Monetary policy signalling and movements in the Swedish term structure of interest rates

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Abstract

This paper examines how various monetary policy signals such as repo rate changes, inflation reports, speeches and minutes of monetary policy meetings affect the term structure of interest rates. We find that unexpected movements in the short end of the yield curve are mainly driven by unexpected changes in the repo rate, while speeches are a more important determinant for the longer interest rates. Hence, we conclude that central bank communication is an essential part of the conduct of monetary policy.

1.   Introduction

The effectiveness of monetary policy is strongly related to monetary policy signalling, ie the way policymakers indicate their intentions through policy reports, speeches and other communication channels. The reason for this is that important variables such as the exchange rate and long-term interest rates reflect expectations of future monetary policy. Thus, the monetary policy stance should be assessed in terms of expected future monetary policy intentions rather than the current setting of the central bank's instrument (normally a short-term nominal interest rate).[2] Indeed, there are examples of models in which the intended future level of the official interest rate rather than its current level is considered to be the instrument for the central bank, see Svensson (2001).

The theoretical considerations above suggest that policymakers should try to steer a (very) long-term interest rate by signalling the intentions of future monetary policy and adjust the short-term interest rates that confirm and support such a signalling policy. However, in practice there are several problems with such a policy device. First, it is hardly meaningful to indicate policy intentions more than a few years ahead since future monetary policy depends on future economic conditions, which become very hard to predict as the forecast horizon increases. Second, the controllability of interest rates declines with maturity since movements in long-term interest rates to a large extent reflect exogenous factors such as global interest rate trends and fluctuating term premia. It is therefore an open empirical issue to determine to what extent monetary policy signalling can affect medium-term and long-term interest rates. The aim of this paper is to shed some light on this issue by examining the relationship between monetary policy signalling by the Riksbank (the Swedish central bank) and movements in the Swedish term structure of interest rates.

The literature that analyses term structure effects of monetary policy actions includes Cook and Hahn (1989), Buttiglione et al (1997), Lindberg et al (1997), Favero et al (1996), Haldane and Read (2000)

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[2]   See eg Svensson (2000) who shows that aggregate demand in an open economy depends on the sum of expected future short real interest rates in excess of the natural real interest rate, which under the expectations hypothesis can be approximated by a long-term real interest rate (in excess of the natural real interest rate) times its maturity.

and Kuttner (2001).[3] This paper extends the analysis in the literature cited above in at least two important directions. First, it relates unexpected term structure movements not only to unexpected monetary policy actions, but also to unexpected changes in other important factors such as foreign interest rates, surprises in the outcome of inflation and GDP and unexpected portfolio effects. This paper is hence also to some extent related to studies analysing macroeconomic announcement effects (Fleming and Remolona (1999)). Second, the paper broadens the concept of monetary policy actions to include (in addition to the changes in the official interest rate) signals from speeches, inflation reports and minutes of monetary policy meetings.[4] These additional channels for monetary policy action turn out to be important. Like Buttiglione et al (1997), and Haldane and Read (2000), we find that unexpected changes in the official interest rate have quite small and often insignificant impacts on longer market interest rates (five-year maturity). However, unexpected signals from speeches appear to have significant effects on longer interest rates that are potentially larger than those from unexpected changes of the official rate. In addition, other monetary policy signals provided by inflation reports and the publication of minutes also seem to be of some importance.[5] The main conclusion of this paper is that central bank communication is an essential part of the conduct of monetary policy - an aspect that has recently started to receive attention in the literature (see eg Guthrie and Wright (2000) and Woodford (2001)).

The paper is organised in the following way. In Section 2 the interaction between economic shocks, monetary policy signalling, monetary policy decision-making and movements in the term structure of interest rates are discussed using features from the policy process at the Riksbank. Section 3 presents a model of the Swedish term structure of interest rates, which incorporates factors discussed in Section 2. A description of the data used is provided in Section 4 and the model is evaluated in Section 5. Section 6 summarises and concludes.

2. Monetary policy process and signalling at the Riksbank

In this section, we discuss the role of monetary policy signalling and its effects on the term structure of interest rates. The discussion will be based on the policy process at the Riksbank but we believe that many of the mechanisms can be found in the policy process at other central banks as well. We will consider four different types of signalling channels: (i) speeches, (ii) judgments about future inflation, (iii) announcements of repo rate decisions and (iv) publication of the minutes of Executive Board meetings where repo rate decisions were taken.

Figure 1 presents a simplified example of how the policy process works at the Riksbank and the role of the different signalling channels. Assume that economic news arrives at time t_0. The implications for future inflation are then analysed internally and a decision-maker indicates in a speech (at time t_1) how future inflation prospects might have changed. A more detailed analysis including an explicit inflation forecast is then published in the inflation report at time t_2. A repo rate decision is announced at time t_3 and different views among decision-makers about the appropriate monetary policy stance as well as individual voting behaviour of the decision-makers are published as minutes at time t_4. Then the policy process cycle is repeated.[6]

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[3] Term structure effects of changes in the monetary policy instrument have also been analysed in VAR models, see eg Evans and Marshall (1998).

[4] Signalling via speeches and inflation reports was also considered in Lindberg et al (1997). Moreover, the effects of central bank statements have been analysed by Guthrie and Wright (2000).

[5] A problem is that only unexpected signals should affect interest rates, which requires a measure of expected values. The expected signals from inflation reports and minutes are, however, difficult to measure.

[6] As will become apparent later on in the text, the term "policy process cycle" is most relevant in the new policymaking regime in place since January 1999. In this regime, the period between two policy meetings (at which repo rate decisions are taken) constitutes a cycle.

Figure 1

The policy process cycle at the Riksbank - an illustrative example

Economic news	Speech	Inflation report	Repo rate decision	Minutes

t_0 t_1 t_2 t_3 t_4
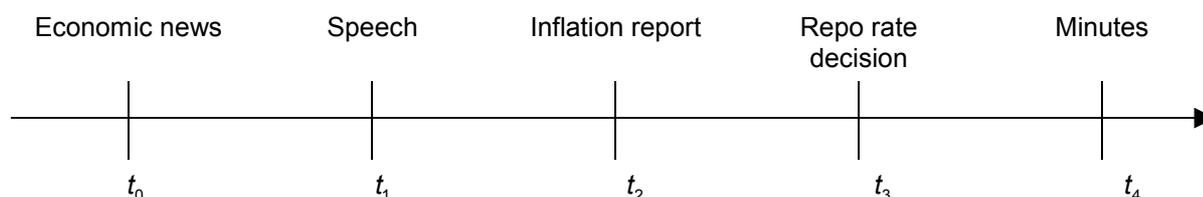
This description of the policy process at the Riksbank is of course a simplification in many respects. For instance, economic news arrives almost continuously over time and several speeches are often given during the policy process cycle. On the other hand, inflation reports are not published during every cycle. Moreover, the policy process at the Riksbank has changed over time. The most important change took place in January 1999, when the new Riksbank Act became effective. Before 1999 monetary policy decisions were taken by the Governor, who set the repo rate in accordance with general guidelines provided by a Governing Board consisting of parliament members. However, the new Riksbank Act states that an Executive Board consisting of six professional members is responsible for the overriding monetary policy objective of achieving price stability.[7] This change in the policy process has several implications that are important to bear in mind.

First, pre-1999 speeches were signalling the intentions of the Riksbank whereas speeches post-1999 reflect views held by individual members of the Executive Board. Second, pre-1999 monetary policy conclusions were discussed in the inflation report and a repo rate decision in accordance with these conclusions was normally announced some time later (in cases where an adjustment of the repo rate was judged to be appropriate). Post-1999 the inflation report presents an inflation forecast that the majority of the Executive Board supports and the policy conclusions can be found in a press release published at the same time as the inflation report announcing the repo rate decision (ie t_2 coincides with t_3). Third, the introduction in 1999 of the Executive Board as the decision-making body was accompanied by other new features of the decision-making process such as preannounced monetary policy meetings (held eight to 10 times per year), the minutes of which are published with a delay of a few weeks.[8]

How does signalling through these different channels affect the term structure of interest rates? First, it is important to note that in the extreme case when the central bank slavishly follows a policy rule, say a Taylor type rule, signalling will have no effect on interest rates. As soon as relevant economic news arrives market participants adjust their expectations according to the rule and subsequent signalling will only serve as a confirmation of this policy rule. In reality, central banks do not follow simple rules perfectly and monetary policy considerations are based on a large number of indicators that are subject to interpretations and judgments. An important function of speeches is to signal decision-makers' interpretations of new economic information.

Moreover, a central bank that is successful in signalling its monetary policy intentions should experience rather small term structure effects from changes in the official interest rate. It can therefore be misleading, as pointed out by Woodford (2001), to associate the effectiveness of monetary policy with the ability to obtain large term structure effects by surprising the market.

One may argue that signalling speeches given before 1999 should have had more impact on interest rates than the ones held after 1999 since the speaker (normally the Governor or one of the Deputy Governors), who knew what monetary action was planned, was able to give rather precise information about future intentions. Today, members of the Executive Board can only indicate individual views

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[7] In 1999 the Governing Board was replaced by the Governing Council (also consisting of members of parliament), that retains general supervisory functions and appoints members of the Executive Board. For a fuller discussion, see Berg and Lindberg (2000).

[8] Two clarifications can be made: first, at the beginning of 1999 the delay was several weeks but since October 1999 minutes have been published with a delay of about two weeks. Second, in *Press Release no 66* of 6 November 1999, it was announced that repo rate decisions will normally only be made at the preannounced monetary policy meetings. However, this is in line with the practice established at the beginning of 1999.

concerning the appropriate stance of monetary policy in speeches whereas the actual decision will be the outcome of a voting process that cannot be predicted for certain by anyone, including the members of the Executive Board. One could also argue that the arrangement with a collective of decision-makers who decide by voting may tend to make monetary policy less predictable in the short run compared with the case of a single decision-maker. On the other hand, a collective of decision-makers, whose members are gradually replaced over time, may imply more continuity in the policy process and therefore increased predictability of monetary policy in a longer perspective. The replacement of a single policy-maker can be a more drastic event associated with substantial uncertainty, which might sometimes generate credibility problems.

Monetary policy statements of the kind analysed by Guthrie and Wright (2000) are not considered to be an important part of the Riksbank's communication policy and are therefore not included in the analysis. Instead, we focus on speeches that are not assumed to have signalling value by Guthrie and Wright. This difference in methodology reflects differences in communication policy between the Riksbank and the Reserve Bank of New Zealand.

As indicated above, the inflation reports published post-1999 may not contain very much additional information concerning policy intentions in the near future given that a press release with policy conclusions and a repo rate decision is published the same day, especially when an adjustment of the repo rate is announced.[9] However, the inflation report does contain a detailed inflation forecast as well as a quantitative risk assessment that should be indicative of monetary policy intentions in the future. In this context it should be noted that inflation forecasts have been published since the 1997:4 inflation report. Moreover, the inflation report does sometimes signal changes concerning the analytical framework, which may have some impact on investors' monetary policy expectations in a longer perspective.

