

Transparency, uncertainty and monetary policy

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This paper analyses the effects of transparency using a simulation model (RIXMOD). A transparent policy normally reduces the cost of disinflation and uncertainty, which contributes to a more stable economy. A change towards a more transparent policy may, however, sometimes lead to a less efficient policy in the short-run. A key mechanism is that increased transparency leads to more forward-looking expectations, which in turn can have non-trivial effects that lead to short-run stabilisation problems.

1.0 Introduction

In recent years there has been a clear tendency toward the more transparent conduct of monetary policy. The increased focus on explicit inflation targeting in several countries is one indication of this. Central banks that use an inflation target to guide monetary policy normally publish inflation reports in which their view of inflation prospects is described in detail. Some central banks also publish their own inflation forecast and measures of its uncertainty. Increased transparency is to a large extent a result of central banks having become more independent, as this heightens the need to motivate monetary policy actions. The importance of transparency has also been emphasised in the academic literature (see eg Faust and Svensson (1997)).

In some respects, however, it seems that the trend to increased transparency has been less pronounced. Inflation prospects are normally presented under the assumption of an unchanged monetary stance; most central banks do not indicate what inflation prospects look like once the effects of

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monetary policy actions are taken into account.¹ If a central bank publishes an unconditional inflation forecast, this can be seen as its intention for actual inflation.² We will sometimes use the expression *path transparent* for a central bank that publishes an unconditional forecast of the future inflation path.

Moreover, while central banks often give detailed descriptions of their view of future inflation several years ahead, they normally provide only qualitative, not quantitative, indications of how their inflation prospects will affect their instrument setting (the instrument is normally a very short-term interest rate). We will sometimes use the expression *instrument transparency* when discussing how transparent the central bank is about its interest rate policy. Likewise, if the central bank describes its prospects for the development of the exchange rate in a transparent fashion, we can say that it is *exchange rate transparent*.³

1.1 The need for transparency

A central bank that has earned a high degree of credibility through its historic performance, has established a good reputation. The cost of disinflation is much lower for a bank with high credibility (ie low inflation expectations) than for a bank that suffers from credibility problems (ie high inflation expectations). With a high degree of credibility follows a greater freedom to occasionally act with discretion, which gives the policymaker more flexibility. A central bank with a lower degree of credibility due to high historical inflation may find it time-consuming and costly to rely solely on its own performance to establish a high degree of credibility. In such a situation it is of potential importance to enhance credibility by making the central bank's policy process more transparent.

1.2 The effects of transparency

The crucial question is whether increased transparency is invariably beneficial. Increased monetary policy transparency should reduce uncertainty in general and therefore lead to a more favourable environment for monetary policy. Moreover, one can argue that transparency may strengthen the central bank's credibility and accountability. On the other hand it is conceivable that increased

¹ In this respect the Reserve Bank of New Zealand appears to be an exception since they publish unconditional inflation forecasts.

² We use the following terminology throughout the paper: a conditional inflation forecast is a forecast conditional on unchanged monetary policy, ie no monetary policy actions, which typically implies unchanged nominal short term interest rates. An unconditional inflation forecast incorporates the effects of planned monetary policy actions (ie monetary policy is "endogenous").

³ To our knowledge no central bank publishes a path for the instrument (or short-term interest rate). The Reserve Bank of New Zealand, however, does publish a desired path of a monetary index, which is supposed to capture the effect on aggregate demand from the short-term real interest rate and the real effective exchange rate. The Bank of Canada, the Bank of England and Sveriges Riksbank have become increasingly more transparent concerning their view of future exchange rate developments.

transparency may lead to a deterioration of credibility if the central bank suddenly has to deviate from a transparent plan.

In the model of Faust and Svensson (1998), increased transparency is socially beneficial but frequently not in the interest of the central bank, since transparency in this model reduces the central bank's ability to act according to its own preferences. One reason why a central bank is rather silent about its intentions is that it is uncertain about the appropriate future policy stance. Even though it is possible for a central bank to announce its intentions, it knows that unexpected events will occur that will give the central bank incentives to deviate from the announced path. To the extent that it might be difficult or costly to explain such deviations, the central bank may choose not to be too transparent about its intentions.

Another mechanism is that, when the central bank is transparent about its intentions and analysis (which is based on some judgements of how agents' expectations are formed), transparency itself may affect expectations and behaviour in ways that weaken the validity of the analysis that was transparently presented to the public. These effects are very uncertain and hard to incorporate in formal analysis.

