial crisis, there is uncertainty as to whether the monetary-policy transmission mechanism could be affected by a very low level of the Riksbank's repo rate. The desired expansionary effect of further cuts of the repo rate needs to be weighed against possible undesirable effects of extremely low interest rates. Consequently, a central bank should investigate whether a very low policy rate entails risks or expenses for financial markets and the economy, and ask at what level such risks or expenses would arise. Below, we present examples of potential disruptions in the interest rate and credit-provision channels that may arise as the consequences of a very low repo rate.

How is the interest-rate channel impacted by a very low policy rate?

Can a central bank's ability to affect interest rates in general through additional decreases of the policy rate be impaired when the repo rate approaches an extremely low level? If the interest-rate channel does not function as it should, it would become apparent partly through the failure of changes of the policy rate to completely spread to various capital market interest rates, and partly through the restricted impact of changes of the policy rate on the interest rates offered to households and companies

² For a more detailed description, see "The Monetary Policy Transmission Mechanism" by Hopkins, Lindé and Söderström in *Economic Review* (2009:2), Sveriges riksbank.

by banks. Below, we present examples of potential disruptions to the interest rate channel as the policy rate approaches a low level.

- Banks' deposit rates for their customers usually lie below the policy rate, while their lending rates lie above the policy rate. The difference between deposit and lending rates forms a part of their earning capacity, usually called the interest-rate margin.³ At the current level of the repo rate, banks' deposit rates for their customers are already very close to zero. If the banks allow their lending rates to decrease along with further decreases of the policy rate, at the same time as they find that there are limited possibilities to lower deposit rates, their interest rate margins will shrink. In order to avoid this pressure on their margins, the alternative for the banks is not to allow repo rate cuts to pass through completely to interest rates offered to households and companies. The risk here is that the impact of monetary policy on the banks' lending rates is weakened.
- When the policy rate is close to zero, certain low-risk short-term market rates will also approach zero. However, if, for a variety of reasons, there should be resistance among market participants to conduct transactions at very low or negative interest rates, further decreases of the policy rate would not spread to market rates with longer maturities and higher credit risk. Such resistance would limit the possibilities for traditional interest-rate policies to affect the pass through to interest rates with both short and long-term maturities, as well as to interest rates with higher credit risks.

How is the credit-provision channel affected by a very low policy rate?

Below, we present a few examples of how the credit-provision channel could be affected by a very low policy rate. Credit provision here refers to the credit that banks and other financial institutions provide to the public, as well as those borrowing activities that can be conducted by the companies themselves via the issue of debt securities on capital markets.

- Banks' realised and potential losses have increased during the financial crisis. As a consequence, banks have needed to focus on measures to maintain and improve capital-adequacy requirements. This has restricted the banks' willingness and ability to issue new loans. This is certainly a problem that arose at an early stage of the financial crisis, before the repo rate reached very low levels. With a very low policy rate, banks' credit provision following further interest rate decreases could be affected by two counteracting factors. On one side, a decrease of the banks' interest rate margins together with the policy rate would further restrict credit provision in a situation in which it is already weak. On the other side, more expansive monetary policy would improve banks' profit-making potential and credit-granting possibilities. This depends on further interest rate decreases having a stimulating effect on the economy, thus improving the credit ratings of banks' customers and increasing demand for loans. Which of these effects will play a dominant role cannot easily be determined in advance.
- When interest rates approach zero, there is a risk that the incentive for market participants to participate in certain markets will decrease or disappear. Very low or negative interest rates could prevail in certain markets without any problems. However, in other markets, there could be resistance towards participation if interest rates are negative. One example of such a market is the interbank market, which handles short-term loans between banks and is normally characterised by low risk and low returns. Very low or negative interest rates could lead a number of participants to refrain from participating in the short-term interbank market if returns were considered unattractive in comparison with alternative investments or, in the extreme case, fell below the return on cash. Fewer participants and reduced volumes may, in turn, lead to insufficient matching between deposits and lending between banks. In the long term, this could lead to reduced volumes and the risk of volatility in the pricing of short-term deposit transactions. This would disrupt the intermediation of credit. If interest rates become very negative, this could in an extreme case result

³ See Karlsson, Shahnazarian and Walentin (2009) for a quantitative assessment of the manner in which banks pass on expenses such as deposit margins and risk premiums onto lending rates.

in banks themselves starting to retain large amounts of cash instead of depositing their money with each other.