Minutes of the Executive Board's monetary policy meetings have been published since 1999 with a delay of a few weeks. Minutes present the range of views held within the Executive Board about the appropriate monetary policy stance as well as the voting behaviour of individual members. Minutes show the support for the latest repo rate decision among the members of the Executive Board, which should be indicative of future repo rate adjustments (Gerlach-Kristen (2001)). For instance, if all members have voted for an unchanged repo rate, investors may assign a lower probability to further increases of the repo rate than when there is a minority that favours an increase of the repo rate.

This review of the policy process at the Riksbank raises several interesting issues. What are the effects from various signalling channels on the term structure of interest rates? How large are the impacts on short-term and long-term interest rates? And how important is it to control for the publication of relevant economic news? In the next section we will develop a model for the Swedish term structure of interest rates in order to quantitatively assess these kind of issues.

3. A model for the Swedish term structure of interest rates

3.1 Determinants of unexpected movements in the term structure

The basic mechanism we want to study is how monetary policy signalling will affect expectations of future short-term interest rates. Economic theory tells us that unexpected movements in the term structure are driven by changes in expectations of future short-term interest rates and unexpected changes in the term premia. Moreover, when analysing the interest rate effects of monetary policy signalling it is crucial to control for other factors affecting the term structure of interest rates. Hence we find it natural to attribute movements in the Swedish term structure to unexpected movements in the foreign term structure, unexpected monetary policy signals, unexpected economic news and unexpected changes in market conditions:

$$\Delta i(t,\tau) - E_{t-1}[\Delta i(t,\tau)] = \kappa(\tau) \{\Delta i^*(t,\tau) - E_{t-1}[\Delta i^*(t,\tau)]\} + \Delta i^{sig}(t,\tau) + \Delta i^{news}(t,\tau) + \varepsilon^{\rho}(t,\tau) \quad (1)$$

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[9] In other words, the fact that several monetary signals are given simultaneously gives rise to multicollinearity problems.

where $i(t,\tau)$ is the continuously compounded interest rate at time t on a nominal Swedish zero coupon bond maturing τ periods ahead, $i^*(t,\tau)$ is a corresponding foreign interest rate, $\kappa(\tau)$ is a parameter, $\Delta i^{sig}(t,\tau)$, $\Delta i^{news}(t,\tau)$ and $\varepsilon^\rho(t,\tau)$ represent unexpected term structure movements caused by new monetary policy signals, relevant economics news and changed market conditions (formally unexpected changes in term premia) respectively. The notation $\Delta x(t)$ denotes $x(t)-x(t-1)$ and $E_{t-1}[.]$ is the expectation operator conditional on information available at time $t-1$. We will next turn to the non-trivial task of defining the above concepts in terms of observable variables.

3.2   Measuring unexpected changes in the term structure

When specifying the unexpected movements in the term structure, we make use of the fact that an implicit forward interest rate at time t for a loan with maturity τ and settlement s periods ahead, $f(t,\tau,s)$, can be written as

$$f(t,\tau,s) = [i(t,\tau + s)\,(\tau + s) - i(t,s)s]/\tau \qquad (2)$$

In what follows, we will consider settlement $s = 1$ period ahead. We also have that

$$f(t-1,\tau,1) = E_{t-1}[i(t,\tau)] + \rho^f(t-1,\tau,1) \qquad (3)$$

where $\rho^f(t-1,\tau,1)$ is a forward term premium that should be very small.[10] Thus, an expectation adjustment term, $v(t-1,\tau)$, defined as

$$v(t-1,\tau) \equiv f(t-1,\tau,1) - i(t-1,\tau) = i(t-1,\tau+1) - i(t-1,\tau) + (i(t-1,\tau+1) - i(t-1,1))/\tau \qquad (4)$$

should be a natural proxy for $E_{t-1}[\Delta i(t,\tau)]$. In the expression above, we have used the fact that one period in our study corresponds to one week, implying that τ should also be measured in weeks.[11] Substituting (2), (3) and (4) into (1), using the corresponding expressions for foreign interest rates and rearranging yields

$$\Delta i(t,\tau) - v(t-1,\tau) = c(t-1,\tau) + \kappa(\tau)\{\Delta i^*(t,\tau) - v^*(t-1,\tau)\} + \Delta i^{sig}(t,\tau) + \Delta i^{news}(t,\tau) + \varepsilon^\rho(t,\tau) \qquad (5)$$

where

$$c(t-1,\tau) = \kappa(\tau)\,\rho^{f^*}(t-1,\tau,1) - \rho^f(t-1,\tau,1) \qquad (6)$$

We will base our empirical analysis on (5), which differs from (1) only by the term $c(t-1,\tau)$, which is likely to be small. The expectation adjustment term, $v(t-1,\tau)$, can be interpreted in the following way. The interest rates $i(t-1,\tau)$ and $i(t,\tau)$ reflect expectations of monetary policy during the time intervals $[t-1,t+\tau-1]$ and $[t,t+\tau]$ respectively, and the difference in monetary policy expectations between these two intervals is captured by the term $v(t-1,\tau)$. One realises that the expectation adjustment term is negligible when τ is large. When τ is small it is of potential importance to take this term into account.[12] In particular, if the next preannounced policy meeting is scheduled just after the maturity of a three-month T-bill at time $t-1$, the expected change in the one-month interest rate might be substantial since the three-month T-bill observed at time t will include a potential repo rate adjustment within the maturity.

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[10]   The forward term premium, $\rho^f(t-1,\tau,1)$, should reflect the uncertainty concerning the spot rate, $i(t,\tau)$, in the next period (in our case the next week).

[11]   The general expression for the expectation adjustment term is actually $v(t-s,\tau,s) = i(t-s,\tau+1) - i(t-s,\tau) + (i(t-s,\tau+1) - i(t-s,1))s/\tau$. We use weekly data and let one period correspond to one week, implying that $s = 1$.

[12]   One should be aware that for small τ there are measurement problems. Good estimates of the term $v(t-1,\tau)$ require good estimates of short-term interest rates that differ very little in time to maturity. This in turn requires many observations of different short-term interest rates at the short end of the yield curve, which we do not have. Thus, the term $v(t-1,\tau)$ should be viewed as a rough indicator of how monetary policy expectations change.

3.3 Foreign interest rate

The foreign interest rate is constructed as a weighted average of estimated zero coupon yields from Germany (GE), the United Kingdom (UK) and the United States (US) according to:

$$i^*(t,\tau) = 0.5 i^{GE}(t,\tau) + 0.25 i^{UK}(t,\tau) + 0.25 i^{US}(t,\tau) \tag{7}$$

This construction can be seen as a rough proxy for a TCW-weighted interest rate, with the weights for the three largest currencies scaled up.[13] Unexpected movements in the foreign term structure are measured in the same way as in Section 3.2.

It is important to realise that unexpected movements in the foreign term structure reflect unexpected news in the global economy that affects monetary policy expectations more or less in all countries as well as changes in global market conditions (ie term premia). This means that the other terms on the right-hand side in (1) only capture domestic factors. In particular, the term $\varepsilon^\rho(t,\tau)$ will only reflect the domestic component of the unexpected changes in market conditions. For instance, the drastic fall of Swedish long-term interest rates during the second half of 1998 was partly the result of a downward adjustment of global monetary policy expectations caused by the Asian crises and partly the result of a decrease of the global component of the Swedish term premium.[14] A closer inspection reveals that Swedish long-term interest rates did not fall as much as in Germany, the United Kingdom and the United States, indicating a possible increase of the domestic component of the Swedish term premium.

3.4 Domestic monetary policy signalling component

The monetary policy signalling component, $\Delta i^{sig}(t,\tau)$, is assumed to be of the form

$$\Delta i^{sig}(t,\tau) = \mu_1(\tau) D^{sp}(t) + \mu_2(\tau)(repo(t) - E_{t-1}[repo(t)]) + \mu_3(\tau)[\pi_2^f(t) - 2] + \mu_4(\tau) m(t) \tag{8}$$

where $D^{sp}(t)$ is a dummy variable taking the value +1 (–1) when a speech at time t contains an unexpected signal of a more contractionary (expansionary) monetary policy and zero otherwise, $repo(t) - E_{t-1}[repo(t)]$ is the change in the repo rate announced at time t relative to its expected value at time t–1, $[\pi_2^f(t) - 2]$ is the Riksbank's inflation forecast two years ahead relative to the inflation target of 2%,[15] $m(t)$ is a minority view indicator that will be described below and the $\mu_i(\tau)$ are parameters. The expected future repo rate at time t–1, $E_{t-1}[\Delta repo(t)]$, is approximated by the two-week forward interest rate at time t–1.

Since 1999, decisions not to change the repo rate have been announced to the public. Such announcements should of course be considered as monetary policy signals but one may argue that they differ from announcements of non-zero repo rate changes. Announcements of zero adjustments of the repo rate are not likely to contain information of substantial revisions of the Riksbank's view of the appropriate stance of monetary policy. Announcements of no change in the repo rate are treated

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[13] The Riksbank uses the Total Competitive Weights (TCW) index as a measure of the krona's effective exchange rate. According to TCW, the Deutsche mark has a weight of 0.22 whereas sterling and the US dollar both have weights of 0.12. We have examined other ways of defining the foreign interest rate without any substantial changes of the results.

[14] The decrease of the global term premium probably reflects an increased demand for liquid assets such as government bonds.

[15] Several clarifications concerning the nature of the inflation forecast should be made. (i) The inflation forecast is conditional on an unchanged repo rate. Consequently, an inflation forecast above (below) the inflation target signals the need for a future increase (decrease) of the repo rate. (ii) Before 1999, the inflation forecast was based on the annual change in the CPI. However, at the beginning of 1999, Deputy Governor Heikensten issued the clarification message that monetary policy for the time being would not respond to transitory inflation effects such as interest rate expenditures and effects from subsidies and taxes, see Heikensten (1999) for details. This clarification was generally interpreted to mean that monetary plicy would mainly be guided by the prospects for underlying inflation (measured by UND1X), and we use the inflation forecast for UND1X from 1999 and onwards. (iii) Before the fourth inflation report of 1997, the Riksbank did not publish an explicit inflation forecast. In five of the six preceding inflation reports, it was stated that the inflation rate was judged to be 2% at the end of the forecast period, which we interpret as if the inflation forecast two years ahead were on target. In the first inflation report of 1997, it was stated that the inflation rate was judged to be below the target and in this case we set the inflation forecast to 1.9%. In Jansson and Vredin (2001), it is revealed that the actual forecast was 1.9%.

as a separate signalling variable in order to examine if they differ from announcements of non-zero repo rate adjustments.