We will shed light on some of the issues outlined above through simulations of RIXMOD.⁴ Since the transparency of monetary policy is a field that is relatively unexplored, the analysis will be mainly positive rather than normative. Furthermore, our main sources of inspiration are considerations that originate from several years of policy analysis at a central bank rather than from analysis in the academic literature. One aspect of this is that policy analysis often aims to improve policy decision-making (towards optimal behaviour) in a complex economy, which differs from academic analysis based on optimal behaviour in a relatively simple model. Our main purpose with the paper is to improve our understanding of the role and effects of transparency in monetary policy. We will restrict the analysis to an inflation-targeting framework, though many of the aspects considered in this paper are also relevant to other monetary policy regimes.

The paper is organised as follows: In section 2, transparency is discussed in more detail with a focus on the potential benefits and costs of increasing transparency. RIXMOD is presented in section 3 and it is shown how different degrees of transparency can be modelled in RIXMOD. The results of various simulation experiments are presented in section 4. Section 5 concludes.

2.0 Transparency

2.1 What is meant by transparency?

The expression "transparency" can be applied to several aspects of monetary policy and is therefore difficult to define. In general, we interpret a transparent policy as one where the public is able

⁴ RIXMOD is a general equilibrium model similar to the models that the Bank of Canada (QPM) and the Reserve Bank of New Zealand (FPS) use in their policy analysis. We wish to express our deep gratitude to the Bank of Canada for its outstanding assistance in starting up our own modelling project.

to monitor and infer the intentions of the central bank, especially their current intentions. We think of this as an *ex ante* calculating process, comparing private expectations with (explicitly or implicitly) announced future paths for key variables: inflation, interest rates, and nominal exchange rates. The process of increased monetary policy transparency that has been observed in many inflation-targeting countries can roughly be described as follows:

- (a) Define the goal for monetary policy in terms of a target variable (some measure of inflation);
- (b) Publish a policy document, ie an inflation report, in which future inflation prospects are discussed and analysed;
- (c) Develop and present the analytical tools by which inflation prospects are assessed;
- (d) Create a framework for policy analysis, ie clarify what assumptions underlie the assessment of inflation prospects and describe how the policy conclusions are related to the assessment;⁵
- (e) Publish a conditional inflation forecast;
- (f) Describe in quantitative terms how the target variable will be brought back to the target, eg a forecast path of actual inflation; and
- (g) Explain in quantitative terms what kind of monetary actions are needed to achieve the preferred path of actual inflation according to (f).

The sequence of the actions listed above can of course be altered to some extent. For example, step (e) can be introduced before step (d). Moreover, the presentation of improved analytical tools is, in itself, a continuous process rather than an integral part of another process. In addition, one can imagine other actions that can lead to increased transparency. Nevertheless, we believe that the sequence above approximately describes the process of increased transparency that has been observed in inflation-targeting countries.

Our analysis will mostly be related to step (f) and to some extent step (g), ie path and instrument transparency, partly because these steps to some extent can be modelled in quantitative terms in RIXMOD. Moreover, we believe that most of the steps (a) to (e) can be viewed as being quite natural, and they are implemented by most inflation-targeting central banks, whereas steps (f) and (g) are more crucial. As far as we know, only the Reserve Bank of New Zealand has implemented steps (f) and (g).⁶ At the same time we would like to emphasise that steps (a) to (e) to a large

⁵ We have a particular framework for monetary policy analysis in mind that is used by some central banks, eg the Riksbank. In this framework the central bank produces an inflation forecast 1–2 years ahead conditional on unchanged monetary policy (which in Sweden means an unchanged repo rate). If this conditional inflation forecast is above (below) the inflation target then the repo rate should be raised (lowered). See Inflation Report 1997:3 for a further discussion of this framework of monetary policy.

⁶ Concerning step (g) the Reserve Bank of New Zealand publishes a path for a monetary conditions that it considers to be consistent with keeping annual inflation between 0 and 3 percent. It also publishes the quarterly short-term nominal interest rate and trade-weighted exchange rate paths consistent with the monetary conditions.

degree reveal information on the central bank's view of the unconditional inflation forecast and to some extent its view of the instrument's future path.⁷

2.2 Benefits and costs of transparency

Most commentators, especially non-central bankers, would argue that transparency is beneficial for society. In Faust and Svensson (1998) it is shown that transparency improves social welfare. Central bankers also recognise advantages of a transparent policy, including:

- (i) *Credibility gains*. Transparency makes the reputation and credibility of the central bank more sensitive to its actions; it is therefore more costly to cheat the public with surprise inflation. This is a key mechanism in the Faust and Svensson (1998) model. More generally, it is believed that a high degree of transparency strengthens the accountability of the central bank as well as the credibility of monetary policy.
- (ii) *Reduction of uncertainty*. A high degree of transparency would lead to a reduction of uncertainty. In particular, transparent intentions of future monetary policy should contribute to the stability of monetary conditions and hence facilitate the conduct of monetary policy.
- (iii) *Incentives*. The increased focus on the analysis that transparency entails should to a certain degree be encouraging for the central bank. Transparency should stimulate the central bank to improve its analysis.

