

# Inflation Forecast Targeting: the Swedish Experience

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This article is an abbreviated version of a paper prepared for the seminar on Inflation Targeting in Rio de Janeiro, 3–5 May 1999, organized by the Monetary and Exchange Affairs Department of the IMF and the Central Bank of Brazil.

*In this article key points in the development of the present Swedish inflation targeting strategy are analysed. Since the implementation of the inflation target strategy began in 1993, three different phases are distinguished: the establishment of the inflation target, the communication of explicit inflation forecasts, and, finally, the introduction of distribution forecast targeting.*

In practice, distribution forecast targeting involves presenting a main scenario for future inflation, and assessments of both the degree of uncertainty in the forecast and the magnitude of the upside and downside risks in the

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**The increased credibility of the inflation target has resulted in both a lower average inflation level and a lower inflation variability.**

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main scenario in quarterly inflation reports. While inflation targeting in Sweden has been successful in reducing both inflation and private sector inflation expectations, aggregate demand as well as supply shocks and temporary factors have also exerted a downward influence on inflation in the 1990s. It is likely that the increased credibility of the inflation target has resulted in both a lower average inflation level and a lower inflation variability.

## 1. Introduction

In the long run, the inflation rate is the most important macroeconomic variable that monetary policy can affect. During recent years a broad consensus therefore

\* I would like to thank Mårten Blix, Hans Dillén, Lars Heikensten, Per Jansson, Hans Lindblad, Hans Lindberg, Eva Srejber, Lars E.O. Svensson, Staffan Viotti, Anders Vredin and seminar participants for many constructive comments. Mårten Blix and Peter Sellin provided background material for the discussion on forecast uncertainty. Martin Edlund and Hanna Widell provided research assistance. I also thank Ann-Christine Högberg for secretarial assistance. The views expressed in this paper are solely the responsibility of the author and should not be interpreted as reflecting the views of the Executive Board of Sveriges Riksbank.



has been established that price stability should be the overriding goal for monetary policy. When monetary policy is used to address short-run stabilization objectives, the long-run objective of price stability should not be compromised. Monetary policy therefore needs a nominal anchor. An inflation target can serve as such a nominal anchor, aiming at coordinating inflation expectations. As a nominal anchor an inflation target will also provide a commitment mechanism and will increase the accountability of the monetary policy authority. The inflation target communicates to the public the inflation rate the central bank is aiming at in the future. It will thus serve as a reference point against which the central bank can be judged.<sup>1</sup> The purpose of this paper is to illuminate and discuss the experience of implementing the Swedish inflation target since 1993.<sup>2</sup>

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**Monetary policy needs  
a nominal anchor.**

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The article is organized as follows. Section 2 considers the reasons for an inflation target regime. Section 3 discusses the main principles in the implementation of such a policy regime. The role of the inflation forecast and the way to deal with forecast uncertainty and transitory effects are analysed. The respective roles of the Staff and the Executive Board in the decision making process are discussed. Section 4 presents the new central bank act and its requirements on accountability and the role of the tolerance interval. Section 5 gives an overview of the implementation of monetary policy since 1993 and describes the development from implicit inflation forecast targeting (1993–1995) to explicit inflation forecasting (1996–1997) and finally distribution forecast targeting (1998 and onwards).<sup>3</sup> Section 6 discusses some preliminary results regarding the effect of inflation targeting on the economy. Section 7 concludes.

## 2. Why inflation target regime?

The fundamental reason why long-term price stability is desirable is that inflation is detrimental economically and socially.<sup>4</sup> Price stability facilitates the role of the payment system, reduces uncertainty in firms and households investment deci-

<sup>1</sup> Bernanke et al (1999).

<sup>2</sup> The evolution of the Swedish inflation target strategy is also analysed in Andersson and Berg (1995), Berg and Gröthelm (1997), Bäckström (1998), Heikensten and Vredin (1998) and Svensson (1997). The Swedish experiment of price level targeting in the 1930s is analysed in Berg and Jonung (1999).

<sup>3</sup> The term “distribution forecast targeting” was introduced in Svensson (1999d), which gives a theoretical and coherent foundation of monetary policy with price stability as the primary objective.

<sup>4</sup> A more detailed review of inflation’s negative effects lies outside the scope of this memorandum; the reader is referred, for example, to Fischer (1994).

**The central bank is in a unique position to pursue the objective of price stability.**

to create assets, such as notes, coins and bank reserves, that can be used for final payments. To a limited extent, moreover, the central bank can contribute to the stabilization of real economic activity.

In January 1993 the Riksbank specified that the objective of monetary policy is to limit the annual increase in the consumer price index in 1995 and onwards to 2 per cent, with a degree of tolerance of  $\pm 1$  per cent. This objective corresponded to the so called underlying rate of inflation when the target was announced. In 1993 as well as in 1994, monetary policy aimed at preventing the inflationary impulse which was deemed unavoidable, due to the large depreciation of the krona and changes in indirect taxes, from causing a persistent increase in inflation, that is, an increase in the underlying rate of inflation.

**In many countries the CPI tends to overestimate inflation.**

There is no clear evidence that the optimal level for an inflation target is exactly 2 per cent. There are grounds, however, for not having an inflation target that is too low. For one thing, there are indications that in many countries the CPI tends to overestimate inflation, e.g. the measurement bias. For another, an excessively low inflation target may cause problems if, as is often the case, nominal wages display downward rigidity. In the absence of any inflation, adjustments to shocks then occur to an unnecessarily large degree via labour shedding because that is the only way of cutting the total wage bill.<sup>5</sup> A final argument in favour of a positive inflation target is the fact that nominal interest rates are non-negative.<sup>6</sup>

Sweden is a member of the European Union since 1995. The primary policy objective of the new European Central Bank (ECB), which assumed responsibility for monetary policy in the euro area from the beginning of 1999, is the maintenance of price stability. Until further notice Sweden has chosen not to join the euro area. The difference between the target formulations of the ECB, with its implicit price norm of 1.5 per cent, and the Riksbank target of 2 per cent is probably small in practice and it has not led to a revision of the level of the Swedish inflation target.

<sup>5</sup> Two per cent is the borderline in Akerlof, Dickens and Perry (1996), who study the effects of downward rigidity of nominal wages.

<sup>6</sup> One per cent is the borderline in Orphanides and Wieland (1998), who examine the consequences of non-negative nominal interest rates.



The Swedish inflation target is expressed as the change in the official consumer price index. The CPI is meant to measure the price changes for total private consumption in the domestic market. The advantages of the CPI

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are well understood: it is widely used and recognized as a measure of inflation among economic agents and the general public, published monthly with a short time lag, and rarely subject to revision. Using the CPI eases communication with the general public and politicians and has educational value.