The inflation forecast in the inflation report is defined as the *mode* of the conditional distribution for the inflation rate two years ahead, which can be viewed as the most likely outcome for inflation.[16]

It is a non-trivial task to determine when a speech contains an unexpected monetary policy signal, as illustrated by the following example. Assume that monetary policy expectations are neutral, ie the short end of the yield curve is flat. A speech signalling an increase of the repo rate will then lead to expectations of future rises of the repo rate and a positively sloped yield curve. A subsequent speech with the same monetary policy signal will then have no effect since the yield curve has already responded to a similar signal. Based on the insights gained from this example, we will use the following two-step procedure to calculate the dummy variable $D^{sp}(t)$. In a first step, a dummy variable $D^{sign}(t)$ is constructed such that it takes the value 1 (–1) when an increase (decrease) is signalled in a speech and zero if an unchanged monetary policy stance is signalled. Then in a second step, the dummy variable $D^{sp}(t)$ is defined as:

$$
D^{sp}(t) = \begin{cases} 1 & \text{if } D^{sign}(t)=1 \text{ and slope}(t\text{–}1) < d \text{ or } D^{sign}(t)=0 \text{ and slope}(t\text{–}1) \leq -d \\ -1 & \text{if } D^{sign}(t)=0 \text{ and slope}(t\text{–}1) \geq d \text{ or } D^{sign}(t)=-1 \text{ and slope}(t\text{–}1) > -d \\ 0 & \text{otherwise} \end{cases} \tag{9}
$$

where d is set to 0.05 in the base model, and the variable slope(t–1) is measured as the difference between the 30-day T-bill rate and the repo rate at time t–1. Thus, if $D^{sp}(t)$ takes the value 1 (–1) the speech is judged to contain an unexpected signal of a more contractionary (expansionary) monetary policy whereas a zero value indicates a monetary policy signal in accordance with market expectations. This method of characterising speeches is similar to the dummy variable method applied by Guthrie and Wright (2000) for characterising monetary policy statements. The main difference is that we control for monetary policy expectations, as reflected in the slope variable, in order to determine whether the signal is unexpected. Guthrie and Wright assume that all statements indicating a need for tighter or looser monetary policy conditions are unexpected (excluding preannounced speeches and statements that are part of regular information releases).

The construction of the variable $D^{sp}(t)$ is problematic and subjective judgments must be used in several steps. First, it must be decided if a speech contains a monetary policy signal as well as the nature of the signal (ie the value of $D^{sign}(t)$). In the Appendix there is a list of speeches containing signals as well as quotations motivating the assigned nature of the speeches. Thereafter it must be decided if the signal was expected or not according to expression (9), which is based on the assumption that investors have expectations of increases (decreases) of the repo rate in the near future only if the slope variable is greater (less) than 5 (–5) basis points. The consequences of changing parameter d will be examined.[17]

The minority view indicator is defined as

$$
m(t) = \frac{1}{6}\sum_{k=1}^{6}\Delta repo^k(t) - \Delta repo(t-n) \tag{10}
$$

where $\Delta repo^k(t)$ is the preferred repo rate adjustment of Executive Board member k according to the minutes published at time t, and $\Delta repo(t-n)$ is the actual repo rate adjustment that took place n weeks earlier at the monetary policy meeting to which the minutes refer.[18] A positive value of the indicator $m(t)$, which can be viewed as the *average* preferred repo rate adjustment relative to the preferred repo

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[16] Formally, the mode is the outcome that maximises the density function of the underlying (conditional) distribution. The mode forecast will typically differ from the adjusted forecast (ie the mathematically expected value) in the presence of asymmetric risks to the forecast. For details, see Blix and Sellin (1998).

[17] An interesting possibility is to estimate the parameter d, eg using maximum likelihood estimation. We have refrained from this rather complex procedure.

[18] For example, in the minutes published on 29 November 1999 it can be read that Executive Board member Mr Bergström voted for an unchanged repo rate whereas the majority voted for an increase of 35 basis points. In this case we have that $m(t) = -0.35/6$.

rate adjustment *of the majority*, signals that there are preferences for a tighter monetary policy within the Executive Board and hence we expect a positive relationship between $m(t)$ and unexpected movements in the term structure of interest rates. Indeed, Gerlach-Kristen (2001), who analyses the voting behaviour of the Monetary Policy Committee at the Bank of England, constructs a model in which the indicator $m(t)$ is indicative of future monetary policy actions. It is worth emphasising that the purpose of publishing minutes is not to signal monetary policy intentions, but to provide a transparent description of the monetary policy views that are held within the Executive Board.

It should be noted that the signalling variables $\left[\pi_2^f(t) - 2\right]$ and $m(t)$ are not defined in terms of deviations from expected values. The problem is that we do not have measures of investors' expectations concerning these variables.[19] Alternatively, one can say that we have approximated the expected values for $\left[\pi_2^f(t) - 2\right]$ and $m(t)$ with zeros. Anyhow, we expect that if the inflation report or the minutes contain unexpected monetary policy signals then they will show up in $\left[\pi_2^f(t) - 2\right]$ and $m(t)$ respectively.

3.5   Economic news term

Interest rate movements caused by unexpected economic news $\Delta i^{news}(t,\tau)$ are modelled as

$$\Delta i^{news}(t,\tau) = \eta^\pi(\tau)\left(\pi(t) - \pi^e(t)\right) + \eta^y(\tau)\left(y(t) - y^e(t)\right) \tag{11}$$

where $\pi(t)$ ($y(t)$) is the official outcome of actual inflation (GDP) announced at time t and $\pi^e(t)$ ($y^e(t)$) is the outcome for inflation (GDP) expected by market participants just before time t. It is of course possible to include other variables but we restrict the analysis to news of inflation and GDP since these variables are judged to be the most important determinants of future inflation.

3.6   Unexpected changes in market conditions

Finally, we have to address unexpected movements in the term structure that cannot be attributed to unexpected international term structure movements, monetary policy signals or economic news. These are contained in the last term in (1): $\varepsilon^\rho(t,\tau)$. It is natural to think of these remaining effects as a result of changes in market conditions such as changes in the demand for liquidity or portfolio adjustments. Formally, this kind of movements can be seen as unexpected shocks to term premia. Moreover, since term premia often exhibit autocorrelation we also expect term premia factors to enter our equations with a lag.[20] We assume that the term premium includes a domestic portfolio component of the form

$$\rho^d(t,\tau) = \varphi(\tau)\,\delta^L(t) \tag{12}$$

where $\delta^L(t)$ is the spread between Swedish and foreign yields on long (10-year) bonds. We think of the term $\rho^d(t,\tau)$ as representing portfolio adjustment effects in the following way. If investors want to substitute from Swedish to foreign bonds, this should tend to increase Swedish interest rates relative to foreign. Such effects are often present during periods of international financial turmoil, eg in the autumn of 1998. Moreover, in the mid-1990s portfolio effects of this kind were large in Sweden and driven by the imperfect (and fluctuating) credibility of Swedish economic policy that the worrisome development of the national debt caused. Dillén and Hopkins (1998) have shown that long-term

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[19]   There exist measures of inflation expectations and inflation forecasts but there are no measures of expectations concerning the conditional forecast published in the inflation reports. This forecast is conditional on an unchanged repo rate and must be distinguished from traditional forecasts.

[20]   To realise this, assume that the term premium (expressed as a deviation from its stationary value) follows an AR(n) process: $\rho(t,\tau) = \theta_1 \rho(t-1,\tau) + ... + \theta_n \rho(t-n,\tau) + \varepsilon^\rho(t,\tau)$. The unexpected change in the term premia can then be written as: $\varepsilon^\rho(t,\tau) = \Delta\rho(t,\tau) + \mu_1 \rho(t-1,\tau) + ... + \mu_{n-1} \Delta\rho(t+1-n,\tau) + \mu_n \rho(t-n,\tau)$, where $\mu_i = 1-(\theta_1+...+\theta_i)$. We see that lagged changes in the term premium have a positive impact on unexpected term structure movements that is also smaller than the contemporaneous change in the term premia ($\mu_1<1$).

interest rate differentials play an important role in explaining term structure movements in Sweden that are not related to monetary policy expectations.[21]

In addition, we acknowledge the possibility that there is a global component in the term premium incorporated in foreign interest rates. For instance, it is reasonable that the drastic fall in international market interest rates during the second half of 1998 partly reflected a reduction in term premia caused by increased demand for liquid assets, such as government bonds. To the extent that this component exhibits serial correlation, we would expect lagged changes in the foreign interest rates to enter significantly in our empirical model.

Finally, we include lagged values of the other regressors (monetary policy signals and economic news) in order to examine the specification. The hypothesis is that investors immediately and correctly evaluate unexpected monetary policy signals and economic news, implying that lagged values of these variables should not be significant determinants of term structure movements. However, if it takes time for investors to evaluate news of a particular kind this should lead to a positive lagged effect. A variant of this argument is that influential commentators (including politicians) comment on news, eg a repo rate decision, with some delay, which in turn leads to subsequent movements in interest rates. Another possibility is that investors overreact to news, in which case there should be a negative lagged effect.[22]

4.   Data

We use weekly data from 16 April 1996 to 25 September 2001. There are two main reasons why we do not extend the analysis backwards in time. First, it is hard to find relevant measures of inflation and GDP expectations prior to 1996. Second, during the first half of the 1990s Swedish interest rates were often high and very volatile due to the presence of credibility problems. Even though it is possible to control for some of these effects, the inclusion of data from the first half of the 1990s is likely to blur the analysis. Swedish and foreign interest rates are estimated as continuously compounded zero coupon yields using (with a few exceptions) interest rate quotations from Tuesdays. These quotations should be viewed as end-week observations and all events that occur between Wednesday morning and the following Tuesday afternoon are considered as week *t* events. Market participants' inflation and GDP expectations have been taken from surveys by Reuters.

Details about the data used can be found in the Appendix. As regards the monetary policy signalling variables, a first look at the data is warranted in order to facilitate the interpretation of the regression analysis in the next section. Table 1 depicts the numerical values of all monetary policy signalling variables used in the analysis. Several interesting observations can be made. Sixteen out of 28 non-zero repo rate adjustments in the sample period were made during 1996.[23] Since 1997 the repo rate has been adjusted only a few times per year (four times or less). The total number of speeches with unexpected monetary policy signals has been relatively constant over the years. The monetary policy signals provided by inflation forecasts in inflation reports and minutes are quite well aligned with the speech signals.

When we compare actual and unexpected repo rate changes, it is noticeable that the predictability of repo rate changes has not increased over time. In fact, the unexpected component of repo rate changes in 1996 was usually substantially smaller than in 2000 and 2001. To a large extent, this is natural since a policy with quite small and frequent repo rate adjustments as in 1996 should tend to reduce the unexpected part of repo rate changes in comparison with a policy with larger but less

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[21] Dillén and Hopkins (1998) derive the presence of the long-term interest rate differential in a term premium (expression) from a theoretical regime switching model in which investors fear that the low-inflation policy will be abandoned in the future. Strictly speaking, the long-term interest rate differential reflects an expectational error (unfulfilled expectations of a switch to a high-inflation regime). Moreover, a German long-term interest rate was used as the foreign interest rate in this study.

[22] Note that there are basically two different arguments for deviations from the expectations hypothesis: (i) investors demand term premia for holding bonds or (ii) expectations are not fully rational due to eg delayed evaluation of news or overreaction.

[23] The repo rate was lowered 22 times during 1996: six of these cuts took place before the start of the sample period (16 April 1996).

frequent changes. One could also argue that the economic situation in 1996 in some sense was easier to evaluate from the perspective of monetary policymaking. It is fair to say that monetary policy in 1996 reflected an adjustment towards lower levels of interest rates associated with the increased credibility of Swedish economic policy, and that the direction of future monetary policy was quite obvious. Since 1997, monetary policy has mainly been guided by future inflation prospects and events such as the Asian crises in 1998, and the surprisingly high productivity growth in recent years has made monetary policy a difficult task.