Transparency may also be associated with costs. In this context it is often important to distinguish between social costs and costs for the central bank. Some of the costs listed below belong to the latter category.

- (iv) *Goal differences*. If the central bank's goal (which is private information) differs from the objective of society (eg the central bank has a different short-run employment target), then increased transparency reduces the central bank's possibility of achieving its own goal, which is a cost for the central bank. This mechanism is analysed by Faust and Svensson (1998).
- (v) *Resources*. A more pragmatic aspect is that transparency involves costs in terms of resources. A transparent policy requires more resources to produce inflation reports, to give speeches and in other ways communicate with the public. These costs are obvious for people involved in policy analysis at a central bank and they are also important in practice.
- (vi) *Cost of changing view*. If the central bank's view of the economy (transparently presented to the public) has to be revised, this revision may be more costly in terms of efficiency losses under a transparent policy. There are two aspects to this cost. First, a revision of the central bank's

⁷ The difference between the conditional and the unconditional inflation forecast should be very small in the short run (shorter than the forecast horizon), but the unconditional forecast should be closer to the inflation target for forecast horizons about 1 to 2 years. If the economy has been hit by a large inflation shock that is hard to counteract within the forecast horizon (ie the conditional forecast is far from the inflation target), then the conditional forecast is less informative about the unconditional forecast.

view may be taken to imply that the central bank is unskilled and lead to criticism. Even if such criticism happens to be unfair, it may for a period negatively influence the central bank's credibility. Costs of this kind are also recognised by central bankers, though such mechanisms are not easy to capture in models.

The other aspect is as follows. A transparent policy will have some impact on private agent's behaviour, for instance via expectations. If the central bank subsequently gains new insights that alter its view of the economy and therefore wants to change its policy, the impact on behaviour that the (premature) transparency caused may exact some costs in terms of efficiency. In other words, transparency can lead to changes in private agents' behaviour that turn out to be undesirable *ex post*.

(vii) *Short-run expectation effects*. When the central bank is transparent about its intentions and analysis (which is based on some judgements of how agents' expectations are formed), transparency itself may affect expectations and behaviour in ways that weaken the validity of the analysis.

Costs (iv) and (v) are costs for the central bank, whereas (vi) and (vii) may induce social costs. Moreover, we feel that costs (vi) and (vii), if they exist, occur when the degree of transparency changes, implying that these costs are temporary. Even if the gains from increasing transparency normally dominate in the long run, it is important to be aware of the short-run costs. In order to examine the validity of costs (vi) and (vii), we will conduct an analysis according to the following scheme.

- (1) In the first step, we will increase transparency in the model by incorporating model-consistent inflation expectations⁸ to show that it is generally beneficial. One component of a transparent policy involves explaining that monetary policy reacts to future inflation prospects (say 6 to 7 quarters ahead). This so called forecast horizon plays an important role in the subsequent analysis.
- (2) We then show that increased transparency does not always lead to more stability if the monetary policy response function does not take the effect on private agents' expectations into account. This step illustrates cost (vii).
- (3) In a third step, we argue that the forecast horizon has to be shortened when the degree of transparency increases. In the extreme case of full transparency, we show that the forecast horizon has to be shortened so as to be almost contemporaneous. This finding, that increased transparency calls for a shorter forecast horizon, is a new insight.
- (4) In the final step, the central bank is modelled according to its new insight and shortens its forecast horizon. It turns out that this may lead to a more unstable economy compared with the situation before the introduction of a transparent policy. The reason for this unfavourable outcome is that this policy is a deviation from the policy announced in step 1, (ie cost (vi)).

⁸ The relationship between transparency and the degree of model consistency of inflation expectations will be discussed in section 3.

Note that in the arguments above we use the expression “new insights” instead of “new information.” The fact that central banks react to new information and therefore deviate from their previous intentions is natural, as their policy changes can be explained to the public transparently. In this paper we focus on changes due to new insights, which rather means that the central bank interprets old information differently.⁹

3.0 A birds-eye view of RIXMOD

This section presents RIXMOD and shows how it can be used to model transparency. RIXMOD consists of two sub models: the “*Steady State Model*”, which describes the long-run equilibrium features of the economy, and a *dynamic model* that explains short- and medium-run adjustment paths of relevant macro variables when, after shocks, the economy is off its steady-state path. Permanent shocks will, by definition, change the steady-state.

The model describes the behaviour of households, firms, a government, a central bank and the rest of the world. The decisions of these agents interact to determine the ultimate levels of key stocks: capital, government debt, and net foreign assets. These target stock levels in turn are key determinants of the associated flows, such as consumption, saving, investment, government spending and revenues, and the external balance. There is a formal stock-flow accounting framework that ensures full consistency among all variables, both in the long-run and along the dynamic adjustment path.