These examples illustrate the importance of effective interest-rate and credit channels for monetary policy to achieve its desired effect. Well-functioning financial markets enable changes in policy rates to be dispersed in the economy, both by way of effective pricing and through the intermediation of credit. When the policy rate approaches an unusually low level, there is a risk that these functions may deteriorate, with impaired pricing and lower activity as a consequence. Disruptions in financial markets could thus undermine the ability of monetary policy to affect the economy.

How have financial markets functioned at the current low level of the repo rate?

Financial markets that function well are thus a key ingredient for monetary policy to attain its desired effect. How has the current low level of the repo rate affected interest rates and functioning of Swedish financial market? Below, we first discuss a few specific examples where negative nominal interest rates may occur even if the repo rate is not zero. We then discuss whether this may lead to impaired functioning of financial markets and investigate whether any disruptions have arisen at the current low level of the repo rate.

Very low interest rates in certain markets

Even under normal circumstances, interest rates that lie very close to or below the Riksbank's repo rate can be noted in certain markets. Examples include interest rates for treasury bills, banks' deposit rates for their customers and interest rates for short-term loans with underlying securities of high quality as collateral. These interest rates are very likely to approach zero or to become negative in advance of the repo rate.

- It is not unusual for the market valuation of treasury bills to have an interest rate below the Riksbank's repo rate. Furthermore, demand for securities with high credit ratings has increased during the financial crisis. This has contributed to further downward pressure on interest rates for low-risk securities, such as treasury bills and government-guaranteed bank certificates or commercial paper. In situations with very low policy rates, it should be possible to trade these securities at a negative market rate.⁴ For example, negative interest rates on short-term treasury bills arose on the U.S. secondary market during a short period in the autumn of 2008. In Sweden, treasury bills has traded very close to zero since the spring of 2009.
- The market for short-term loans with underlying securities of high quality as collateral is known as the repo market.⁵ The repo market with underlying collateral in the form of government bonds or mortgage bonds forms an important source of funding for different types of trading with debt instruments. The repo rate – that is, the cost for repo transactions – may, for certain securities, lie 0.10–0.25 percentage points below the Riksbank's policy rate. However, the difference between the cost for repo transactions and the Riksbank's repo rate may occasionally be even greater.⁶ This means that repo transactions for attractive securities take place at interest rates close to zero or even negative with the current policy rate of 0.25 per cent. Since July 2009, market participants have reported that repo transactions for particularly attractive securities have occasionally taken place at levels as low as -0.25 per cent – that is 0.5 percentage point below the Riksbank's repo rate. Market participants thus seem willing to accept negative interest rates on repo transactions as long as this financing cost is lower than the return expected by the participant when trading with debt instruments.
- The interbank market handles commercial banks' short-term deposits and loans with each other. No securities are involved, rather deposits and loans without underlying collateral. Interest on overnight interbank loans tends to be very close to

⁴ In this case, market participants should be willing to pay a price exceeding the value of the security on maturity.

⁵ The word repo derives from the term repurchase agreement. A repo transaction is an agreement in which one party borrows a security from another party against the receipt of security as collateral. However, it need not always be two securities that are exchanged between the parties – a security may also be exchanged for cash.

⁶ The rate for repo transactions should not be confused with the Riksbank's policy rate, which is also called the repo rate.



the Riksbank's repo rate, which is also the intention of the design of the Riksbank's operational system for monetary policy.⁷ Since approximately one year ago the Riksbank has offered banks the opportunity of additional borrowing, for example over 3, 6 and 12 month terms, with the result that liquidity in the banking system is higher than normal. Due to the excess liquidity in the banking system, short-term interbank rates have occasionally fallen below the repo rate by approximately 0.05–0.10 percentage points and occasionally even lower.