Table 1

Monetary policy signals

Date[1]	Speech	Report	Repo change	Unexp repo	Minutes
1996-04-23			− 0.25	0.08	
1996-05-07			− 0.20	0.06	
1996-05-21			− 0.20	− 0.03	
1996-06-04			− 0.20	− 0.10	
1996-06-18			− 0.20	− 0.04	
1996-07-02			− 0.20	0.06	
1996-07-16			− 0.20	0.03	
1996-07-30			− 0.15	− 0.06	
1996-08-13			− 0.15	− 0.06	
1996-08-27			− 0.15	− 0.06	
1996-09-10			− 0.10	− 0.00	
1996-09-24			− 0.10	0.05	
1996-10-08			− 0.10	0.01	
1996-10-22			− 0.35	− 0.23	
1996-11-12	− 1.00				
1996-11-26			− 0.25	− 0.18	
1996-12-17			− 0.25	− 0.14	
1997-01-28	1.00				
1997-02-04	1.00				
1997-03-25		− 0.10			
1997-05-06	1.00				
1997-06-17	1.00				
1997-10-21	− 1.00				
1997-11-25	1.00				
1997-12-09		0.50			
1997-12-16			0.25	0.17	
1998-06-02	− 1.00				
1998-06-09		− 0.40	− 0.25	− 0.24	
1998-08-25	− 1.00				
1998-09-29		− 0.10			
1998-11-03			− 0.25	− 0.24	
1998-11-17	− 1.00				
1998-11-24			− 0.25	− 0.21	
1998-12-08		− 0.60			
1998-12-15			− 0.20	− 0.17	
1999-02-16			− 0.25	− 0.17	
1999-03-30	− 1.00	− 0.20	− 0.25	− 0.22	

[1] Refers to the Tuesday of the week in which the signal was given.

Table 1 (cont)

Date[1]	Speech	Report	Repo change	Unexp repo	Minutes
1999-06-08					– 0.04
1999-09-21					0.06
1999-10-12		0.10			
1999-10-26					0.08
1999-11-16			0.35	0.26	
1999-11-30					– 0.06
1999-12-14		0.20			
2000-02-08			0.50	0.40	
2000-03-21	– 1.00				
2000-03-28	– 1.00	0.10			
2000-04-18					0.08
2000-05-23	1.00				
2000-06-13		– 0.10			
2000-06-27					0.08
2000-07-25					0.08
2000-09-05					0.08
2000-10-10		– 0.10			
2000-10-24					0.08
2000-11-14	1.00				
2000-11-28	– 1.00				
2000-12-12		– 0.10	0.25	0.18	
2000-12-26					– 0.04
2001-03-27		– 0.10			
2001-06-05		0.10			
2001-06-19	1.00				
2001-07-10			0.25	0.17	
2001-07-24					– 0.13
2001-09-18			– 0.50	– 0.49	

1 Refers to the Tuesday of the week in which the signal was given.

However, it cannot be ruled out that the new arrangement with an Executive Board that collectively makes repo rate decisions has rendered repo rate changes less predictable. On the other hand, it would be premature to conclude that monetary policy intentions as reflected in the term structure have become less predictable. There are no indications that unexpected movements in long-term interest rates have become larger since 1999 according to Table 2. Indeed, 2000 exhibits the smallest movements in one- and two-year interest rates. The overall impression from Table 2 is, however, that the predictability of term structure movements has not changed significantly since 1996.

5. Results and evaluation

5.1 Results in the basic model

Table 3 displays estimates of the model for unexpected movements in the Swedish term structure of interest rates described in Section 3. Four interest rates are examined; a short interest rate (maturity of 90 days), two medium-term interest rates (maturities of one and two years), and a long interest rate (maturity of five years).

Table 2

Unexpected weekly movements in the Swedish term structure of interest rates

(mean, standard deviation)

Sample	90-day bill	1-year bond	2-year bond	5-year bond
1996-04-16 to 2001-09-25	– 0.0089, 0.0769	– 0.0085, 0.0885	– 0.0092, 0.1082	– 0.0098, 0.1216
1996-4-16 to 1996-12-31	– 0.0704, 0.0865	– 0.0623, 0.0837	– 0.0588, 0.1091	– 0.0467, 0.1334
1997	0.0159, 0.0642	0.0161, 0.0957	0.0100, 0.1292	– 0.0090, 0.1420
1998	– 0.0217, 0.0591	– 0.0303, 0.0744	– 0.0334, 0.0818	– 0.0334, 0.0894
1999	0.0033, 0.0619	0.0163, 0.0900	0.0264, 0.1151	0.0332, 0.1376
2000	0.0106, 0.0747	0.0001, 0.0687	– 0.0108, 0.0780	– 0.0190, 0.1029
2001-01-01 to 2001-09-25	– 0.0100, 0.0918	– 0.0067, 0.1097	0.0056, 0.1189	0.0067, 0.1097

5.2 Non-policy factors

Note first that the impact of foreign term structure movements increases with time to maturity as expected, and that foreign interest rates appear to be the dominant factor for longer interest rates (Table 4). This is natural since global economic shocks should affect long-term monetary policy intentions in different countries in a similar way, whereas policy actions in the short run, ie the timing of policy actions, are related to foreign policy intentions only to a limited extent. Moreover, lagged foreign interest rates also enter significantly (with one exception) in the regressions, but with a lesser magnitude, which is consistent with the presence of a serially correlated global term premium.

Changes in market conditions (measured by changes in the long-term forward rate differential between domestic and foreign bonds) exhibit a significant impact on medium- and long-term interest rates, indicating that weekly changes in interest rates are to some extent driven by noisy market effects. The absence of lagged effects indicates that these market effects are probably not serially correlated. The term structure effects from the long forward rate differential are also small in comparison with Dillén and Hopkins (1998).

Economic news concerning GDP and inflation seems to have significant effects on longer interest rates but the modest coefficients are hard to reconcile with the view that the market believes that the Riksbank follows a Taylor rule closely. It appears that economic news does not play an important role for monetary policy in the near future but mainly affects expectations regarding monetary policy in the medium term. Moreover, the impact on monetary policy expectations depends on how economic news is interpreted. If GDP surprises are interpreted to be the result of productivity shocks rather than changes in demand conditions (the output gap), then we expect limited effects on monetary policy expectations and market interest rates.

5.3 Policy factors

Turning to the policy signalling variables, we see from Tables 3 and 4 that announcements of repo rate changes are not fully discounted with a substantial effect on the 90-day T-bill rate. The quantitative effects on short-term interest rates are broadly similar to the findings of Cook and Hahn (1989), Favero et al (1996) and Kuttner (2001). The impact from unexpected repo rate changes on longer market interest rates is smaller and declines with maturity. This observation, which is in line with the findings of Favero et al (1996), Buttiglione et al (1997) and Haldane and Read (2000), suggests that interest rate policy is mainly used to implement rather than signal long-run monetary policy intentions. Note also that there appears to be a lagged effect from unexpected repo changes on medium-term market rates. This may indicate that it takes some time for investors to fully appreciate the signal or that the repo rate change triggers some kind of delayed reaction from influential commentators, which in turn affects market rates.

Table 3
Yield curve impact of news, monetary policy and market factors

Variable	90-day bill	1-year bond	2-year bond	5-year bond
Constant	– 0.006 (1.624)	– 0.004 (0.873)	– 0.004 (0.766)	– 0.003 (0.567)
GDP	0.014 (0.766)	0.036 (1.530)	**0.058** (2.059)	**0.063** (2.162)
lagged effect	0.021 (1.113)	– 0.013 (0.576)	– 0.013 (0.475)	– 0.008 (0.276)
CPI	0.037 (1.048)	**0.151** (3.452)	**0.157** (2.960)	0.085 (1.555)
lagged effect	0.058 (1.640)	**0.086** (1.970)	0.062 (1.173)	0.088 (1.600)
REPO	**0.589** (9.940)	**0.341** (4.642)	**0.268** (3.014)	0.127 (1.390)
lagged effect	0.043 (0.736)	**0.134** (1.853)	0.101 (1.146)	0.058 (0.644)
NOREPO	**0.856** (3.096)	0.192 (0.562)	– 0.175 (0.422)	0.094 (0.219)
lagged effect	**0.610** (2.187)	– 0.025 (0.073)	– 0.005 (0.011)	– 0.179 (0.417)
REPORT	0.064 (0.850)	**0.161** (1.723)	0.136 (1.203)	0.104 (0.890)
lagged effect	0.017 (0.218)	– 0.081 (0.855)	– 0.104 (0.903)	– 0.048 (0.404)
SPEECH	**0.043** (3.111)	**0.054** (3.124)	**0.056** (2.661)	**0.038** (1.779)
lagged effect	**0.027** (1.911)	0.018 (1.030)	0.009 (0.437)	0.008 (0.375)
MINUTES	0.342 (1.631)	0.039 (0.151)	0.085 (0.271)	0.223 (0.687)
lagged effect	– 0.033 (0.158)	0.166 (0.647)	0.161 (0.519)	0.166 (0.517)
R*	**0.234** (4.896)	**0.305** (7.496)	**0.420** (11.128)	**0.632** (15.950)
lagged effect	**0.085** (1.858)	0.053 (1.285)	**0.072** (1.898)	0.110 (2.764)
RDIFF	0.028 (1.345)	**0.125** (4.867)	**0.158** (5.057)	**0.119** (3.682)
lagged effect	– 0.011 (0.523)	0.010 (0.380)	0.027 (0.867)	0.007 (0.208)
RDIFF	0.028 (1.345)	0.125 (4.867)	0.158 (5.057)	0.119 (3.682)
lagged effect	– 0.011 (0.523)	0.010 (0.380)	0.027 (0.867)	0.007 (0.208)
R^2	0.407	0.350	0.372	0.471
R^2adj	0.367	0.306	0.329	0.435
DW	2.027	1.837	1.815	1.943

Coefficients significant at the 10% level are in bold. t-values are in parentheses. The equations have been estimated using SURE. *GDP* is the actual minus the expected percentage change in GDP, *CPI* is the actual minus the expected change in CPI inflation, *REPO* is the announced change in the repo rate minus the expected change, *NOREPO* corresponds to *REPO* in the case where no change in the repo rate is announced, *REPORT* is the two-year inflation forecast minus 2%, *SPEECH* is a dummy variable indicating the monetary policy stance of the speaker, *MINUTES* reflects the minority view relating to a repo rate change as revealed in the minutes of the Executive Board, *R** is the change in the foreign interest rate with matching maturity to the dependent variable, and *RDIFF* is the change in the difference between domestic and foreign forward interest rates. DW is the Durbin-Watson test for first-order autocorrelation.