A drawback, when using headline CPI as a target variable for monetary policy, is that it contains prices that are outside the control of the Riksbank (indirect taxes and subsidies) and prices that have perverse effects on monetary policy (mortgage interest costs). Another potential problem with the use of a conventional price index is that transitory price movements in the market prices of particular goods may mask a different development of the general price level. There are commodities that historically have given rise to such one-off effects on the price level, for example oil products, food products, etc. The current role of a measure of underlying inflation, UNDEX, in the conduct of monetary policy and the issue of how to deal with transitory effects will be discussed in section 3.4 below.

When proposals have been presented by the CPI Inquiry appointed by the Swedish Government, which is scheduled to be published in the autumn of 1999, there may be occasion to consider which index of inflation should guide policy. One alternative to the CPI could be the HICP, which is being constructed under EU auspices. There may also be cause for a future assessment of monetary policy's formulation and target in the light of the move to Stage Three of EMU and the monetary policy of the European Central Bank.

## 3. The principles of an inflation target regime

### 3.1 THE INFLATION FORECAST<sup>7</sup>

The considerable lag before monetary measures affect inflation means that policy has to be forward-looking. Forecasts of central macro variables, inflation in particular, therefore play an important part. In practice, the part played by the Riksbank's inflation forecast is so vital that it resembles an intermediate target.

The main principle for implementing an inflation target regime can be for-

<sup>7</sup> For a more technical presentation see Svensson (1999b).

mulated as a simple rule of thumb: if the inflation forecast, based on an unchanged repo rate, is in line with the target at the time horizon of twelve to twenty-four months, then the monetary stance is appropriate; if the forecast is above (below) the inflation target, then the monetary stance is too expansionary (restrictive), and the repo rate should be raised (lowered) immediately or in the near future. As this rule of thumb refers to an inflation forecast with the instrumental rate unchanged, it is natural for the Riksbank to present its forecasts accordingly.

### 3.2 THE MAIN SCENARIO

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**The inflation forecasting framework imposes discipline on judgemental adjustments.**

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In order to construct the inflation forecast various econometric models are used. There is also a rule for additional extra-model information and judgemental adjustment, given the uncertainty about modelling the transmission mechanism. The inflation forecasting framework imposes discipline on judgemental adjustments, as convincing cases must be presented why pieces of extra-model information will affect inflation at the time horizon which is relevant for monetary policy.

A main scenario, and several alternative scenarios, are presented by the Staff to the Executive Board. The factors that, in addition to monetary policy, essentially determine the development of inflation are international activity and inflation, demand relative to supply, other cost shocks (effects of indirect taxes and interest expenditure) and inflation expectations.

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The forecasting round at the Riksbank culminates in a main scenario that is published in the Inflation Report<sup>8</sup>. It should be stressed that the main scenario is viewed as the most likely outcome under the assumption that the repo rate is held constant over the forecast horizon. The assumption of an unchanged repo rate is made primarily for pedagogic reasons in order to show whether or not the repo rate needs to be changed to bring inflation in line with the target. One consequence of this assumption is that the Riksbank's forecast is not directly comparable to other forecasts that typically assume some response from monetary policy.

<sup>8</sup> See for example the Inflation Report 1998:4 for a discussion of the framework for the forecast.

### 3.3 DEALING WITH FORECAST UNCERTAINTY<sup>9</sup>

However, monetary policy is not only guided by the most likely outcome, e.g. the main scenario, based on an unchanged repo rate over the forecast horizon. An assessment of the risk spectrum is also important, and in practice the mean forecast of future inflation is therefore taken into consideration, when deciding on the appropriate monetary policy stance.<sup>10</sup> In recent Inflation Reports, confidence intervals for the forecasts have been published. The Executive Board may take the properties of the whole distribution into account when setting the repo rate. This implies that monetary policy can be described as being guided by “distribution forecast” targeting. Since this is a fairly new component in the implementation of inflation targeting, there is reason to present the approach in some detail.

As indicated above, the assessment in the main scenario is the path of future inflation that is deemed to be most likely over the forecast horizon. It is based on assessments of the factors that are deemed to be important

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for how inflation will develop, such as total demand and supply in the economy, import prices and wages. Such assessments are of course associated with uncertainty. The uncertainty analysis is based on two types of assessments for each factor that is deemed to affect inflation. First, an assessment is made whether the uncertainty in the forecast is larger or smaller than the uncertainty that historically has been associated with the factor. Second, there might also be reasons to believe that the probability of outcomes above the main scenario is larger than the probability of outcomes below. This would then constitute an “upward” risk in the forecast. Correspondingly, there would be a downward risk if the probability of outcomes below the main scenario is judged to be larger than the probability of outcomes above the main scenario. In other words, it is possible for the risks to be asymmetrically distributed around the main scenario. The resulting distributions are then weighed together to an inflation-forecast distribution with weights that reflect each factor’s relative importance for future inflation.

How are these assessments made in the forecasting round? The economists at the Economics Department of the Riksbank make forecasts one and two years ahead for the factors that they are responsible for. For each assessment and forecast horizon they make a subjective judgement whether the uncertainty is the

<sup>9</sup> This section is based on Blix and Sellin (1999).

<sup>10</sup> By focusing on the mean forecast, the use of econometric models is facilitated, as such models normally produce forecasts of the mean.

**The economists at the Economics Department of the Riksbank make forecasts one and two years ahead for the factors that they are responsible for.**

same as or larger or smaller than the average historical uncertainty. A subjective assessment that departs from the historical has to be accompanied by a clear explanation – for example in the form of some indicator – that justifies it. Likewise, if the risks around the main scenario are deemed to be asymmetric, this also has to be motivated.

### *The inflation forecast distribution*

When there is a forecast in the main scenario as well as an assessment of uncertainty and risk for each factor deemed to be important for inflation this information must be weighed together in some way to determine what it implies for the inflation-forecast distribution.

The inflation forecasts from the main scenario that are published in the Inflation Reports (since 1998:2) are presented with surrounding uncertainty bands that are derived using the inflation-forecast distributions discussed here. The bands are constructed such that the probability of outcomes below the lower band and outcomes above the upper band are equal. A 5 per cent chance of being below and 5 per cent chance of being above, for example, define the 90 per cent interval.<sup>11</sup>

### *The respective role of the Staff and the Executive Board in the decision making process*

**All economists involved in the forecast meet to discuss and potentially adjust their assessments.**

The work with these assessments is initiated at the Economics Department concurrently with the main scenario. It seems natural that the forecasters of a certain factor also make an uncertainty and risk assessment for the factor. But in order to make the assessments consistent with one another, all economists involved in the forecast meet to discuss and potentially adjust their assessments so that the overall risks are congruent.

The Executive Board takes a preliminary main scenario and the picture of risk from the Economics Department's analysis as the starting point for its assessment at an early stage of the process.<sup>12</sup> The initial assessment from the Economics

<sup>11</sup> Wallis (1999) criticizes the Bank of England for not having equal tail probabilities. See also the Economist (1999). It should be stressed that the Riksbank's uncertainty bands have equal tail probabilities.