These examples illustrate that interest rates on both debt securities and normal deposits can very well fall below the repo rate and even become negative. In the repo market for government bonds, we have observed negative nominal interest rates since July 2009. The next step is to investigate the consequences of very low or negative nominal interest rates for these markets. We describe two different approaches towards this: the first deals with system-technical aspects and the second with whether incentives for participation in the various markets have been affected.

What kind of technical aspects or difficulties should be taken into consideration when nominal interest rates are negative? It is typically unproblematic for market participants to handle negative interest rates for securities using existing systems for trading, book-keeping etcetera. For debt securities such as treasury bills, commercial paper, government bonds and mortgage bonds, there is always an equivalent price for a market-listed interest rate. In contrast, deposit transactions are typically only handled with the listed interest rate and not the equivalent price. When deposit transactions take place at negative nominal interest rates, certain internal systems may have difficulty in managing negative rates. This is usually something that can be adjusted manually. However, if the number of manual transactions is large, there is a risk that existing resources will be insufficient and that bottlenecks will arise. However, over time, it should be possible to remedy this problem by upgrading systems and reallocating resources.

So far, no negative deposit rates have been reported either on the interbank market or for bank customers. Nevertheless, a lower repo rate than today's will increase the likelihood of negative interbank rates. However, just as we mentioned above, it is unclear where the threshold lies below which very low or negative interest rates would lead to disruptions in the interbank market. Regardless, a central bank should observe the manner in which the level of the policy rate affects incentives to participate in those markets that are of importance for the effectiveness of monetary policy.

Market functioning to date with a very low Riksbank repo rate

One way of investigating whether low or negative nominal interest rates have, thus far, affected incentives to participate in various markets is to study turnover statistics. Since interest rates were decreased in April and July to 0.5 and 0.25 per cent, respectively, we have not observed any disruptions to the Swedish spot and repo markets for debt securities or to the derivatives markets for fixed-income instruments. Figure 1 presents turnover statistics for various markets gathered by the Riksbank from participants. It illustrates how activity in the spot market for government bonds has been relatively stable since April. Turnover for repo transactions in the repo market has also remained unchanged in recent months.⁸ Turnover in most markets for debt securities has certainly decreased sharply compared with one year ago, but this is rather a consequence of the financial crisis. Seen from this perspective, it does not seem as though the interest rate cuts have additionally contributed towards the decrease in turnover.

Since May 2009, actual turnover on certain derivatives markets, for example, Forward Rate Agreement contracts, has risen noticeably, which we interpret as indicating that the prevailing low level of the repo rate does not act as a disincentive to participate in these markets. It is also worth noticing that the market for repo transactions has continued to function without reports of breach of contract, even though the interest rate for certain transactions had been negative.⁹

⁷ For further information on the interbank market's role and function, see Kronestedt Metz, Pia, "The Swedish Market for Balancing Liquidity", *Economic Review* (2005:4), Sveriges riksbank.

⁸ We have employed seasonally-adjusted data. Turnover is typically low during the summer months.

⁹ Breaches of contract and failures to deliver have been observed in the repo markets in the United States but have been rare in Sweden from a historical perspective.

Money market funds are typically major participants in short-term money markets such as bank certificates and commercial paper. Over time, the net income of these funds tends to lie in line with or below the repo rate. The funds' investments are closely linked to the level of the policy rate. Consequently, a very low policy rate thus implies a very low or negative net return for these funds.¹⁰ Money market funds' returns normally vary with changes in the repo rate. Temporarily low earnings for these funds are thus a natural part of monetary policy's transmission mechanism. However, if very low or negative returns led to major outflows from money market funds, this could have repercussions in markets for bank certificates and commercial paper where these funds are major and active investors. A drastic reduction of funds' demand for commercial paper, for example, could temporarily disrupt companies' possibilities of issuing debt.¹¹ However, in Sweden, reallocation between funds and various types of assets seems to have taken place without noticeable disruptions.

When a central bank is considering the lower limit for its nominal policy rate, it should also take into consideration how long such a low level should be allowed to prevail. So far, in Sweden, we have only experienced very low and negative nominal interest rates for a relatively short period of time. However, if interest rates were to be kept very low for a longer period of time one should consider whether this would affect incentives for the continued participation of market participants in various markets. Over a longer perspective, there is a risk that reduced activity and trade in certain money markets would lead to loss of human capital from these markets. This, in turn, would entail a drain of competence, a failure of systems to develop to the required extent, and a longer run-up towards restoring the functioning of the markets after circumstances and interest-rate levels return to normal.