Table 4

**Variance decomposition of changes in interest rates, as a share
of total explained interest rate variance**

(in percentages)

Component	90-day bill	1-year bond	2-year bond	5-year bond
News variance	2.7	13.0	9.7	4.6
Policy variance	82.9	43.7	23.5	9.9
DR* variance	12.3	22.0	39.5	70.7
DRDIFF variance	1.4	18.0	18.9	7.2

News includes the *GDP* and *CPI* variables, while policy encompasses *REPO*, *NOREPO*, *REPORT*, *SPEECH* and *MINUTES*. The contributions from the covariance components (not reported in the table) were all quite small (less than 3% in absolute values).

Announcements of no change in the repo rate only affect short-term interest rates. Thus, in this case investors are mainly somewhat surprised by the timing of monetary policy actions but the decision not to change the repo rate does not appear to contain signals concerning monetary policy in a longer perspective. Moreover, there is an additional and significant lagged effect on short-term interest rates, which may indicate that investors adjust their monetary policy expectations for the near future with some delay when the Riksbank surprises the market by not changing the repo rate.

The overall impression is that repo rate changes only cause investors to revise their expectations regarding the Riksbanks' monetary policy intentions in a longer perspective to a limited extent, but that investors are sometimes surprised by the timing of monetary policy actions. The economic consequences of postponing a repo rate adjustment until the next monetary policy meeting are often very limited and the actual timing of a decision depends to a large extent on the decision-makers' views concerning the appropriate tactics, which are hard to predict.

The observation that repo rate changes only signal long-run monetary policy intentions to a limited extent gives rise to further questions; if shocks to the economy call for a substantial change in the monetary policy stance, which according to theory means changes in the longer segment of the yield curve, how can this be achieved? In other words, how are monetary policy intentions in a longer perspective signalled? It is natural in this context to examine which roles other channels for monetary policy signalling play.

Inflation forecasts published in the inflation report may have some impact on the Swedish term structure, especially on the one-year interest rate. The quantitative term structure reaction appears to be much smaller than the actual repo rate response to changes in inflation forecasts, see Jansson and Vredin (2001).[24] This indicates that a substantial proportion of future monetary policy actions were expected by investors before the publication of the inflation forecast. Indeed, we do not expect a strong effect from the publication of the inflation forecast since its main role is to support the repo rate decision announced at the same time rather than to provide the market with additional signals. We have also examined various methods to incorporate the risk assessment in the inflation report without obtaining any effects on the Swedish term structure of interest rates.[25]

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[24] Jansson and Vredin (2001) find that an upward revision of the inflation forecast of 1 percentage point is associated with a short-run response of the repo rate of about 66 basis points.

[25] We have tried to use the risk-adjusted inflation forecast (corresponds to the mathematically expected inflation), which if anything had weaker effects on Swedish interest rates. When we added separate variables representing the risk assessment in the inflation report, small insignificant effects of the wrong sign were obtained.

There are several reasons for our cautious interpretation of the effects from the inflation forecast. One problem is that the impact of the inflation forecast is quite sensitive to outliers and in the baseline model we exclude the inflation forecast published on 8 December 1998.[26] Moreover, there is some evidence of overreaction in the form of a negative lagged effect from publications of the inflation forecast that to some extent balances the contemporaneous effect. If we do not exclude the inflation report published on 8 December 1998, this negative lagged effect actually dominates. Moreover, the fact that the unexpected component of the Riksbank's inflation forecast relative to the target is measured with error, since we do not know the expected value, also blurs the analysis. Finally, there is also a multicollinearity problem since the publication of inflation reports normally coincides with the announcement of a repo rate decision. The inflation report may contain some uncertain signalling effects that are difficult to extract due to measurement and statistical problems.

The minority view appears to have some impact only on Swedish short-term interest rates, indicating that investors adjust their monetary policy expectations towards the minority view to some extent. The coefficient of 0.35 is not very far from corresponding estimates reported by Gerlach-Kristen (2001).[27] It should, however, be remembered that the unexpected component of the minority view (as defined by expression (9)) is measured with an error since we do not know the expected values, and that the motive behind the publication of minority views is not to affect monetary policy expectations but to give a more detailed description of the decision-making process.

Finally, Table 3 indicates that unexpected signals from speeches have significant but at first sight small effects on Swedish interest rates. However, of all policy variables only speeches have a significant effect on the five-year interest rate. Moreover, a closer examination reveals that the effect on the five-year interest rate from an unexpected signal given in a speech corresponds to an unexpected repo rate change of 30 basis points, which is quite large. Our tentative conclusion is that speeches have provided the market with the strongest signals for monetary policy intentions in a longer perspective.

5.4   A closer look at speeches

The analysis above indicates that speeches appear to be an important channel for monetary policy signalling. At the same time, it is a non-trivial task to extract unexpected signals from speeches and therefore we find it appropriate to examine alternative methods. First, we analyse the consequences of assigning a very low value of 0.005 to the slope variable d in (9). This means that investors very seldom have neutral monetary policy expectations, implying that most non-neutral speeches deliver expected signals. As can be seen from panel A in Table 5, this leads to a reduction of the estimated coefficients[28] for the speech signals as well as R^2. A similar pattern also emerges (to a lesser degree) if we increase the slope variable d to 0.10.[29] The problem in this case is that investors are judged to have neutral monetary expectations most of the time, implying that too many non-neutral unexpected speech signals are included.[30] Our choice of the slope variable d is probably not very far from the value that would have emerged if this variable were estimated.

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[26]   The inflation forecast published on 8 December 1998 was special in several respects. The forecast exhibits the largest deviation from the target in the sample and it also represents a rather large downward revision in comparison to the forecast published about two months earlier (29 September 1998). Moreover, the low inflation forecast of 1.4% is measured in terms of CPI whereas the inflation forecast for underlying inflation (UND1X) was substantially higher (1.8%) and it is not unreasonable to suppose that investors believed future monetary policy would be guided by the outlook for UND1X - a practice that was announced at the beginning of 1999, see footnote 15.

[27]   Gerlach-Kristen (2001) reports significant coefficients in the range 0.24-0.28 for changes in the three-months interest rate, whereas the impact on longer interest rates is smaller and insignificant.

[28]   Changes in the definition of the *SPEECH* variable had very small effects on estimates of the coefficients of the other regressors and they are therefore not reported.

[29]   If we increase the parameter d to a sufficiently large number, all non-neutral speeches become unexpected. The result in this case is quite similar to that presented in panel B of Table 5.

[30]   When the parameter d is set to a very high number (ie no adjustment for monetary policy expectations as reflected in the slope of the yield curve), the size and significance of the estimated coefficients weaken further.

Table 5

Variable	90-day bill	1-year bond	2-year bond	5-year bond
A. d = 0.005 in (9)				
SPEECH	0.008 (0.593)	0.013 (0.813)	0.014 (0.723)	– 0.005 (0.227)
lagged effect	**0.031** (2.278)	0.005 (0.322)	– 0.009 (0.472)	– 0.009 (0.446)
R^2/ R^2adj	0.390/0.348	0.326/0.280	0.356/0.312	0.465/0.428
B. d = 0.10 in (9)				
SPEECH	**0.031** (2.526)	**0.033** (2.176)	**0.031** (1.653)	0.012 (0.651)
lagged effect	0.009 (0.761)	0.021 (1.400)	0.022 (1.206)	0.022 (1.125)
R^2/ R^2adj	0.393/0.352	0.343/0.298	0.367/0.323	0.468/0.432
C. Include only speeches given within three weeks before repo rate adjustment				
SPEECH	**0.047** (1.781)	**0.076** (2.366)	0.056 (1.447)	0.030 (0.744)
lagged effect	0.034 (1.240)	0.011 (0.315)	0.052 (1.300)	0.088 (2.122)
R^2/ R^2adj	0.386/0.344	0.334/0.288	0.360/0.317	0.471/0.435
D. Impact of speeches given by the Governor before and after 1999				
SPEECH-pre99	**0.067** (2.935)	**0.047** (1.672)	0.022 (0.655)	-0.007 (0.186)
lagged effect	0.033 (1.451)	**0.050** (1.779)	0.051 (1.480)	**0.078** (2.198)
SPEECH-post99	**0.061** (2.305)	**0.105** (3.214)	**0.124** (3.136)	0.052 (1.275)
lagged effect	0.002 (0.078)	0.006 (0.187)	– 0.029 (0.720)	– 0.035 (0.821)
R^2/ R^2adj	0.410/0.365	0.362/0.313	0.383/0.336	0.477/0.437
E. Speeches with unexpected contractionary or expansionary monetary policy signals				
SPEECH-contractionary	**0.0944** (4.706)	**0.091** (3.651)	**0.116** (3.835)	**0.116** (3.736)
lagged effect	0.011 (0.557)	0.024 (0.713)	– 0.003 (0.102)	– 0.009 (0.294)
SPEECH-expansionary	– 0.002 (0.117)	0.020 (0.822)	0.001 (0.048)	– 0.031 (1.058)
lagged effect	**0.041** (2.113)	0.012 (0.500)	0.019 (0.656)	0.022 (0.736)
R^2/ R^2adj	0.433/0.389	0.360/0.311	0.389/0.342	0.494/0.455

t-values are in parentheses.

Next we restrict the analysis to speeches that were followed by a non-zero repo rate change within three weeks. In this case, the signals should be stronger since these signals were typically followed up by a corresponding policy move. In panel C, we see that this is indeed the case for interest rates up to one year. For longer maturities, this is true only in the sense that the sum of the contemporaneous and lagged coefficients increases, but these coefficients are on the other hand insignificant with one exception (a quite strong delayed effect on the five-year interest rate). Moreover, speech signals constructed in this way cannot be used in real-time analysis.

We also examine whether speeches by the Governor had a bigger impact before the introduction of collective decision-making by the Executive Board in 1999 than after. However, the evidence

presented in panel D of Table 5 provides no support for this hypothesis. Indeed, speeches given post-1999 have a larger contemporaneous impact on medium- and long-term interest rates, but if we include lagged effects the picture is not clear. We cannot reject the hypothesis of equal impact in the two subperiods using a formal F-test.

In panel E of Table 5, it is evident that unexpectedly contractionary speeches have had a much larger impact on Swedish interest rates than unexpectedly expansionary speeches. A mirror image of this result is that unexpected repo rate decreases have had a much larger impact than unexpected repo rate increase (see Table 6). Indeed, it appears that unexpected increases of the repo rate have had no effects on medium- and long-term interest rates. The observations above suggest that investors have had difficulties identifying unexpected signals in speeches about future decreases of the repo rate and therefore view repo rate decreases as a rather drastic change of policy intentions when they occur.

We do not, a priori, think that there should be any asymmetric response to repo rate increases and decreases. The estimated asymmetry is probably to some extent a small sample problem in the sense that the sample only includes five upward adjustments of the repo rate and on several occasions these adjustments were associated with substantial interest rate *reductions*. However, one cannot exclude the possibility that this reflects an asymmetric credibility effect, ie that repo rate increases lead to lower nominal interest rates thanks to lower inflation expectations but not the other way around (ie repo rate decreases lead to higher inflation expectations).[31] Another possible explanation for the asymmetry is that most of the repo rate decreases since 1996 have been against the long-run trend, ie the repo rate has been cut when its current level has been below its long-run equilibrium level. It is conceivable that such policy moves are harder to communicate, which may explain the lack of impact from speeches signalling unexpected repo rate decreases, and therefore leading to a substantial revision of monetary policy expectations when they occur.