<sup>12</sup> As the present management structure has been in place for a short period of time, the interaction between the Executive Board and the Staff is still developing. See section 4 below.

Department thereby provides a concrete basis for the Executive Board's discussion. The Executive Board's conclusions may imply that the main scenario and the distribution for the inflation forecast are revised. This final assessment is presented in the Riksbank's Inflation Report, enabling the Riksbank to pedagogically communicate its view on uncertainty and (a)symmetric risk for the inflation forecast in the main scenario.

### 3.4 POLICY CLARIFICATION TO DEAL WITH TRANSITORY EFFECTS

As mentioned above, there is a limit to the ability of monetary measures immediately to counter price movements arising from some kind of shock, for instance changes in the exchange rate, indirect taxes and subsidies, raw

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materials prices, etc. Given a credible monetary policy, moreover, countering the direct effects of shocks in full is not necessarily desirable if their impact on inflation is only transitory. Such countermeasures might destabilize real economic activity. It is important, on the other hand, to try to counter – and thus to obtain information about – shocks that affect prices more permanently, and hence influence inflation expectations.

The problem of temporary influences can be managed in different ways. One possibility is to specify in advance which deviations from the CPI are acceptable. This is the method used in New Zealand. A closely related alternative is to use a measure of the underlying inflation as the target. Another possibility is to supplement the CPI by one or several measures of the underlying inflation. In Canada the objective is expressed in terms of the CPI, whereas a measure of the underlying inflation – which describes the process of inflation better – is the operational target. A “softer” variety on the same theme is to clarify how the practical policy is influenced by various measures of the underlying inflation, since it can often give a clearer picture of the process of inflation.

When the Swedish inflation target was clarified in 1999 it was modified in two respects.

The first respect concerns situations when CPI inflation in the relevant time perspective is being affected by specific factors that are judged to have no substantial permanent impact on inflation or the inflation process. A repo rate adjustment, up or

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down, affects house mortgage interest expenditure, which is a sizeable component



of the CPI. This is evidently not an effect on the CPI that the Riksbank ought to counter. Monetary policy effects of indirect taxes and subsidies can be analysed in a similar way.<sup>13</sup> Although supply shocks are more difficult to analyse, they also deserve special mention. Price movements for petroleum and other imported goods, for example, that are judged to have only transitory effects on domestic inflation, ought not to elicit monetary policy countermeasures. When policy is formulated in these situations, there may be grounds for explaining in *advance* that a deviation from the CPI target is warranted.<sup>14</sup>

In the Inflation Reports published in June and in October 1999, changes in indirect taxes, subsidies and house mortgage interest expenditure were judged to have no permanent effect on inflation. They were therefore disregarded in the formulation of monetary policy. In practice, monetary policy is currently based on an assessment of underlying inflation as measured by UNDI<sub>X</sub>.

### *Target horizon*

The second respect which required a clarification in the formulation of the inflation target is when inflation for some reason has deviated markedly from the target. This raises the question of how quickly inflation should be returned to the target rate of 2 per cent. With an inflation target strategy, it is the Riksbank's duty to construct monetary policy so that forecasted inflation at an appropriate horizon is in line with the inflation target. This *target horizon* is a forward-looking concept for how far ahead monetary policy is calibrated to fulfil the inflation target.

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**There are several grounds for preferring a longer horizon and a gradual adjustment of the monetary stance.**

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Attempts to fulfil the inflation target in the short run may prove difficult and require sharp interest rate adjustments and abrupt shifts in the monetary stance. There are several grounds for preferring a longer horizon

and a gradual adjustment of the monetary stance. Very pronounced changes in interest rates and the monetary stance are liable to generate instability in real variables, such as output, employment and the real exchange rate. With a longer horizon and a gradual policy realignment, the inflation target can be fulfilled along with some stabilization of these real variables.

<sup>13</sup> It should be noted, however, that even taxes and charges contain important information about the inflation process. Political decisions affect administered prices, e.g. for medical care; increased fees or indirect taxes may be a sign of growing pressure from public sector costs.

<sup>14</sup> It should be underscored that the question of what constitutes a transitory effect is *complex*. This is particularly evident in the case of supply shocks. To what extent do import price movements, for example, reflect transitory factors rather than international competition's more long-term consequences? This suggests that supply shocks may need to be analysed particularly closely and cited selectively as an argument for departing from the CPI target.

The choice of target horizon is very contingent on the lag with which monetary policy affects inflation, and the length of this lag is generally difficult to specify. Experience in Sweden as well as international studies suggest that the lag before monetary policy elicits its main effect is 1–2 years.<sup>15</sup>

This horizon for the main effect of monetary policy implies that policy is guided by inflation forecasts 5–8 quarters ahead. The target horizon, however, is not necessarily the same as the horizon for the main effect of monetary policy. The target horizon for meeting the inflation target *normally* is 5–8 quarters ahead. However, in the event of a sizeable deviation from target, there are always grounds for weighing the ambition to achieve a rapid return to target against its consequences for the real economy.<sup>16</sup>

## 4. Accountability

### 4.1 THE NEW CENTRAL BANK ACT

The amendments to the Riksbank act which came into force 1 January 1999 were designed to ratify the Swedish central bank's independence from political influence, establish a primary objective for monetary policy (price stability) with a legal backing and ensure accountability on the part of the Riksbank for achievement of its policy objective.<sup>17,18</sup>

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The responsibility for monetary and exchange rate policies was transferred to a new body, an Executive Board. The Executive Board has six full-time members of which one is chairman and Governor of the Riksbank.<sup>19</sup> Their term of office is six years, and they will be up for election on a rolling basis. The Governing

<sup>15</sup> For references, see Bernanke and Gertler (1995) and Gerlach and Smets (1994).

<sup>16</sup> See Heikensten and Vredin (1998) for a discussion of flexible inflation targeting.

<sup>17</sup> With regard to exchange rate policy, the Government will have the authority to decide, after consultation with the Riksbank, on the choice of exchange rate regime. The Riksbank will have responsibility for the implementation of the exchange rate regime adopted by the Government. This means, for example, that the Riksbank will decide on the central rate and the band width in a fixed exchange rate system and on the practical application of policies in a floating rate system.

<sup>18</sup> The first step towards making the Riksbank more independent was taken already in 1988. For a discussion of the Swedish debate, see Heikensten and Vredin (1998).

<sup>19</sup> Also having constitutional status is a provision to the effect that no public authority will be allowed to issue instructions to the Riksbank in matters relating to monetary policy. A corresponding provision is included in the Riksbank Act. No member of the Executive Board is allowed to seek or accept instructions in monetary policy matters.