How have other central banks reasoned regarding the lower limit for their policy rates?

Like the Riksbank, other central banks have also made assessments of the appropriate lower limit for their policy rates. A number of central banks currently have nominal policy rates between zero and 0.5 per cent (see Table 1) and have indicated that these interest rates have probably reached their floors for this round of interest rate cuts.

Table 1. Current policy rates of selected central banks

Central bank	Policy rate variable*	Prevailing policy rate level (per cent)
Federal Reserve	Federal funds rate	0,00 - 0,25
Bank of England	Bank Rate	0,50
Bank of Canada	General collateral repo rate	0,25
Swiss National Bank	Repo rate	0,02
Bank of Japan	Call market funds rate	0,10
Sveriges Riksbank	Repo rate	0,25

*All policy rate variables apply to overnight loans.

The arguments behind the various central banks' choices of the floor for their nominal policy rates resemble those presented earlier in this commentary. Central aspects that recur include the importance of preserving effective monetary policy transmission channels and well-functioning financial markets. Several central banks have emphasised the risk that functioning of financial markets may be impaired by very low policy rate levels. For example, the Bank of Canada has stated that an efficient repo market is important for the effective functioning of monetary policy. The Bank of Canada has selected a level for its policy rate that it considers preserves incentives for lenders

¹⁰ Fund fees reduce a relatively large portion of gross earnings. Fees charged by money market funds in Sweden vary between 0.1–0.6 per cent, according to Morningstar.

¹¹ In the United States, we observed examples of major and abrupt outflows from money market funds during the autumn and winter of 2008, which gave rise to disruptions in the commercial paper market, among others. However, these disruptions were linked more to the general crisis situation prevailing during the autumn of 2008 than to a low policy rate.

and borrowers to meet on the market.¹² The Swiss National Bank is presently aiming for the interbank rate CHF Libor, with 3 months maturity, to be 0.25 per cent – that is, close to the lower limit of the central bank's target interval which lies between zero and 0.75 per cent. In order to achieve this goal, the Swiss National Bank has set the interest rate of its weekly repos at a rate as low as 0.02 per cent.¹³

Since December 2008, the US Federal Reserve has applied a target interval of 0–0.25 per cent for its policy rate, thereby creating scope for very low interest rates on the overnight market for federal funds. It is worth noting that the Federal Reserve has set its deposit rate, the interest rate received by the banks when they place their excess reserves with the central bank, at 0.25 per cent. This contributes towards keeping the overnight rate closer to the upper limit of the target interval.¹⁴ During the period 2000 to 2006, the Bank of Japan had a policy rate of zero per cent. The Bank of Japan's experience has been that even a modest increase to the policy rate improved the functioning of money markets regarding both pricing and turnover.¹⁵ In this round of interest rate cuts, the Bank of Japan has not cut its policy rate to the same low level as before.

In addition to taking into consideration the manner in which the financial markets function, some central banks have also emphasised that a very low policy rate may risk weakening the monetary policy transmission mechanism via the banking sector. For example, the Bank of England has made the assessment that the banking sector could find it difficult to further cut its lending rates or, alternatively, maintain its level of credit granting to the public if the policy rate were cut to an excessively low level.¹⁶ All in all, it seems as though many central banks are reasoning in a similar manner, even though no definite conclusions can be drawn as to exactly where the limit lies for each central bank. At the end of the day, this is a matter of judgement in which different considerations need to be compared. However, going forward, it should be possible to draw more definite conclusions after a sufficient number of countries have had very low policy rates for a longer period of time.

Conclusions

In this economic commentary, we have addressed various questions and potential problems that the Riksbank has considered as the repo rate has been cut to a historically low level. In order for monetary policy to have the desired effect, two aspects in particular play a central part in this context: the importance of maintaining the efficacy of the monetary policy transmission mechanism and the significance of well-functioning financial markets. We have shown that negative nominal interest rates can arise before the repo rate reaches zero. Indeed, negative interest rates have arisen in certain financial markets since the Riksbank cut the repo rate to 0.25 per cent in July.