The model provides solutions for both the desired financial wealth of consumers in the long-run and the consumption/savings paths that will sustain that level. Firms take the long-run labour supply as given, and choose both the optimal stock of capital to go with it and the path for investment spending that will take the economy to that equilibrium and maintain it. The government chooses a steady-state ratio of government debt to GDP. With these three steady-state decisions taken, aggregate net borrowing or lending for the economy as a whole is determined, resulting in the country's net foreign asset position. Associated with this equilibrium net foreign asset position will be a unique external balance, ie imports, exports and foreign debt service. The relative price that will adjust to achieve this is the real exchange rate.

The dynamics in the model originate from mechanisms explaining *slow adjustments* of real variables as well as of nominal variables such as prices and wages. The dynamics stem from three different sources. The first source is intrinsic to the economic structure and refers to all sources of gradual adjustment not related to expectations. These include labour market contracts, the fixed costs associated with investment, and so on. Such features give rise to a gradual response to disturbances, regardless of how large the disequilibrium might be. One can think of this as a general phenomenon of costly adjustment, which causes all agents in the economy to choose not to adjust immediately.

⁹ A related but different concept is learning, which normally means that agents learn about parameters of the model as new information arrives.

A second source of dynamics is the *expectation mechanisms* in the model. Expectations are formed in a flexible way. In principle they are constructed as a combination of *backward- (adaptive)* and *forward-looking (model-consistent)* elements. The weights attached to the two types of expectations differ between variables. A high degree of backward-looking expectations implies a high degree of rigidity in the adjustment of a variable. For instance, it takes time before changes in monetary policy feed into price and wage formation, which in turn implies a need for substantial adjustments in real variables. In contrast, a high degree of forward-looking expectations implies more flexible adjustments. In this respect the flexibility of the simulation model concerning the assignment of the weights attached to different mechanisms, eg in the formation of expectations, is fruitful to explore in a study of this sort.

The third source of dynamics is the reaction of policies to disturbances. As the main purpose of the model is to discuss monetary policy, the endogenous reaction of the fiscal authority is not modelled in detail. In order to respect the government's budget restriction and targets for public expenditure and debt as ratios to GDP, the income tax rate changes endogenously. Furthermore, the model includes a monetary policy reaction function, according to which a rise in anticipated inflation above target produces a rise in interest rates intended to move inflation back towards its target level over a horizon of six to seven quarters. The horizon is not arbitrary: it is an approximation of the sort of horizon over which monetary policy can expect to have a meaningful influence on the trend rate of inflation. With monetary policy represented in this way, the response on the part of monetary authorities to economic disturbances that affect inflation is built-in, ie, interest rates adjust automatically to put inflation on a path that will converge to its target level. Formally, the reaction function can (somewhat simplified) be written as:

$$r_t = (1 - \mu_1)r_{ss} + \mu_1 r_{t-1} + \mu_2 Ygap_{(t+4)} + \theta \left[\frac{\pi_{(t+6)} + \pi_{(t+7)}}{2} - \pi_0 \right] \quad (1)$$

where r_t is the 3 months interest rate at time t , r_{ss} is the steady-state 3-month interest rate, $ygap_{(t+4)}$ is the output gap 4 quarters ahead, and the last term shows how monetary policy reacts to the difference between the projected inflation 6 to 7 quarters ahead and the inflation target, π_0 . In the latest version of RIXMOD the policy reaction function explicitly incorporates the output gap 4 quarters ahead. There are some indications that this forward-lookup monetary policy reaction function reduces the variability of the inflation rate as well as the output gap, see Dillén (1998).

The determination of the short and long-term interest rates and the nominal exchange rate is highly endogenous. The interdependence goes via the yield curve and the assumption of uncovered interest parity (UIP), although expectations about the future nominal exchange rate do not exhibit perfect foresight. There are some expectation errors in the short-run. In the long run the level of the real exchange rate and the difference between the domestic and the foreign price level determine the nominal exchange rate. Of these, only the real exchange rate is solved in the steady-state model, since there is no price level targeting. The actual levels for prices will depend on the exact type of shock under study and the dynamic factors that drive the inflationary process until the target inflation level is reached again.

The long-term interest rate is partly determined by the expectations theory of the term structure and partly by the differential with the rest of the world, mainly the German ten-year bond rate. Furthermore, there is a direct link between shifts in the short-term rate and movements at the longer end of the yield curve that are assumed to represent the empirical observation of a high degree of volatility in long-term interest rates in Sweden, that is, higher than the pure expectations theory predicts. These components have recently been recalibrated. In the long-run, interest rates and the nominal exchange rate obey relative PPP, that is, they adjust to accommodate differences in actual and expected rates of inflation between Sweden and the rest of the world.