Board retains general, supervisory functions and appoints the members of the Executive Board.<sup>20</sup>

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**Proposals aiming to ensure transparency and Riksbank accountability were also laid down in law.**

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Proposals aiming to ensure transparency and Riksbank accountability were also laid down in law. The Riksbank is required to make a written report on monetary policy to the Parliamentary Standing Committee on Finance

at least twice a year (Riksbank Act, Ch. 6, Art. 4). The Riksbank considers that these reports should coincide with its Governor's appearance before the Standing Committee. After the legislation went into force the Riksbank has clarified the role of the tolerance bands in this context. It also started the publication of the minutes of the Executive Boards monetary policy meetings, with a publication lag of 6–8 weeks. This publication lag will be reduced during the second half of 1999.

#### 4.2 THE ROLE OF THE TOLERANCE INTERVAL

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**Inflation may lie outside the interval for a certain percentage of time.**

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As monetary policy cannot control future inflation exactly, inflation will fluctuate around the targeted rate. There are several grounds

for a tolerance interval. A tolerance interval may be useful in the assessment of monetary policy by the body to which the central bank is accountable. It can also be seen as a way for the Riksbank to explain that it is not capable of keeping inflation exactly on target. The width of the tolerance interval can also be regarded as an indicator of inflation's presumed variability. In other words, the degree of tolerance can be interpreted as a confidence interval in the statistical sense, implying that inflation may lie outside the interval for a certain percentage of time.

Two measures have been taken recently aiming at clarifying the role of the tolerance band. First, after the new central bank legislation went into force 1 January 1999, the assessment of monetary policy by the Riksdag has been clarified. Certain routines have been prescribed when inflation moves outside the tolerance interval. In connection with the Governor's first appearance before the Riksdag each year the Riksbank intends to account for results of its policy. In this context the tolerance interval will have an operational function. The Riksbank has an-

<sup>20</sup> It is not possible to separate a member of the Executive Board from his position unless he no longer fulfils the conditions required for the performance of his duties or if he has been guilty of serious misconduct.

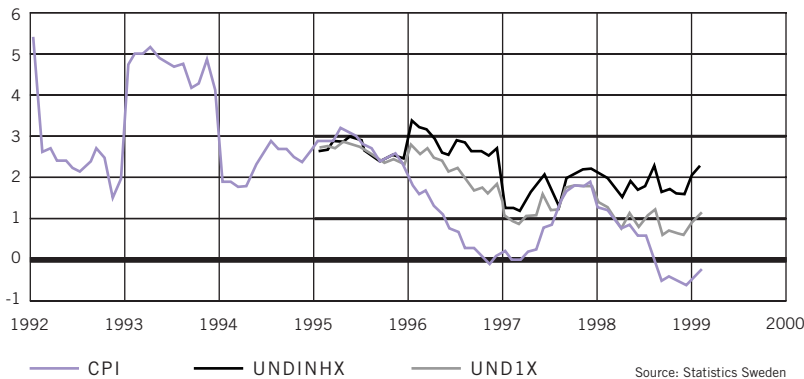
nounced that whenever CPI inflation is outside the tolerance interval, it will present an explanation of the reasons.<sup>21</sup>

Second, in order to specify the statistical uncertainties in the inflation forecasts, the Inflation Report, since mid-1998, includes a table showing the probabilities of inflation of being inside the tolerance interval inflation twelve and twenty-four months ahead, assuming unchanged monetary policy stance. In March 1999, for example, the probability of the twelve-month CPI inflation being inside the tolerance band in March 2001 was calculated at 50 per cent, while there was a 41 per cent probability of inflation being below 1 per cent and a 9 per cent probability of inflation being above 3 per cent. It should be noted that the assumption of unchanged interest rates results in a wider confidence interval than if an endogenous response of monetary policy is assumed.

**The assumption of unchanged interest rates results in a wider confidence interval than if an endogenous response of monetary policy is assumed.**

Since the inflation target came into force at the beginning of 1995, the annual increase in consumer prices has averaged 1.1 per cent. This average outcome is below the targeted figure but inside the tolerance interval. In the same period the average underlying rate of inflation has been somewhat higher: 1.7 per cent in terms of UNDIX and 2.3 per cent in terms of UNDINHX (diagram 1). This shows that during these four years, transitory downward effects on inflation have been stronger on the whole than the upward effects.

**Diagram 1. CPI and Underlying Inflation. Per cent**



<sup>21</sup> This clarification has been inspired by the rule requiring the Bank of England, as soon as inflation is outside a tolerance interval, to write an open letter explaining why inflation is not on target. It was suggested by Heikensten and Vredin (1998).

### 4.3 THE PUBLICATION OF MINUTES

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**One way to facilitate effective monitoring of the central bank is to publish the minutes of the decision making body.**

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Evaluation of monetary policy decisions requires knowledge about the analysis and discussion preceding the decisions. One way to facilitate effective monitoring of the central bank is to publish the minutes of the decision

making body.

Moreover, a brief account of the grounds for decisions are presented in a communiqué on the day after the meeting.

There may be situations in which members of the Executive Board reach divergent conclusions. That will necessitate a more formal voting procedure. The outcome will be recorded in the minutes. No mention of a vote indicates that the Board agreed unanimously; otherwise, members with dissenting opinions will be named.

The first minutes from a monetary policy meeting (the meeting on 12 February were published on 6 April.<sup>22</sup> The outline of the minutes is similar to the structure of the Inflation Report. The first section covers international activity, interest rates and exchange rates, monetary aggregates, demand and supply, prices, transitory factors and inflation expectations. The second section gives the Executive Board's assessment of inflation prospects in the main scenario and the risk spectrum for the formation of monetary policy. The third section presents the discussion and assessment of the monetary policy situation. The decision is finally presented in the fourth section.

## 5. The implementation of monetary policy in Sweden since 1993

### 5.1 INTRODUCTION

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**Since the announcement of the inflation target, longterm inflation expectations have fallen from above 4 to 2 per cent.**

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The implementation and communication of monetary policy since 1993 can be divided into three phases. In the first phase, 1993–1995, the inflation target strategy was announced and established. During the first

two years of this period the objective was to prevent the underlying rate of inflation to increase. The publication of a report "Inflation and inflation expectations