Table 6
Impact of unexpected increases and decreases in the repo rate

Variable	90-day bill	1-year bond	2-year bond	5-year bond
REPO increases	0.571 (5.559)	0.084 (0.671)	– 0.049 (0.323)	– 0.049 (0.306)
lagged effect	– 0.100 (0.994)	0.163 (1.313)	0.155 (1.034)	0.091 (0.579)
REPO decreases	0.604 (8.052)	0.479 (5.223)	0.436 (3.946)	0.220 (1.916)
lagged effect	0.124 (1.668)	0.117 (1.285)	0.068 (0.622)	0.039 (0.342)
R^2/ R^2adj	0.413/0.368	0.363/0.315	0.385/0.338	0.474/0.433

6. Conclusions

This paper examines how various monetary policy signals from the Riksbank (the Swedish central bank) affect the Swedish term structure of interest rates. The paper extends the existing literature in two important ways. First, it relates unexpected term structure movements not only to unexpected monetary policy actions, but also to unexpected changes in other factors such as foreign interest rates, surprises in the outcome of inflation and GDP and unexpected portfolio effects. Second, the paper broadens the concept of monetary policy actions to include (in addition to the changes in the official interest rate) unexpected signals from speeches, inflation reports and minutes of monetary policy meetings.

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[31] The observation that long-term interest rates tend to decrease when the repo rate is increased can also be interpreted in terms of changed central bank preferences (see Ellingsen and Söderström (1998)).

The overall picture is that the policy variables, especially unexpected changes in the repo rate (the official instrumental rate of the Riksbank), are the most important factors behind movements at the short end of the yield curve (the nominal three-month interest rate) but they still contribute significantly (in a statistical as well as an economic sense) to movements in medium-term interest rates with maturities of one and two years. Surprises in the outcome of inflation and GDP and unexpected changes in market conditions (term premia) also had some impact on medium-term interest rates. However, the foreign interest rate is probably the most important factor in the sense that it is the dominant factor for interest rates with a maturity of two years or more.

A closer inspection of the policy variables reveals that the impact on market interest rates of unexpected changes in the repo rate declines as the maturity increases. The results are in line with the results in other papers analysing how changes in the official rate affect the term structure of interest rates. However, announcements of no change in the repo rate only affect short-term interest rates. The published inflation forecast two years ahead may have some impact on medium-term interest rates but this result should be interpreted with caution due to statistical and measurement problems. There is also evidence that the minority view as reflected in the minutes published a few weeks after monetary policy meetings affects investors' expectations concerning repo rate decisions in the subsequent meetings.

Unexpected signals from speeches appear to be as important as unexpected repo rate changes for Swedish term structure movements. Indeed, one can argue that speeches are more important in the sense that they, in contrast to repo rate changes, significantly affect the long-term (five-year) interest rate. Moreover, there is weak evidence that the impact is larger when the analysis is restricted to speeches that were followed by a non-zero repo rate change within three weeks. However, it can be misleading to compare repo rate changes and speeches as separate policy variables without taking the interaction between them into account. As an example of this interaction, it is shown that speeches signalling repo rate increases had a far stronger impact than speeches signalling repo rate decreases. Consequently, unexpected decreases in the repo rate had a much stronger impact than repo rate increases.

Finally, one should recall that there is an implicit and fundamental role for the repo rate in the sense that other channels for signalling future monetary policy intentions would be useless if there were no repo rate (or other instrument) that could implement these intentions. This does not, however, alter the main conclusion of this paper, namely that central bank communication is an essential part of the conduct of monetary policy - an aspect that should be examined further in future research.

Appendix: Description of data

Interest rate data

With the exception of the repo rate, which is expressed as a simple annual rate, interest rates are continuously compounded zero coupon rates estimated with the extended Nelson-Siegel method (see Svensson (1995)). Interest rates obtained in this way are displayed in Figures A1 and A2.

Figure A1
**Swedish (SE) and Foreign (FOR) zero coupon interest rates**
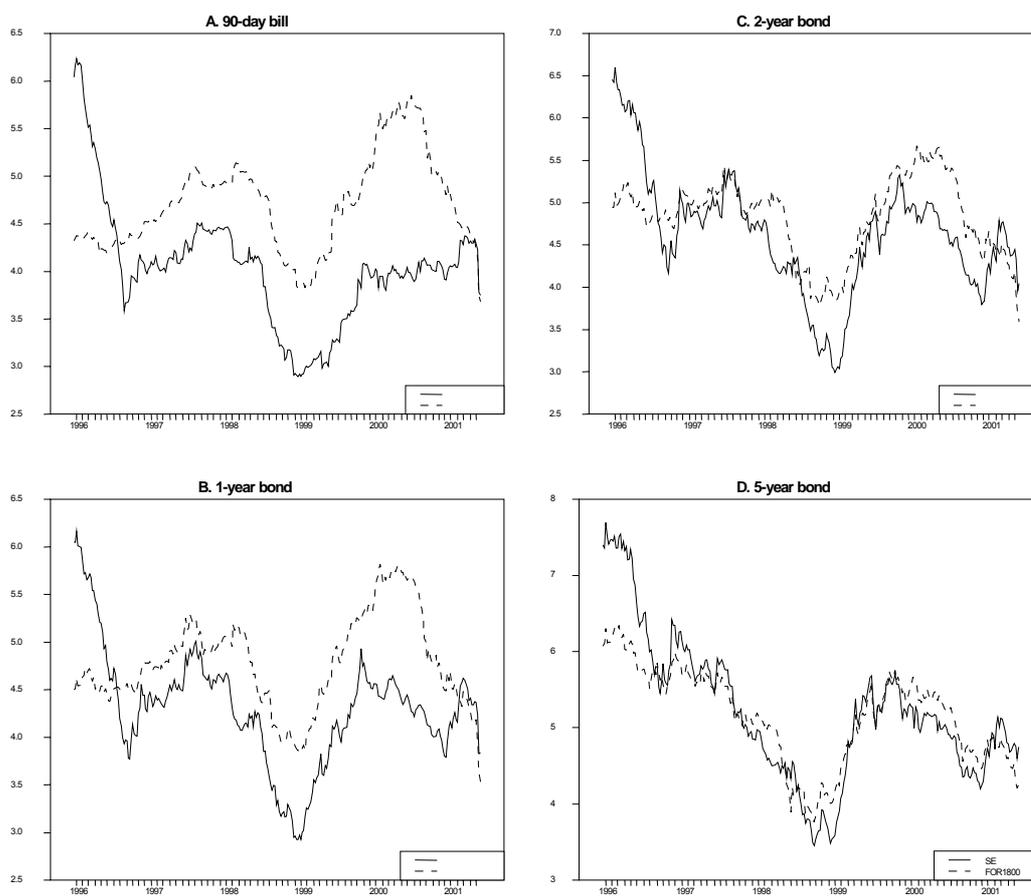
Figure A2
Repo rate and 10-year forward interest rate differential
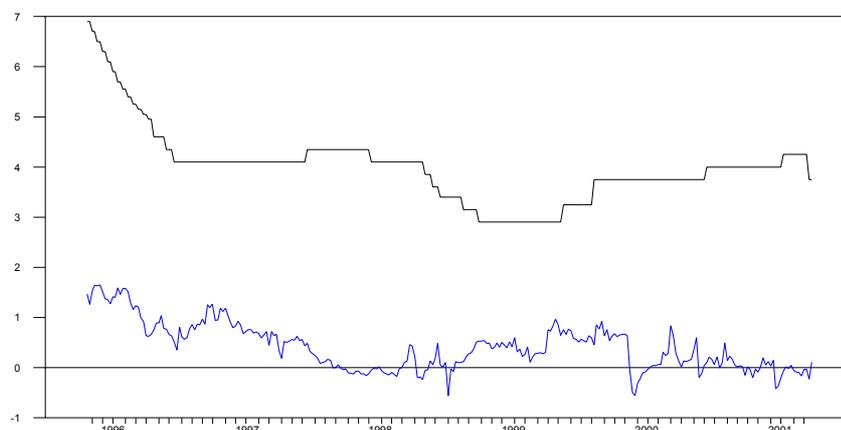
Table A1

Speeches and quotes with monetary policy content

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
1996-04-19	Urban Bäckström	Sweden's economy and monetary policy; Handelsbanken Seminar in New York	– 1	"All in all, this background suggests that there may be some scope for a further easing of interest rate policy. The real economic trends and the related outlook for future inflation will provide guidance in the task of assessing how large this scope may be. This assessment starts from sustained confidence in Sweden's economic policy, measured in terms of inflation expectations and exchange rate movements, viewed over a somewhat longer period."
1996-05-09	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance, Stockholm	– 1	"Regardless of which of the two alternatives for the real economy proves most probable, the Riksbank considers that there may continue to be some room for repo rate reductions. But the room for manoeuvre is contingent on the alternative that materialises, on the attendant inflation outlook, and on the confidence in economic policy."
1996-06-03	Urban Bäckström	Monetary policy perspective; Monetary Policy Forum, Stockholm	– 1	"The Riksbank's own assessment of the outlook for inflation in the coming years, which includes an appraisal of tendencies in the real economy, likewise indicates that the possibility of fulfilling the inflation target is good. Under these circumstances, therefore, there may continue to be some scope for easing the monetary stance."
1996-08-15	Urban Bäckström (18)	Interest rate corridor lowered 0.5 percentage points; Stockholm	– 1	"During 1996 the repo rate has been lowered comparatively quickly. The pace of the Riksbank's recent cuts has been somewhat slower. It is essential that the conditions for future monetary policy are carefully analysed in the light of incoming information. There may still continue to be some room for easing the monetary stance."
1996-10-09	Lars Heikensten	Monetary policy; autumn conference arranged by SNS (Centre for Business and Policy Studies)	– 1	"Our assessment from the middle of September, which still stands, was that the available information pointed to some remaining room for cuts in the repo rate. It should not be expected, on the other hand, that in the period ahead monetary policy will follow a particular pattern. The future path will depend on new information and on how this relates to the analysis in the Riksbank's latest inflation report."
1996-10-09	Urban Bäckström	Current issues in monetary policy; Örebro	– 1	"Under these circumstances the Riksbank considers that there is a good prospect of inflation being in line with the inflation target in the coming years. The available information accordingly suggests that some room may remain for cuts in the repo rate. It should not be expected, on the other hand, that in the period ahead the Riksbank will follow a particular pattern. The future path will depend on new information and on how this relates to the analysis in the Riksbank's latest inflation report."
1996-11-07	Urban Bäckström	The current situation for monetary policy; opening remarks at hearing by the Standing Committee on Finance.	– 1	"The background to this is that while we perceive some limited room for a further lowering of the repo rate, the picture is not entirely unambiguous. We need time in which to follow and analyse incoming statistics. The conclusion to be drawn from the assessments that are made may also be an unchanged repo rate."