An important characteristic of the model is that the steady-state allocation of real variables is independent of the target rate of inflation. That implies, among other things, that the long-run level of all real stocks is left unchanged. Accordingly, there is no mechanism in the model that determines an optimal rate of inflation. This has to be determined by factors outside the model and then imposed in the model as the monetary authority's target rate of inflation.

3.1 How transparency is modelled in RIXMOD

Modelling transparency is a non-trivial task, since transparency is a concept that is difficult to quantify. Increased transparency means that the central bank reveals more of its intentions, implying that the central bank relinquishes some of its information advantage. Consequently, increased transparency should lead to an adjustment of private agents' inflation expectations towards the central bank's model-consistent inflation expectations. Thus, in RIXMOD increased transparency should imply that private agents' inflation expectations become more model-consistent. Inflation expectations t periods ahead can essentially be written as:

$$\pi_{(t)}^e = (1 - \alpha)\pi_{BL(t)}^e + \alpha\pi_{MC(t)}^e, 0 \leq \alpha \leq 1 \quad (2)$$

where subscripts BL and MC denote backward-looking expectations and model-consistent expectations, respectively. Thus, we will assume that increased transparency leads to a larger value for α in expression (2).

4.0 Results

4.1 Effects of increasing transparency

Following the reasoning in the previous section, model-consistent expectations should be a natural candidate for indicating the degree of transparency. Increasing transparency, interpreted in this way, is generally beneficial in terms of nominal and real stability.¹⁰ In figures 1 to 7 we show the

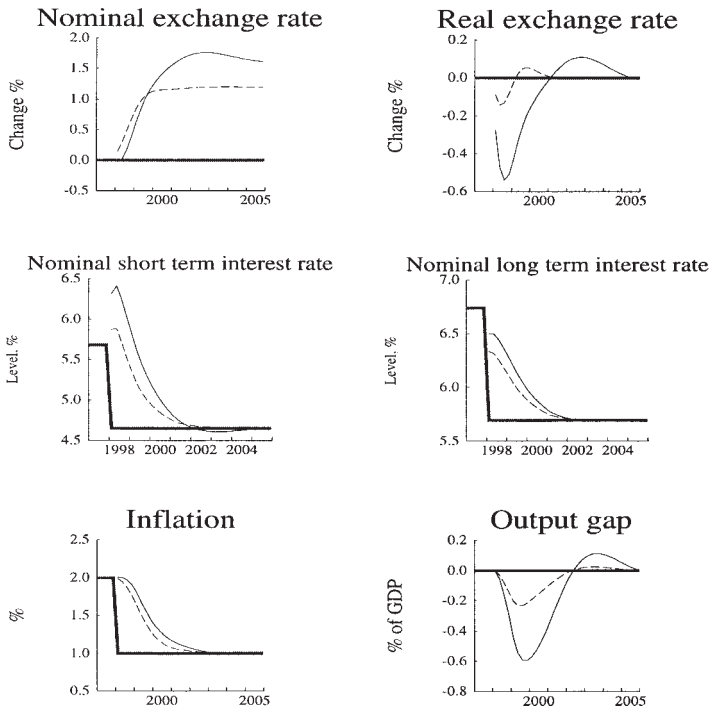
¹⁰ To draw general conclusions from simulations we need a technology to compare over several types of shocks and parameter values. This could, for instance, be approached through stochastic simulations, a technique that is not available at the moment. Instead we have to use illustrative examples.

result of increasing the degree of model consistency (from $\alpha = 0.3$ to $\alpha = 0.4$ for all nominal prices). We present two kinds of shocks; a permanent disinflation shock of 1 percentage point and a temporary increase in consumption. The magnitude of the latter shock is 1 percent and the duration is 1 quarter. In the figures the basic setting implies $\alpha = 0.3$ and a forecast horizon of 6 to 7 quarters, see policy reaction function (1).

Step 1: A disinflation shock

We first consider a disinflation shock where the steady-state inflation rate (P_DQ) is permanently lowered by 1 percentage point (figure 1). We see that increasing the degree of model consistency generally shrinks the volatility in real as well as nominal variables. The convergence to the new target level is somewhat faster when transparency is increased ($\alpha = 0.4$). A faster convergence to the new target level implies a smaller drift in nominal variables such as the exchange rate.