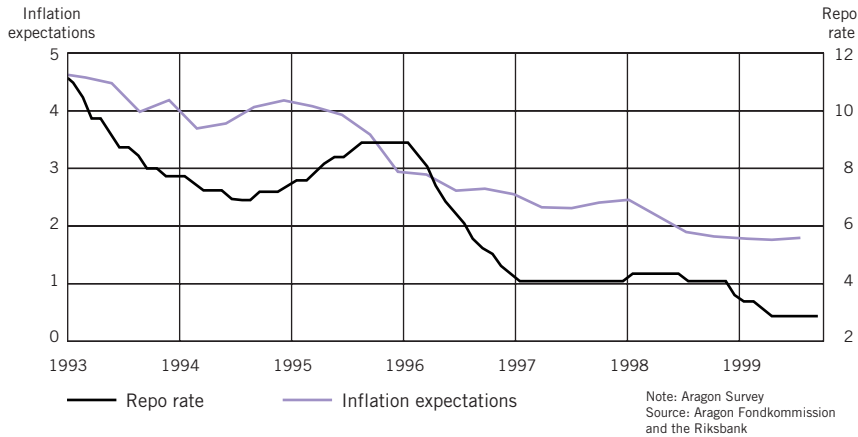
<sup>22</sup> See Sveriges Riksbank's web page: [www.riksbank.se/eng/](http://www.riksbank.se/eng/)

in Sweden” began. During this phase bond investors’ long-term (five-year) inflation expectations fell from above 4 per cent to 3 per cent, that is to the upper bound of the tolerance interval (diagram 2). At the end of this phase the credibility of fiscal consolidation increased. In the second phase, 1996–1997, inflation forecast targeting was introduced. The Riksbank’s own inflation forecasts were given more weight in communication of monetary policy. Forecasts for future inflation were gradually introduced in the reports which changed names to “Inflation Reports”. During this phase bond investors’ inflation expectations five years ahead fell from 3 per cent to around 2 per cent, implying that the inflation target gained credibility. In the third phase, 1998, “distribution forecast” targeting was introduced and explicit paths for future inflation were published, surrounded by uncertainty intervals. Uncertainty bands around the inflation serve to illustrate that the inflation forecast is inherently uncertain. Long-term inflation expectations during this period were slightly below 2 per cent, signalling the credibility of the inflation target strategy.

### 5.2 ESTABLISHING THE INFLATION TARGET STRATEGY AND IMPLICIT INFLATION FORECASTING

The move to a flexible exchange rate in November 1992 did not entail any change in the principal objective of monetary policy, price stability. This was made clear by the Riksbank when announcing the inflation target in January 1993.

**Diagram 2. Repo rate and long-term inflation expectations (5 years). Per cent**



Since monetary policy measures show their full effect on the economic activity and price developments only after a year or two, monetary policies must be far sighted in their direction. The Riksbank started to employ a number of indicators of economic activity and anticipated future inflation. The publication "Monetary Policy Indicators" in June 1993 summarized the work during the first six months of inflation targeting. The first publication of a report providing an account of the Riksbank's analysis of current inflationary pressure and inflation expectations occurred in October 1993.

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**Excessively large steps might cause inflation expectations to rise.**

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The Riksbank lowered the instrumental rate from November 1992 to June 1994 by more than 5 percentage points, to 6.92 per cent (diagram 2). This was done mostly in small steps; as the Riksbank considered that, with the new framework, excessively large steps might cause inflation expectations to rise or lead to the market misunderstanding the Riksbank's intentions.

Inflationary pressure grew during the spring and summer of 1994. This prompted the Riksbank to start raising the repo rate in August 1994; a series of increases, totalling 2 percentage points, brought the rate up to 8.91 per cent in the summer of 1995. The Riksbank was forward-looking and based its monetary policy on inflation forecasts. In August 1994, the internal inflation forecast for the annual increase of CPI inflation in 1995 was 3.8 per cent, given a constant weak exchange rate. In order to bring inflation down to 3 per cent an appreciation of the krona of around 2–4 per cent per quarter was deemed necessary.

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**In October 1994 the Riksbank stated that monetary policy indicators showed that the inflation target would be threatened.**

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However, during this period the Riksbank did not publish inflation forecasts. In the reports "Inflation and Inflation Expectations in Sweden", published three times a year, monetary policy adjustments were motivated in a more general way. In October 1994, for example, the Riksbank stated that monetary policy indicators showed that the inflation target would be threatened. It was pointed out that firms' and investors' inflation expectations were not in line with the target and that inflation forecasts by outside observers indicated that they did not expect the inflation target to be met.

### 5.3 EXPLICIT INFLATION FORECAST TARGETING

CPI inflation in 1995 turned out to be just under 3 per cent, and estimates of the underlying rates were about 2 per cent. The difference mainly reflected tax changes but also had to do with increased house mortgage interest costs. The re-



po rate increases, however, were of little consequence for mortgage interest costs, which largely rose in connection with the upward shift in bond rates.

Slackening economic activity in central Europe led to a slowdown in Sweden in the second half of 1995. Partly for this reason, the Riksbank successively adjusted the infla-

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**Increased confidence in the economic policy during 1996 was evident.**

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tion forecast down. The Riksbank saw a possibility of lowering the repo rate in January 1996. The internal inflation forecast for 1996 and 1997 was somewhat above 2 per cent in terms of headline CPI. Indirect taxes were assumed to contribute around 0.2–0.4 percentage points to the annual increase in CPI. However, this internal forecast was based on a growth assumption on the high side for 1996 (around 2 per cent), and it became more and more clear that domestic and international demand were becoming weaker than expected. Therefore the internal discussion focused on the probabilities for alternative growth and inflation scenarios, giving more weight to a scenario in which the economy would grow at less than its potential rate in 1996. Increased confidence in the economic policy during 1996 was evident from an appreciation of the krona and falling market interest rates.

By December 1996 the repo rate had been lowered from 8.91 to 4.1 per cent. The monetary policy easing was motivated in the reports. The report changed name to “Inflation Report” in March 1996. From March 1996 and onwards the Riksbank publishes four “Inflation Reports” per year. Inflation forecasts were gradually introduced in the reports.

Inflation turned upwards again during the autumn of 1997. A marked economic recovery was evident in more and more sectors.

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**During the autumn of 1997, a marked economic recovery was evident in more and more sectors.**

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Considering that activity was becoming stronger and the monetary stance still was expansionary, inflation was expected to rise in the years ahead. In the Inflation Report published in December 1997, graphs showing forecasts for future inflation and uncertainty margins were published for the first time. CPI inflation by the end of 1999 was expected to be around 2.5 per cent, while the underlying rate of inflation (UND1) was expected to be above 2.5 per cent. It was concluded that monetary policy had to be given a less expansionary stance. The repo rate was increased by 0.25 percentage points to 4.35 per cent. The report was published when wage negotiations were held in Sweden and it was felt important to stick to the inflation target regime in a credible way.



**Diagram 3. Distribution forecast targeting**

Inflation Report	June 1998	September 1998	December 1998	March 1999
End of forecast horizon	June 2000	September 2000	December 2000	March 2001
Forecast of 12-month CPI inflation	1.6	1.9	1.4	1.4
Forecast of 12-month underlying inflation	1.8	2.0	1.8	1.8
Uncertainty in the inflation assessment	Normal	Above normal	Slightly above normal	Slightly above normal
Risk assessment	Downside risks dominate	Symmetric	Downside risks dominate	Downside risks dominate

1. At the end of the forecast horizon.
2. UND1 in June 1998 and September 1998. UND1X in December 1998 and March 1999. (UND1 was calculated by the Riksbank, whereas UND1X is calculated by Statistics Sweden.)