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
1996-11-07	Lars Heikensten	The Swedish Economy; SE-Banken in New York	– 1	"In the light of the available information, the Riksbank considers that there is still some limited room for lowering the repo rate. But the picture is not unambiguous. This means that additional time is needed to follow and analyse incoming information. The conclusion to be drawn from the assessments that are made may also turn out to be an unchanged repo rate."
1997-01-28	Urban Bäckström	Maintaining price stability; address at Handelsbanken seminar in London	0	"All in all, the picture of future inflation does not appear to have changed from the assessment in the December inflation report. The conclusion in that report - that monetary policy is relatively well balanced - therefore holds good."
1997-01-29	Lars Heikensten	Inflation and the interest rate; conference arranged by the Stockholm Chamber of Commerce and Veckans Affärer.	0	"The picture I have outlined does not warrant any change in the conclusions presented in the December inflation report. Our main scenario suggests that at present the monetary stance is relatively well balanced."
1997-04-30	Urban Bäckström	Sweden's economy and monetary policy; New York	0	"The conclusion in the latest inflation report was that monetary policy is well balanced. That conclusion still holds true."
1997-05-14	Urban Bäckström	The Swedish economy; Skånska Sparbanks-föreningen	0	"The repo rate was lowered most recently last December. Since then we have frequently declared that the monetary stance is well balanced. My message today is the same. On the whole, economic tendencies confirm the picture in the Riksbank's latest inflation report. So at present we see no need to alter the repo rate."
1997-05-15	Lars Heikensten	The economy and monetary policy; Real-Estate Day, Grand Hotel, Stockholm	0	"The repo rate was lowered most recently last December. Since then we have frequently declared that the monetary stance is well balanced. This still applies."
1997-05-15	Urban Bäckström	The current situation for monetary policy: opening remarks to the Standing Committee on Finance	0	"The repo rate was lowered most recently last December. Since then we have frequently declared that the monetary stance is well balanced. This still applies. At present the Riksbank sees no need to alter the repo rate."
1997-06-15	Lars Heikensten	The economic situation; Centre Party Economic Seminar, Haparanda	0	"The conditions for monetary policy in the years ahead will then be improved and greater freedom of action will be created for economic policy in the longer term."
1997-10-15	Lars Heikensten	Inflation and the interest rate; Sweden Financial Forum, Örebro	0	"The overall assessment in the inflation report is that the monetary stance is well balanced. Today there is no reason to modify that conclusion. In the past month there has been no appreciable change in the outlook for inflation."

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
1997-10-22	Lars Heikensten	Monetary policy; autumn conference arranged by Centre for Business and Policy Studies, Stockholm	1 (0)	Part 1: "As activity in the economy strengthens and the monetary policy perspective is moved forward in time, monetary policy has to be gradually adjusted so that instead of giving a certain expansive effect, it has a more neutral effect on the economy." Part 2: "Most indications are that the level of activity and resource utilisation has risen further during the autumn. However, according to the Riksbank's assessment, there is still available capacity to meet an upswing. Therefore our assessment is that monetary policy at present is well balanced."
1997-10-23	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance	1	"As economic activity becomes stronger and monetary policy adjusts its sights on the future picture, the Riksbank's monetary stance will have to gradually move away from its current expansionary position. The timing of such a move has to be assessed in the light of new information and today one cannot say when it will happen."
1997-11-19	Urban Bäckström	Sweden's economy and monetary policy; Swedish Shareholders' Association, Stockholm	1	"From what I have said about demand, resource utilisation and other factors, it is clear that some time in the future monetary policy will have to be given a somewhat less expansionary direction."
1998-01-27	Urban Bäckström	Inflation and the interest rate; Stockholm Chamber of Commerce and Veckans Affärer	0	"The conclusion is that at present there is no reason to alter the repo rate."
1998-03-12	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance	0	"All in all, in the inflation report the Riksbank concluded that the repo rate should not be altered at present. With the uncertainties in the assessment, however, there are strong reasons for appraising the construction of monetary policy continuously as new information becomes available. Since the presentation of the inflation report, some new statistics have been produced. They do not motivate an altered conclusion about the monetary stance."
1998-03-21	Lars Heikensten	Inflation and monetary policy; Swedish Shareholders' Association, Trelleborg	0	"The conclusion in the latest inflation report was that the repo rate should not be altered at present but that a cautious tightening would probably be considered in the year ahead. The information that has been obtained since the publication of the inflation report does not alter that conclusion."
1998-05-27	Lars Heikensten	Economic policy and inflation; Meeting of Almega-affiliated employers' associations, Stockholm	– 1	"With the bright inflation prospects and a strict interpretation of the Riksbank's rule for monetary policy decisions, today there may even be grounds for considering a minor downward repo rate adjustment. What the Riksbank now has reason to consider is whether such an adjustment would lead to good conditions for stable economic development in the future."

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
1998-08-25	Urban Bäckström	The present situation; Näringslivets Fonds annual meeting	− 1	"Some new information that has been obtained during the summer does not appreciably alter the picture we painted in June. If anything, the statistics on overall real economic activity and inflation point more in the direction of a future inflation tendency that is weaker than in the main scenario in our June report, though in that case the revisions would be only marginal."
1998-10-07	Urban Bäckström	The Swedish economy; Svenska Handelsbanken Seminar, New York	0	"Inflation prospects and the future path of monetary policy accordingly depend on two - contrary - factors: on the one hand, the international economic trend could be weaker than we have counted on and thereby lead to lower inflation; on the other, a sustained weak exchange rate that has no counterpart in a weaker real economy could generate increased inflationary pressure. Our monetary policy conclusion is that we will go on analysing the course of events and appraise monetary policy continuously in the light of new information. Hopefully, the analysis in the inflation report should give an indication of our line of reasoning about the inflation outlook in Sweden and the future path of monetary policy that is as clear as possible in the global economy's present state of uncertainty."
1998-10-14	Lars Heikensten	Monetary policy; autumn conference arranged by Centre for Business and Policy studies	0	"At present there are no grounds for altering the direction of interest rate policy."
1998-10-20	Urban Bäckström	Monetary policy during financial unrest; Swedish Bond Promotion	0	"The monetary policy conclusion is that we must keep a close watch on the real economy, the financial system and the financial markets. At present we are waiting with a change in the repo rate but that decision may need to be altered in time as the picture becomes clearer."
1998-11-13	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance, Stockholm	− 1	"The course of the Asian crisis and its contagious effects in the industrialised countries is having a larger impact than we counted on earlier. I cannot rule out the possibility that in order to fulfil the inflation target, further adjustments of the monetary stance will be called for in the same direction as recently. A weaker development in the rest of the world also affects conditions in Sweden."
1999-01-22	Lars Heikensten	The new currency and the Swedish economy; Swedish Shareholders' Association, Stockholm	− 1	"Since the publication of the December report, international economic activity can hardly be said to have changed appreciably for the better. […] The economic statistics for Sweden suggest that industrial activity may go on weakening. [….] The assessment of future inflationary pressure has to take these and other factors into account. At the same time, the downward path of market interest rates in recent months represents a demand stimulus further ahead."
1999-02-02	Urban Bäckström	The krona and the interest rate; Stockholm Chamber of Commerce and Veckans Affärer	− 1	"Thus, the international outlook can hardly be said to have improved since the publication of the December report and there still seem to be risks of a development that is weaker. […] The Executive Board's monetary policy discussion on 11 February will thus focus to a large extent on assessing global economic prospects and their consequences for Sweden's economy. "

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
1999-03-25	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance, Stockholm	– 1	"The conclusion from the Riksbank's inflation forecast is that, even when transitory effects from changes in indirect taxes, subsidies and interest rates are disregarded, the rate of inflation 12 to 24 months ahead will be below the Riksbank's target. Moreover, as I just said, the risk of lower inflation compared with the main scenario is greater than the upside risk."
1999-09-01	Urban Bäckström	The economic situation in Sweden; Föreningsspar-banken, Ulricehamn	0 (1)	"In my opinion, there is no reason as yet to reduce the expansionary effect on the Swedish economy that monetary policy is currently exerting. A monetary policy adjustment will indeed be called for at some time in the economic upswing but I still see its timing as an open question."
1999-10-06	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance, Stockholm	1	"Thus, there are still no signs of more widespread shortages that might generate unsettling inflationary impulses; but the risk spectrum has shifted. Moreover, the situation can change at short notice and the Riksbank has to be alert to this. We must be ready to take preventive action."
1999-10-12	Lars Heikensten	Monetary policy and the new Executive Board; autumn conference, Centre for Business and Policy Studies, Stockholm	1	"In connection with the publication of the inflation report we made it clear that the repo rate will need to be increased in the future if there is no new information that clearly alters the perspective. Even if inflation expectations continue to be low and there are certain signs that the economy is functioning more efficiently, the growth rate will have to be brought into line with the long-term potential. That we shall do in good time. We can thereby contribute to good, stable growth in the Swedish economy for a long time to come."
1999-10-25	Lars Heikensten	Competition, trade and inflation; Örebro Association of Building Contractors	1	"The inflation report earlier this month allowed for the effects of increased competition and so on that we could identify. So the Riksbank's conclusion in connection with the publication of the report - that the repo rate will need to be increased if nothing unforeseen happens - holds."
1999-10-26	Lars Heikensten	Economic conditions for wage formation; National Institute of Working Life, Stockholm	1	"At the same time, it is important that current assessments and policy are discussed continuously. Along with most other observers, we now count on an acceleration of inflation in the coming years. Assessments of the rate at which inflation will move up may vary, of course. But when the underlying rate of inflation is 1.8%, it is obvious that a repo rate increase ought not to wait particularly long, given that nothing unforeseen alters the economic assessment. Timely action creates the best conditions for a stable development with a longer upward phase."
1999-12-01	Lars Heikensten	Repo rate increase reconfirmed by new information; Swedish Shareholders' Association in Folkets Hus, Stockholm	1 (0)	"The new information since then strengthens my conviction that the interest rate increase was needed. If the economic upswing continues as expected, further interest rate increases will be called for in order to adjust growth to the rate that the Swedish economy can maintain with a continuation of low inflation. There are reasons for returning to this after the turn of the year."