To date, a repo rate of 0.25 per cent has not given rise to disruptions in financial markets according to indicators of market turnover and anecdotal reports. It is difficult to determine at exactly which level of the repo rate problems could arise. It is quite possible that financial markets could continue to function normally in the event of an even lower repo rate. However, uncertainty remains great and our experience of very low policy rates is limited. At the Monetary Policy Meeting in September, the Executive Board of the Riksbank resolved to leave the repo rate unchanged at 0.25 per cent. Certain members of the Executive Board considered that the repo rate could be lowered to zero without risk of disruption, while other members considered it appropriate to adopt a cautious approach towards areas in which previous guiding experience is lacking.¹⁷

¹² See Bank of Canada, "Framework for Conducting Monetary Policy at Low Interest Rates", Monetary Policy Report, April 2009.

¹³ See Swiss National Bank, Monetary Policy Assessment, 12 March 2009.

¹⁴ See Board of Governors of the Federal Reserve System, Monetary Policy Report to the Congress, July 2009.

¹⁵ According to the Bank of Japan's Financial Market Report (April 2007).

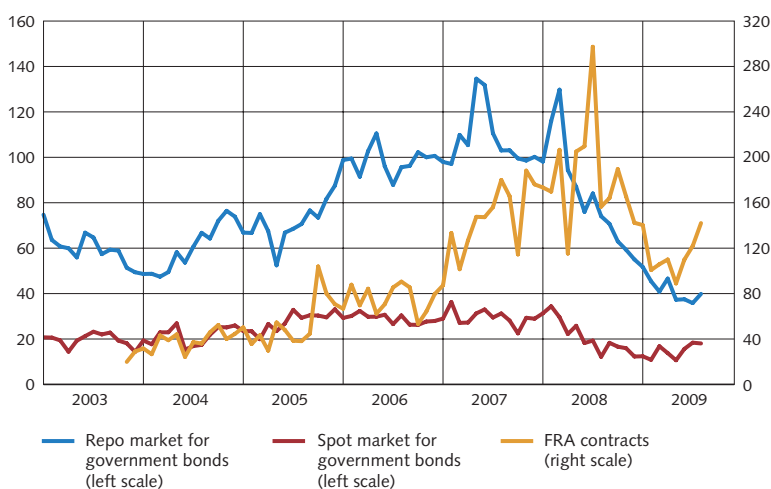
¹⁶ See Bank of England, "Monetary Policy at Low Interest Rates", Inflation Report, February 2009.

¹⁷ See the minutes of the Executive Board's monetary policy meeting on 2 September 2009, Sveriges Riksbank.

Figure

Figure 1. Turnover statistics for spot and repo markets for government bonds and for Forward Rate Agreement (FRA) contracts

Billions, SEK, seasonally adjusted data



Source: The Riksbank.

References

Bank of Canada, "Framework for Conducting Monetary Policy at Low Interest Rates", Monetary Policy Report, April 2009.

Bank of England, "Monetary Policy at Low Interest Rates", Inflation Report, February 2009.

Bank of Japan, "Changes Observed in Money Markets after the Rise in the Policy Interest Rates in July 2006", Financial Markets Report-Supplement, April 2007.

Board of Governors of the Federal Reserve System, Monetary Policy Report to the Congress, July 2009

Hopkins, Elisabet, Jesper Lindé and Ulf Söderström, "The Monetary Policy Transmission Mechanism", Economic Review (2009:2), Sveriges riksbank.

Karlsson, Magnus, Hovick Shahnazarian and Karl Walentin (2009) "What determines the banks' lending rates?", not yet published.

Kronstedt Metz, Pia "The Swedish Market for Balancing Liquidity", Economic Review 2005:4, Sveriges Riksbank.

Minutes of the Executive Board's monetary policy meeting, 2 September 2009, Sveriges Riksbank.

Swiss National Bank, Monetary Policy Assessment, 12 March 2009.

Söderström, Ulf and Andreas Westermark, "Monetary Policy with a Zero Interest Rate", Economic Review (2009:2), Sveriges Riksbank.