#### 5.4 DISTRIBUTION FORECAST TARGETING

As mentioned above, distribution forecast targeting involves presenting a main scenario for future inflation, and assessments of both the degree of uncertainty in the forecast and the magnitude of the upside and downside risks in the main scenario.

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**In the June 1999 Report a construction of the uncertainty interval, based on the two-piece normal distribution, was introduced.**

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In the June 1999 Report a construction of the uncertainty interval, based on the two-piece normal distribution, was introduced, showing the perceived probability of inflation being inside a particular interval in some future period. The overall inflation assessment accordingly pointed to a rate of inflation that was somewhat lower than in the main scenario. This was reflected in the uncertainty interval, which, instead of being symmetric around projected inflation, was somewhat broader on the downside, reflecting uncertainty regarding the effects of the Asian crisis (diagram 3). It was concluded that the monetary conditions could be moved in a somewhat more stimulatory direction. The repo rate was cut by 0.25 percentage points to 4.1 per cent.

In the September 1998 Report the main scenario presupposed that the weakening of the krona by almost 4 per cent since the June report was temporary and mainly a consequence of short-term market reactions generated by the stock exchange unrest.

There were still considerable downside risks in the international picture, above all in the form of a weaker than expected outcome in Japan and the United

States. But there were also upside risks in the form of a permanently weakened Swedish exchange rate and the strong upward trend in Sweden's economy. All in all, the downside and upside risks were judged to be equally large. The equal magnitude of the upside and downside risks was represented by the uncertainty interval being symmetric around the main inflation forecast. The uncertainty in the inflation assessment was appreciably greater than usual on account of the financial market unrest and the consequences it and other factors may have had for international economic developments. The greater uncertainty in the inflation assessment was reflected in a broader uncertainty interval compared with the June Report (diagram 3). It was also reflected in the monetary policy conclusion not to change interest rates at the publication of the September Report.

In November, the real economic consequences of the global financial crisis were judged to be greater than expected earlier. There were grounds for a downward revision of growth and inflation forecasts for the OECD area. Therefore, the repo rate was cut twice by 0.25 percentage points in November, lowering it from 4.10 to 3.60 per cent.

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**In November 1998, there were grounds for a downward revision of growth and inflation forecasts for the OECD area.**

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In the December 1998 Report growth prospects in Sweden seemed to be somewhat poorer than at the time of the September Report. All in all the balance of risks in the inflation assessment seemed to be somewhat on the downside, as was evident from the probability distribution published in the Report (diagram 3). This picture differed from the assessment in the September Report in that the balance of risks at the time was judged to be symmetrical. However, the financial unrest had tended to subside since September, and the general uncertainty in the inflation assessment had decreased since the September Report. Therefore the uncertainty interval was narrower in the December Report. The repo rate was cut by 0.20 percentage points to 3.40 per cent in mid-December.

In February 1999, immediate inflationary pressure in Sweden once again had proved to be somewhat lower, compared with the Riksbank's most recent inflation assessment in December 1998. The newly elected Executive Board of the Riksbank decided to lower the repo rate by 0.25 percentage points, from 3.40 to 3.15 per cent.

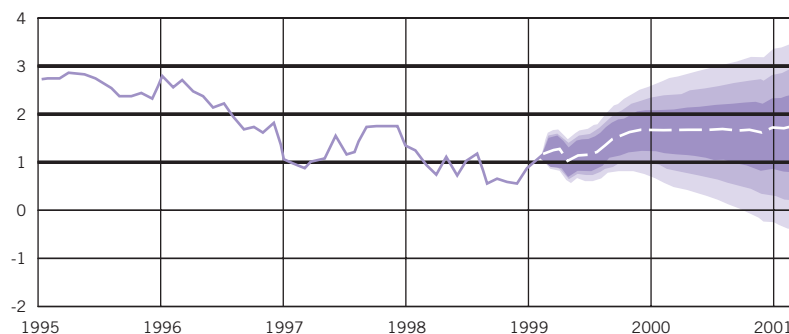
In the March 1999 Inflation Report, it was noted that the consumer price tendency since the December Report had been weaker than expected. A price fall for petroleum-related products that exceeded expectations

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**In the March 1999 Inflation Report, it was noted that the consumer price tendency had been weaker than expected.**

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**Diagram 4. CPI with uncertainty interval. Percentage 12-month changes**  
(Inflation Report March 1999)



Sources: Statistics Sweden and the Riksbank

contributed to this. Moreover, since the beginning of December the lowering of repo rates had had a downward effect on household interest expenditure.

All in all, the inflation assessment carried a downside risk stemming from the risk of weaker international activity than in the main scenario. The downside risk for inflation was accordingly somewhat larger than the upside risk. The larger downside risk was represented by the uncertainty interval being somewhat broader below the forecast path than above it (diagram 4). In that downside risks predominated, the mean assessment of inflation in March 2001 was almost 0.2 percentage points below the mode, e.g. the main scenario's forecast. The width of the uncertainty interval, reflecting the uncertainty in the inflation assessment, was slightly above normal.

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**The rate of inflation twelve to twenty-four months ahead would be somewhat below the Riksbank's target.**

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The Report concluded, that after adjustments for transitory effects from indirect taxes, subsidies and interest rates, the rate of inflation twelve to twenty-four months ahead would be somewhat below the Riksbank's target. On the basis of this conclusion, the Executive Board decided to lower the repo rate by 0.25 percentage points to 2.90 per cent.

## 6. What effect does inflation targeting have on the economy?

In this section some preliminary results regarding the effect of inflation targeting on the real economy are discussed. Has the adoption of the inflation targeting framework affected inflation, growth and the inflation-output trade-off? Did the

adoption of inflation targeting alter the private sector's inflation expectations? Did the pass-through of exchange rate movements to CPI inflation change after the introduction of the inflation target? Some of these questions are difficult to answer, since Sweden has not been through a complete business cycle since adoption of the inflation target.