Figure 1
Permanent 1% decrease in P_DQ



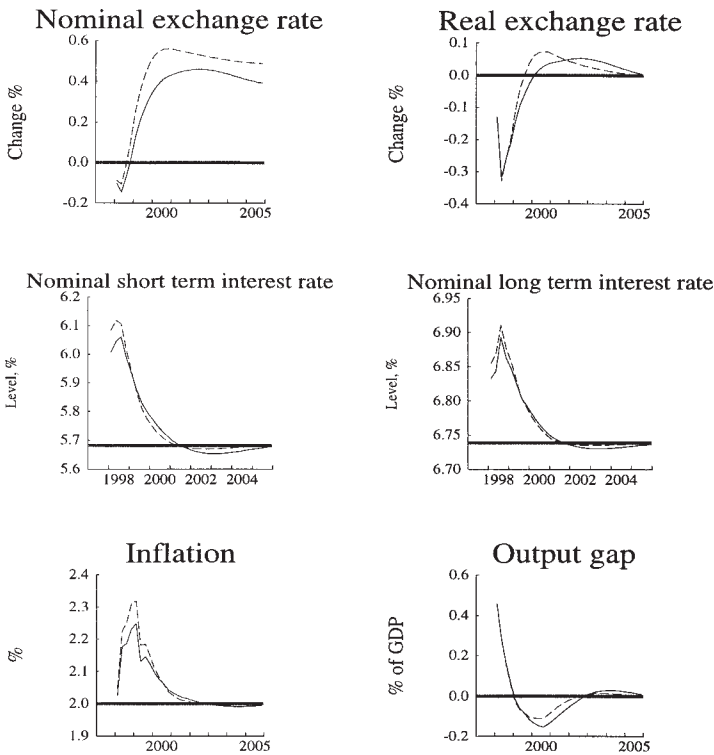
Basic setting solid-line, Mod. cons. share 0.4 in prices-dashed line.

The reduction of variability in real variables such as the real exchange rate and the output gap is clear. The more stable real development comes from the diminished burden on interest rate policy with more forward-looking expectations: less restraining of aggregate demand is needed to convince the public of the central bank's intentions. This exercise can be seen as an illustration of the problems a central bank faces when, in a situation of high (historical) inflation and inflation expectations, it introduces an explicit inflation target. The simulation confirms the view that a disinflation policy is better facilitated if a transparent policy leads to inflation expectations that are in accordance with the intentions of the central bank.

Step 2: A consumption shock

The following simulations address the generality of the results in step 1. The shock applied this time is a temporary increase in private consumption (Lc), with the results shown in figure 2.

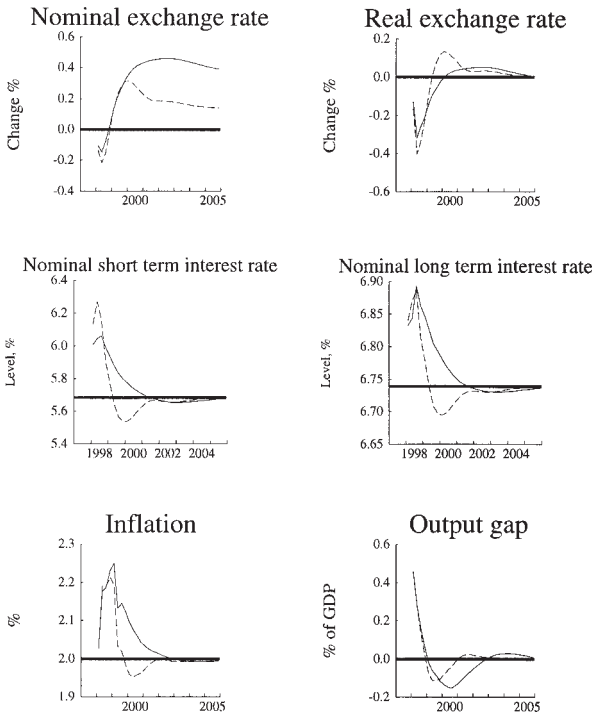
Figure 2
Temporary 1% increase in Lc for one quarter



Basic setting solid-line, Mod. cons. share 0.4 in prices-dashed line.

The degree of model consistency in prices is increased to 0.4% (from 0.3%), as in step 1, but this time without any obvious effects. There are signs of increased volatility in inflation, without any large decrease in the volatility of the output gap. In figure 3 we show the result of the same consumption shock as above but with an altered policy function. This time we have shortened the central bank forecast horizon so that it reacts to inflation prospects 2 and 3 quarters ahead.