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
2000-03-14	Kerstin Hessius	Controller Congress 2000	1	"Growth prospects in Sweden at present are robust and during an upward cyclical phase monetary policy must be gradually realigned in a less relaxed direction but the rate at which we have to proceed is by no means self-evident."
2000-03-17	Urban Bäckström	Swedish monetary policy; Monetary Policy Forum	0	"After the latest repo rate increase in February, against this background I consider that the inflation risks still seem to be fairly balanced."
2000-03-23	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance	0 (1)	"The strong economic activity and gradually growing inflationary pressure point to a future need for a further repo rate increase. The timing and size of the increase are considered in the light of, for example, new information and its significance for the Riksbank's overall inflation assessment. Our current assessment is that in the greater part of the coming one to two years, inflation is expected to be below 2%. This speaks in favour of leaving the repo rate unchanged for now."
2000-05-18	Lars Heikensten (28)	Present inflation prospects good; Fastighetsvärlden conference in Stockholm	1	"Although inflation prospects seem to be better, in my view there is reason to count on a need for further interest rate hikes. The rate at which they may be introduced has become more uncertain. That depends, as always, on our ongoing appraisal of inflation."
2000-06-06	Eva Srejber	The role of monetary policy for growth; Förenings Spar-banken's Economics Day in Vellinge	1	"I am more concerned about what can happen with inflation and growth after the forecast period if demand increases at the rate we have anticipated. […T]he consequences that the economic development can have for macroeconomic stability and inflation beyond the forecast horizon must also be weighed in. The risk of financial imbalances now being built up when indebtedness is increasing and of inflationary pressure accumulating at the same time must in my view therefore be taken into account in the monetary policy decisions. […] The quantity of money and lending, especially to households, are for instance increasing at present at a rate which is probably not sustainable in the long term."
2000-08-22	Lars Heikensten (48)	Domestic inflation surprisingly low; Öhmans Fondkommission, Stockholm	1	"There are many indications that the growing competition, deregulations and so on may continue to aid the Riksbank in combatting inflation. But even if they do, growth above the long-term potential will presumably generate rising inflationary pressure. With our present assessment of economic activity - an average growth rate in the coming years of over 3% - it is thus natural to count on further interest rate increases."
2000-09-04	Eva Srejber	Price stability and growth; SEB Malmö	1	"Caution indicates that monetary policy should at least be neutral in the present situation. I regard monetary policy as being expansive at present. I therefore consider that the interest rate should be increased."

Table A1 (cont)

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
2000-09-06	Villy Bergström (52)	Sweden's economy performing strongly; Aktie Torget's and Almi's "Market Day" at Uppsala University	1	"This has enabled us to defer an increase in the interest rate but the fact remains that if the economy continues to grow at the same good rate, an increase will come sooner or later. Production capacity is calculated to grow at an annual rate of 2-2.5%, while demand growth is on a higher path. More and more unutilised resources are being brought into production. Sooner or later demand growth will have to be curbed."
2000-10-10	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance, Stockholm	1	"The picture of a strong upswing in the Swedish economy still holds, with rising resource utilisation in the labour market, for example. That suggests that the repo rate may need to be raised in the future."
2000-11-07	Lars Heikensten	Six monetary policy issues; Umeå School of Business and Economics	1	"For my part, there seems to be no reason at present for any appreciable change in the assessment I made in October, namely that a repo rate increase will probably be needed in the future in order to safeguard the continuation of a favourable and stable development, with low inflation and rising output."
2000-11-08	Urban Bäckström	The Swedish economy's future path; Association of Swedish Chambers of Commerce & Industry, Stockholm	1	"In the absence of a sufficient slowdown in demand, an adjustment to the long-term growth path will need to be achieved with interest rate increases by the Riksbank. […] Consideration will also have to be paid, of course, to the inflation risks associated with the high price of oil and the high dollar rate. These were some of the risks we highlighted in the October inflation report."
2000-11-17	Lars Heikensten	Monetary policy autumn conference; Centre for Business and Policy Studies, Stockholm	1	"Still, there are now many indications that resource utilisation is relatively high and will go on rising. That implies that, little by little, inflationary pressure will grow. […] Although it is still too early to specify when, there will presumably be grounds for increasing the repo rate in the future."
2001-11-21	Villy Bergström (74)	Conflicting trends in the Swedish economy; Swedish Shareholders' Association in Örebro	1	"Demand is still growing more quickly than long-term sustainable growth, which means that available resources are being utilised. If the increase in demand continues at a rapid rate, sooner or later inflation will begin to rise and force increases in interest rates. However, the growth in demand is probably on the verge of slowing down somewhat."
2000-11-28	Urban Bäckström	The Swedish economy; Swedish Shareholders' Association, Stockholm	1	"To some extent, therefore, the situation for monetary policy has changed. That is also why I began by saying that the time will soon come to raise the repo rate. Not because I have dramatically revised my assessment of inflation prospects but rather because resource utilisation is still rising and a shift can be discerned in the risk spectrum."
2000-11-28	Villy Bergström (75)	The economic scope for wage increases; seminar in Industrihuset organised by the Mediation Institute, Stockholm	1	"However, considering the strong development in demand we anticipate for the coming two years, the signs of bottlenecks and labour shortages will probably increase and resource utilisation will become more strained. It will probably also be apparent in the form of some upward pressure on prices and wages. Sooner or later, the Riksbank will have to increase the rate if a spontaneous slowdown does not occur."

Date	Speaker (number of press release)	Title and place of speech	$D^{sign}(t)$	Quote
2001-02-28	Villy Bergström	The Riksbank's role in the economy; Swedish Shareholders' Association, Jönköping	0	"It is still too early to say anything about the conclusions for monetary policy that can be drawn from this reasoning about future cyclical developments. The Riksbank's overall assessment will be included in the next inflation report on 27 March. There will then be a clearer basis for assessing whether resource use is expected to be under such strain that a more stringent policy is required or whether the cyclical outlook has weakened so much that stimulation is called for. One thing is clear, however. Downward adjustments of growth assessments mean that the large number of interest rate increases that most analysts expected during the spring will hardly be necessary to keep inflation on target!"
2001-03-27	Urban Bäckström	The current situation for monetary policy; Standing Committee on Finance	0	"All in all, however, the Executive Board of the Riksbank considers that the spectrum of risks is asymmetric, so that inflation somewhat below the main forecast is more probable than a higher rate. With the risks taken into account, inflation in the coming years is forecast to be around two tenths of a percentage point below the targeted level of 2%. At the same time, the margins are so small that we have decided not to adjust the repo rate at this time."
2001-06-14	Urban Bäckström	Currency interventions cannot be ruled out; Inter-Alpha's Steering Committee Press release no 38	71	"The weak exchange rate at present is a deviation from the path in the main scenario that served as the basis for the latest inflation report. This means that if the krona remains weak for a longer period, there may be a risk of inflation being higher one to two years from now. If there are grounds for believing that the krona will continue to be weak - and nothing else happens to alter inflation prospects - that will have consequences for monetary policy."
2001-06-15	Lars Heikensten	The krona has shifted the risk spectrum; Trevises Economic Club in Malmö	1	"If the exchange rate were to remain weak and nothing untoward happens in other respects, it would have consequences for monetary policy."

Note: $D^{sign}(t)$ = 1 (–1) implies that the quote is interpreted as indicating a forthcoming tightening (easing) of the monetary policy stance by the Riksbank, whereas 0 indicates a neutral signal concerning coming monetary policy moves. Alternative values for the dummy variable are provided within parentheses for some speeches, as discussed below. The following principles have guided the assignment of values for the dummy variables. (i) If a general need to increase (decrease) the repo rate is expressed and/or if there are judgments about inflation prospects that clearly imply the need of a future increase (decrease) of the repo rate, then the dummy variable is assigned the value 1 (-1). (ii) If the speech does not signal an adjustment of the repo rate in a specific direction, the dummy variable takes the value zero. (iii) If a need for a repo rate adjustment is accompanied with a clear declaration that the repo rate does not need to be adjusted in the near future, the dummy variable takes the value zero. This is the reason why the speeches given on 21 March 1998, 1 September 1999 and 23 March 2000 are judged to be neutral even if the last two of these speeches can be viewed as borderline cases where a tightening signal is also possible. Another borderline case is the speech given on 1 December 1999, where it is clear that a repo rate adjustment not will occur before the turn of the millennium. Since there are technical rather than economic grounds for this position, we assign a tightening signal even if a strict application of principle (iii) may suggest a neutral signal. (iv) If several speeches are given during the same week, then an overall assessment is made and the speeches are given a common value which also constitutes that week's value of the variable $D^{sign}(t)$ (only one speech signal per week is allowed). Principle (iv) explains why the speech given on 22 October 1997 is given a value of 1 even if part 2 of that speech calls for a zero value according to principle (iii). Taking the speech given on 23 October 1997, we make the overall assessment that the signals from speeches given that week indicate in future increase in the repo rate. Finally, we have examined alternative characterisations of the borderline speeches mentioned above with no significant changes of the results.

Table A2

CPI and GDP news releases with unexpected component

Date	CPI	Unexp CPI	GDP	Unexp GDP
1996-04-15	0.50	0.20		
1996-05-13	0.30	– 0.20		
1996-07-15	– 0.40	– 0.20		
1996-09-16	– 0.50	– 0.50		
1996-10-14	0.60	– 0.30		
1996-10-21			1.40	– 0.30
1996-12-16	– 0.20	– 0.10	0.80	– 0.70
1997-01-20	– 0.20	0.10		
1997-02-24	0.20	– 0.20		
1997-03-17			1.80	0.10
1997-05-19	0.50	0.30		
1997-06-16			1.60	0.00
1997-07-14	0.10	0.20		
1997-08-18	– 0.20	– 0.30		
1997-10-20	0.90	0.30		
1997-10-27			1.20	– 0.90
1997-12-15	– 0.20	– 0.20		
1997-12-22			2.70	0.20
1998-01-19	– 0.10	0.10		
1998-02-23	– 0.30	– 0.30		
1998-03-09			3.30	0.90
1998-03-16	– 0.10	– 0.20		
1998-06-15	0.20	0.30	2.30	– 0.70
1998-07-13	– 0.20	– 0.10		
1998-08-10			4.20	1.20
1998-08-17	– 0.20	0.10		
1998-09-14	– 0.50	– 0.10		
1998-10-05			4.20	0.00
1998-10-19	0.40	– 0.30		
1998-11-16	0.20	0.10		
1998-12-14	– 0.30	– 0.20		
1998-12-21			3.40	0.00
1999-01-18	– 0.20	– 0.10		
1999-02-22	– 0.10	0.20		
1999-03-15			3.20	0.50
1999-04-12	0.40	0.10		
1999-05-10	0.20	– 0.30		
1999-06-14			3.60	0.20
1999-07-12	0.20	0.20		
1999-08-09			3.70	– 0.20
1999-08-30	– 0.40	– 0.30		
1999-09-27			3.20	– 0.50
1999-10-18	0.70	0.10		
1999-11-15	0.10	– 0.10		
1999-12-13	– 0.30	– 0.20		

Table A2 (cont)

Date	CPI	Unexp CPI	GDP	Unexp GDP
1999-12-20			4.10	0.10
2000-01-17	0.20	0.20		
2000-02-28	− 0.40	− 0.30		
2000-03-13	0.50	0.30	3.40	− 0.90
2000-05-15	− 0.10	− 0.30		
2000-06-19	0.50	0.20	3.00	− 1.30
2000-08-07			4.00	− 0.20
2000-08-14	− 0.50	− 0.10		
2000-09-18	0.10	0.20		
2000-10-02			4.30	0.30
2000-10-16	0.70	− 0.10		
2000-11-13	0.20	0.10		
2000-12-18	0.10	0.30	4.00	0.00
2001-01-22	− 0.10	0.10		
2001-02-26	− 0.1	− 0.1		
2001-03-13	0.40	0.20	2.60	0.00
2001-04-17	0.70	0.20		
2001-05-15	0.90	0.50		
2001-06-19	0.70	0.20	2.30	0.00
2001-07-17	− 0.10	0.10		
2001-08-14	− 0.50	− 0.20	1.40	0.00
2001-09-18	0.20	0.10		

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