INFLATION-OUTPUT TRADE-OFF AND  
HOUSEHOLD INFLATION EXPECTATIONS

Inflation in Sweden since 1992 has been low, accompanied by declining inflation expectations and rising credibility in monetary policy. Moreover, the sharp fall in households' inflation expectations is a clear sign of increased

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**The sharp fall in households' inflation expectations is a clear sign of increased credibility for the inflation target.**

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credibility for the inflation target. In the 1980s, these expectations of inflation in the coming twelve months averaged 6.5 per cent, while average inflation expectations since the beginning of 1992 have been slightly below 2 per cent. The clear break in households' inflation expectations in 1992 can be interpreted as an initial sign of a downward shift in the inflation process.<sup>23</sup> Diagram 5 also shows that households have been quite successful in forecasting future inflation. In particular, households in Sweden appear to have foreseen the disinflation in the early 1990s surprisingly well. The adoption of the inflation target, however, involves a process of learning for all actors in the economy, which means that there is some time lag before long-term inflation expectations move down, as is evident from bond investors' inflation expectations (diagram 2).<sup>24</sup>

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**The adoption of the inflation target involves a process of learning for all actors in the economy.**

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Using Phillips type equations, it is possible to analyse whether the inflation process has changed since the introduction of the inflation target. The inflation process is affected by inflation expectations, the trade-off between the output gap (or unemployment) and inflation, and transitory or supply effects. A more permanent change in the inflation process may arise because of institutional changes and affect the way in which inflation expectations are generated as well as the trade-off between

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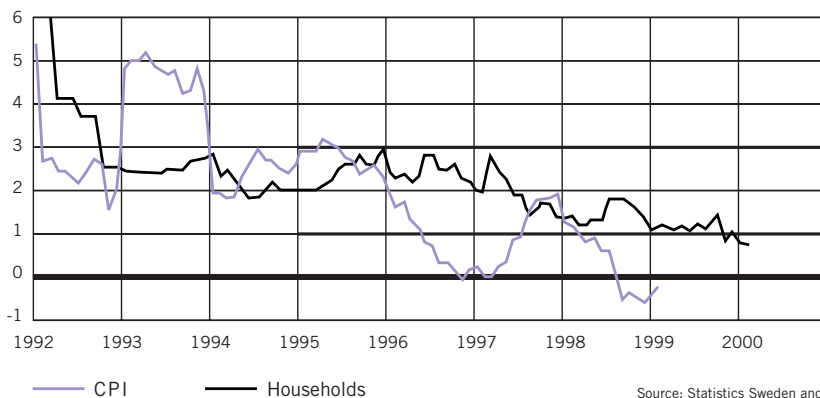
**A more permanent change in the inflation process may arise because of institutional changes.**

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<sup>23</sup> In the 1991 Budget Statement, the Government declared that a policy for a fair distribution and full employment must give the fight against inflation precedence over other ambitions and demands.

<sup>24</sup> The downward shift in Swedish inflation is explicitly modelled in Blix (1999) with two discrete regimes, a high- and a low-inflation state. The probability of switching between the regimes is estimated and discussed.

**Diagram 5. CPI and inflation expectations of households. Percentage 12-month change**



the supply and demand situation and the rate of inflation. In a Riksbank study, it was found that when demand was represented by indicators of an output gap, inflation tended to be overpredicted for the years immediately after the introduction of the inflation target in 1993.<sup>25</sup> Thus, the inflation-output trade-off seems to have improved in Sweden. However, when the output gap was replaced by unemployment, the Phillips curve relationship no longer overestimated inflation in the period after 1993. In another Riksbank study the analysis starts from the following decomposition of registered inflation:

$$\pi_t = \pi_t^{LS} + \pi_t^E + \pi_t^T, \quad (1)$$

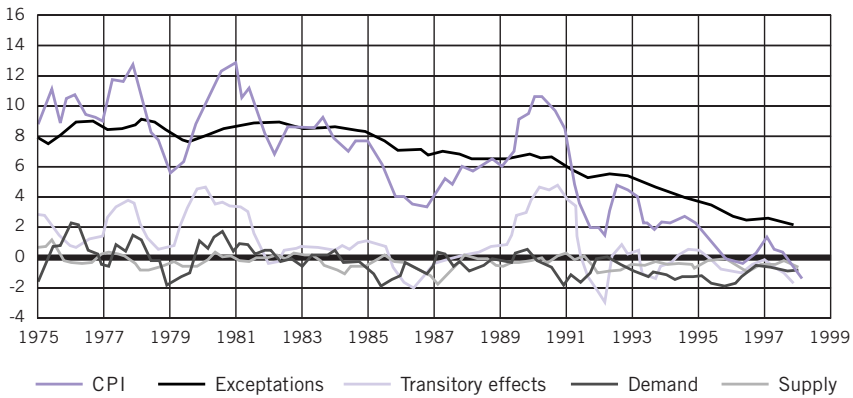
where  $\pi_t$  is the measured inflation rate,  $\pi_t^{LS}$  long-run inflation (*expected*),  $\pi_t^E$  the component of inflation generated by cyclical fluctuations in the economy (often regarded in turn as an indicator of variations in aggregate demand), and  $\pi_t^T$  the component of inflation generated by various types of transitory effects and supply shocks, for example changes in indirect taxes, subsidies and oil prices.<sup>26</sup>

The picture of the inflation process conveyed by the model agrees in important respects with other analytical approaches (used by the Riksbank as well as other observers) and with the overall picture outlined in recent Inflation Reports. The most notable finding is perhaps, as shown in diagram 6, the marked decline of expected inflation in the 1990s.

<sup>25</sup> See Berg and Lundkvist (1997).

<sup>26</sup> A discussion of the model was presented in a box on pp. 35–37 in Inflation Report 1999:1.

**Diagram 6. CPI inflation and underlying factors. Percentage 12-month change**



Sources: Statistics Sweden and the Riksbank

Another conclusion from diagram 6 is that the level of demand has had an appreciable downward effect on inflation almost continuously in the 1990s but that supply effects and transitory factors of various types have exerted an appreciable downward influence as well.<sup>27</sup> This picture of inflation's path can be said to indicate that monetary policy in the 1990s has been rather successful in bringing expected inflation down to a more favourable level but that overall measured inflation has also been lower as a result of a weak demand trend and various other transitory factors. Given the chosen specification, in 1998 Q4 the contribution from the latter type of effects was as much as -1.6 per cent (-2.1 per cent including the contribution from supply shocks).

**Monetary policy in the 1990s has been rather successful in bringing expected inflation down to a more favourable level.**

The dominance of falling expected inflation in the 1990s makes it difficult to analyse the partial relationship between demand and inflation. There are some indications of a change in this relationship. While the reduction of expected inflation does indicate that the average *level* of measured inflation will be lower in the future, it is not certain that inflation's *fluctuations* related to the business cycle have decreased. It is conceivable, however, that the development of inflation expecta-

<sup>27</sup> In the specification used here, the origins of transitory effects are changes in the short-term nominal interest rate, the nominal oil price, nominal import prices and indirect taxes; supply shocks are approximated with changes in the real oil price and productivity.

tions also plays some part in inflation's short-run fluctuations, in which case the result could be a lower average *level* as well as a lower *variability*.<sup>28,29</sup>

## THE EXCHANGE RATE

The Riksbank's view on the exchange rate has altered in some respects since 1992. Gradually more emphasis has been placed on the krona's forecast path, while occasional fluctuations have been played down.<sup>30</sup>

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**When the flexible exchange rate regime was introduced, the krona depreciated markedly.**

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When the flexible exchange rate regime was introduced, the krona depreciated markedly; in the first six months it weakened about 20 per cent, measured by the TCW index. A major factor behind the krona's initial depreciation was no doubt uncertainty about the Swedish economy and economic policy. In the first years with a flexible exchange rate the path of the krona was not strongly related to current inflation or demand. A simple regression analysis shows that the confidence of market agents in Swedish economic policy – measured as the long-term interest rate differential

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**From 1994 to 1996 the swings in credibility, measured in this way, actually explain almost two-thirds of the exchange rate movements.**

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against Germany (diagram 7) – can explain almost a third of the nominal exchange rate's variability since 1992. In the period from 1994 to 1996 the swings in credibility, measured in this way, actually explain almost two-thirds of the exchange rate movements.