Figure 3
Temporary increase in L_c with shorter horizon



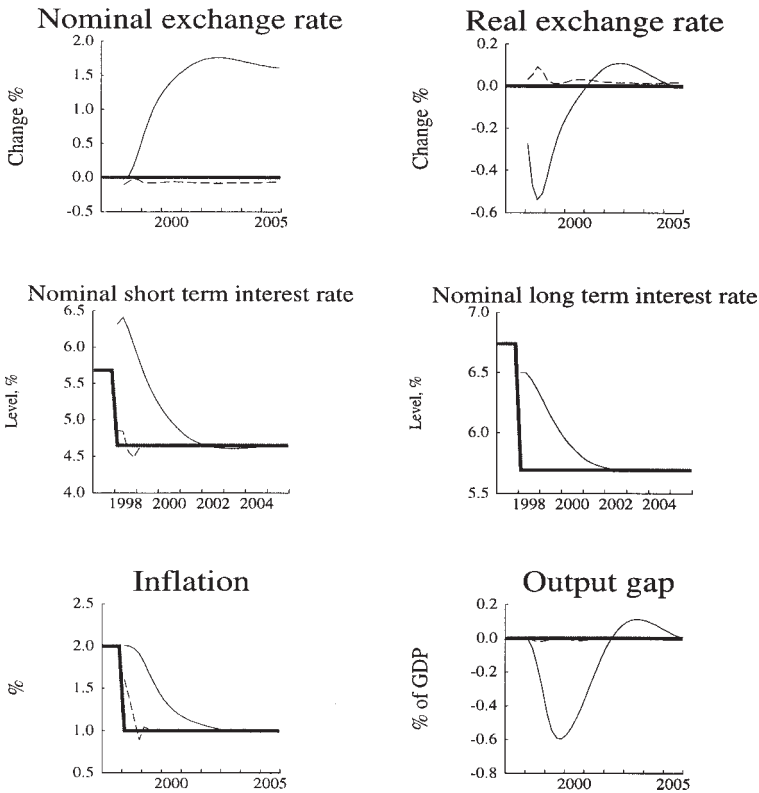
Basic setting solid-line, Mod. cons. = 0.4 and horizon 2-3 quarters-dashed line.

The resulting paths (the dashed lines) indicate that the new policy rule delivers more stability in both nominal and real variables. With the exception of the short-term interest rate and the real exchange rate. The deviations from the steady-state values of the latter variables tend to be smaller when expectations exhibit a higher degree of model consistency, even though there is a tendency to undershoot the steady-state level. This example underlines the importance of altering the conduct of monetary policy in response to structural changes in the economy.

Step 3: Gaining new insights

The results above indicate that increased transparency may motivate a shortening of the forecast horizon. To examine this new insight further we show in figure 4 the result of a simulation comparing the current calibration of RIXMOD with a completely model-consistent expectations version ($\alpha = 1$).

Figure 4
Permanent decrease in P_DQ with model consistent expectations



Basic setting solid line, full model consistency dashed line.

The shock applied is again a permanent reduction of the inflation target by 1 percent. The announcement effect is almost immediate, ie inflation converges very rapidly to the new target and nominal interest rates react only to the small degree of "undershooting" of the target that stems from the intrinsic dynamics in prices. In order to have a sensible simulation one needs to adjust the horizon for monetary policy.

With fully forward-looking private expectations, a central bank horizon of 6 to 7 quarters ahead will lead to monetary policy acting too late, which will give rise to too much drift in nominal variables; for a discussion of this mechanism see Batini & Haldane (1998). The long-term interest rate adjusts virtually immediately to the new steady-state and the output gap does not move at all. Once again we have an example that illustrates the benefits of transparency during a disinflation period.¹¹

Step 4: Using new insights

In the section above we showed that a higher degree of transparency in the economy calls for an adjustment of monetary policy. In particular, it is appropriate to shorten the forecast horizon. Consider now the following scenario. The central bank, through its new information policy, has managed to increase the degree of transparency outside the bank. However, the fact that this also calls for a shortening of the forecast horizon has not reached the community. Instead, the general opinion is that monetary policy has its main effects inside 6-7 quarters ahead (which probably was a part of the transparent description of the policy).

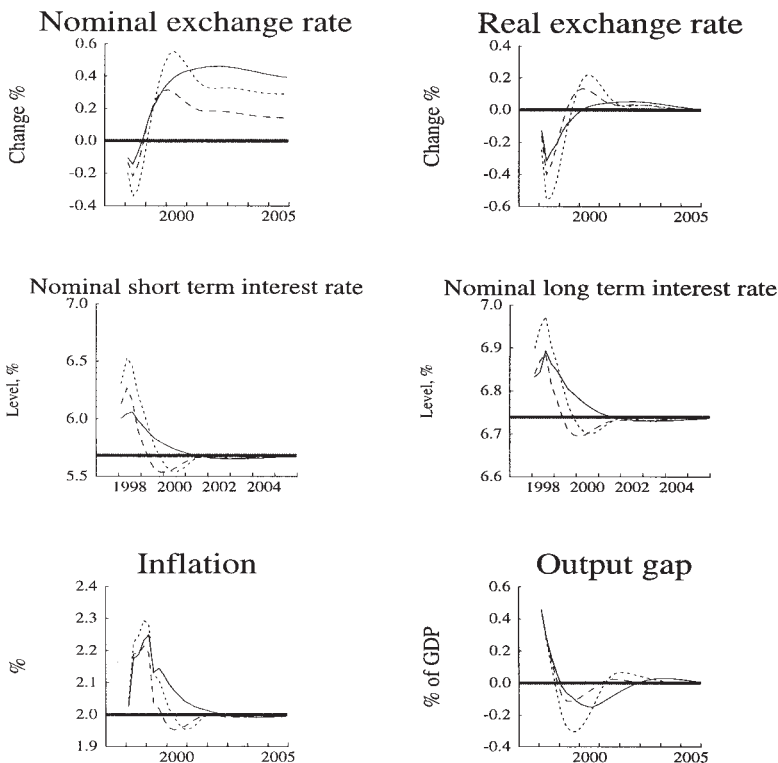
In figure 5 (overleaf) we illustrate this phenomenon, taking once again a temporary increase in private consumption. The solid lines represent the basic setting, the current calibration of RIXMOD. The dashed line represents the case of higher transparency *and a fully understood change in monetary policy*. The new feature, the dotted line, represents the economy's behaviour in the case that the public still believes in a monetary policy conducted with a horizon of 6 to 7 quarters.