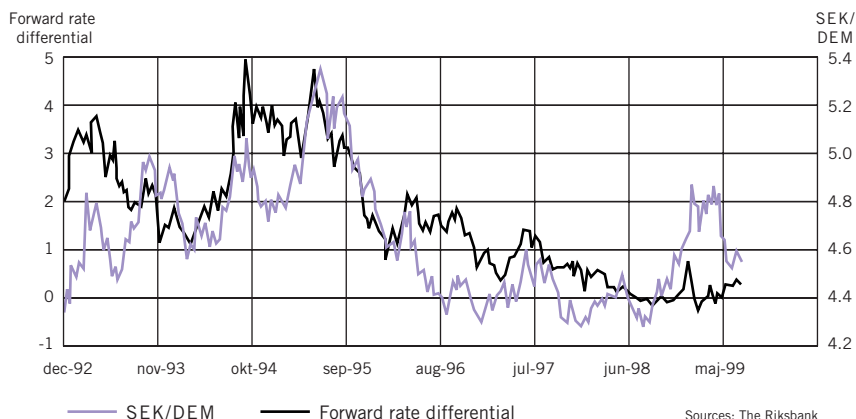
In the period thereafter, the exchange rate has been relatively more stable, except during the widespread turbulence in connection with the international financial crisis in the autumn of 1998. But even with relatively strong Government finances and low inflation, a flexible exchange rate does seem to entail exchange rate fluctuations that are greater than what was believed when the krona fell in the autumn of 1992. This experience is shared with other inflation targeting countries, like the UK and Canada, and may not be related to credibility prob-

<sup>28</sup> See Apel and Jansson (1999).

<sup>29</sup> A general result in the recent study by Bernanke, Laubach, Mishkin and Posen (1999), is that inflation targeting appears to have been successful in reducing both inflation and private sector inflation expectations in four inflation targeting countries. They also find evidence in favour of an improved inflation-output trade-off in Sweden since the introduction of the inflation target. Bernanke et al find that the sacrifice ratio in Sweden is lower than in Canada, New Zealand and the United Kingdom during the disinflation process. This result, however, may partly be a consequence of the method they use to calculate the output gap. In their VAR model, lower than expected inflation rates in Canada, New Zealand and the United Kingdom, but not in Sweden, are accompanied by substantial shortfalls of GDP over the two years following target adoption of the target. Thereafter, GDP growth rates in all four countries exceed the projections, while inflation and short-term interest rates remain at levels below the forecasted levels.

<sup>30</sup> See "Monetary Policy and the Exchange Rate", speech held by Lars Heikensten, April 1999.

**Diagram 7. Forward 10-year interest rate differential with Germany and SEK/DEM exchange rate**



lems regarding economic policy in Sweden, as is evident from bond market developments. Although the long-term interest rate differential with Germany increased somewhat during the financial turmoil in 1998, it stayed on a very low level (below 1 percentage point), compared to the levels at the beginning of the floating exchange regime.

The exchange rate normally affects inflation through import prices as well as via foreign trade and resource utilization. The relationship is complicated, however, in that the average pass-through from exchange rate movements to import prices seems to be incomplete. In the short run and particularly if the exchange rate movement is judged to be temporary, this is a consequence of price rigidities and other adjustment costs. In the longer run the pass-through is also dependent on other market conditions.


Since the introduction of the inflation target, the pass-through of exchange rate movements to CPI inflation seems to have weakened. One important explanation is probably that the move to a flexible exchange rate has altered pricing behaviour. When the krona was devalued during the last decades of the fixed exchange rate regime, the new exchange rate was perceived as permanent, and prices were set in relation to its weaker level. Since 1992, depreciations of the krona have probably been perceived as temporary and therefore resulted in more limited price adjustments. Another factor may be downward price pressure from increased international competition. It is reasonable to

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**Since the introduction of the inflation target, the pass-through of exchange rate movements to CPI inflation seems to have weakened.**

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suppose that increased competition has the primary effect of depressing inflation temporarily. It is a matter of a one-off effect – albeit a protracted one on the *price level*, in that firms are obliged to adjust prices downwards as long as competition is intense. In an inflationary environment this shows up as lower inflation.

## 7. Conclusions

In this article key points in the design of the present Swedish inflation targeting strategy have been described and analysed. According to the Riksbank act, the primary objective of monetary policy is price stability. A numerical target value of 2 per cent for inflation, with a tolerance band of  $\pm 1$  percentage point, serves as a target for monetary policy and as a nominal anchor for inflation expectations. In practice, monetary policy is currently based on an assessment of underlying inflation as measured by UNDI<sub>X</sub>.

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**The target horizon for meeting the inflation target normally is 5–8 quarters ahead.**


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The target horizon for meeting the inflation target normally is 5–8 quarters ahead. However, in the event of a sizeable deviation from target, there may be scope for adjusting the

target horizon, allowing for stabilization of real variables. The publication of inflation forecasts in the Riksbank's Inflation Reports for both headline CPI and underlying inflation as well as uncertainty assessments is used to motivate monetary policy decisions. The publication of the forecast is thereby an important feature of the Riksbank's accountability to the public and to the Parliament on achieving the inflation target. When inflation is outside the tolerance band, the Riksbank has to present the reasons for this and show how inflation can be brought in line with the target.

Since the implementation of the inflation target strategy began in 1993, three different phases have been distinguished: the establishment of the inflation target, the communication of explicit inflation forecasts, and, finally, the introduction of distribution forecast targeting.

In practice, distribution forecast targeting involves presenting a main scenario for future inflation, and assessments of both the degree of uncertainty in the forecast and the magnitude of the upside and downside risks to the main scenario. The probabilities of inflation twelve and twenty-four months ahead being inside certain intervals are published in the Inflation Reports. When the Executive Board sets the interest rate (the repo rate), both the main scenario, that is the mode of the forecast, and the risk spectrum surrounding the main scenario, are taken into account.



While inflation targeting in Sweden has been successful in reducing both inflation and private sector inflation expectations, aggregate demand as well as supply shocks and temporary factors have also exerted a downward influence on inflation in the 1990s. It is therefore difficult to distinguish any improvements in the inflation-output trade-off after the announcement of the inflation target in 1993. It is likely, however, that the increased credibility of the inflation target has resulted in both a lower average inflation level and a lower inflation variability.

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