In this simulation we try to illustrate the behaviour of an initially "uninformed" private sector. In order to do that we use expectations calculated from a simulation running under the old policy. These expectations are initially held exogenous and subsequently endogenised during 10 quarters until they are fully endogenised. That means that the public starts off with expectations of "business as usual" and gradually incorporate the new central-bank behaviour.

Anticipating the need for a shorter horizon, the central bank starts off with a more aggressive interest rate policy and deepens the output gap more than before. This policy is reinforced by the more volatile nominal and real exchange rate, reducing aggregate demand even further. However, this real development of the economy cannot offset the expectations driving nominal prices. We get a rapid decrease in the output gap together with a rapid increase in inflation. Over time, the harsher interest rate policy will succeed in bringing inflation back to target with less drift in nominal prices, as witnessed by the long-run development of the nominal exchange rate, but the overall picture is that of increases in both nominal and real variability.

¹¹ For a more systematic examination of how the optimal forecast horizon is affected by changes in expectations, see Amano, Coletti and Macklem (1998).

Figure 5
 Temporal increase in Lc for one-quarter Basic setting solid line



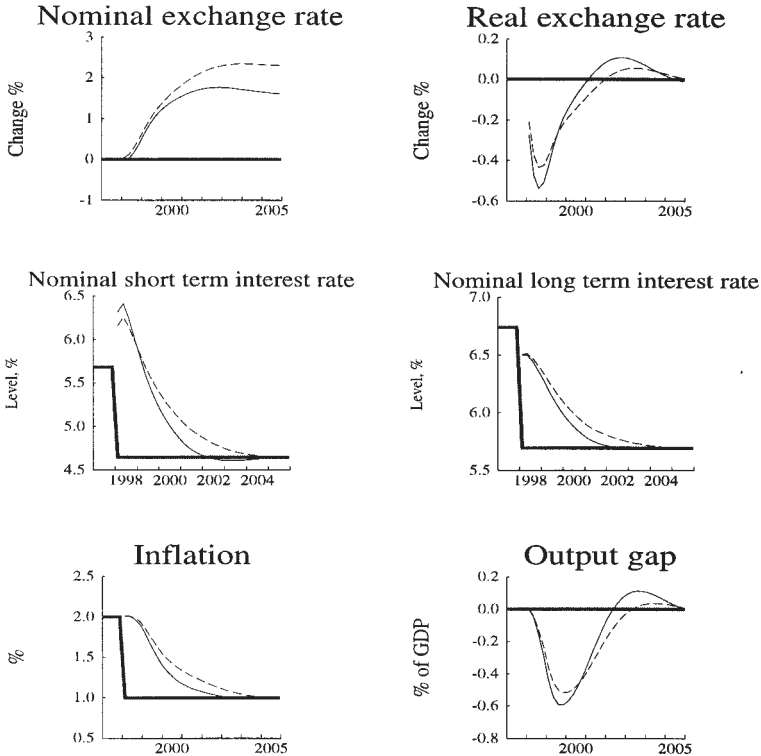
Mod. cons. = 0.4 and horizon 2-3 dashed line, mod. cons. = 0.4, horizon 2-3 (exp. exog at hor 6-7) dotted line.

Steps 3 and 4: Gaining and using new insights again

It is not always the case that a higher degree of transparency leads to problems when new insights call for a new policy. The effects could be the other way around. To clarify the ambiguity of new insights, we now discuss another example. Following recent academic studies and conventional central bank wisdom, there are indications of the superiority of a policy rule that explicitly incorporates output considerations. This is not the place to dwell on that, we just take it as a possible example of a “new” insight.¹² In figure 6 we show the results of increasing the weight of the

¹² Drew and Hunt (1998) provide evidence that adding the output gap to a forward-looking inflation-targeting regime leads to a more efficient policy. See also Dillén (1998) for a discussion of the effects of explicitly introducing the output gap in the policy response function.

Figure 6
Permanent 1% decrease in P_DQ



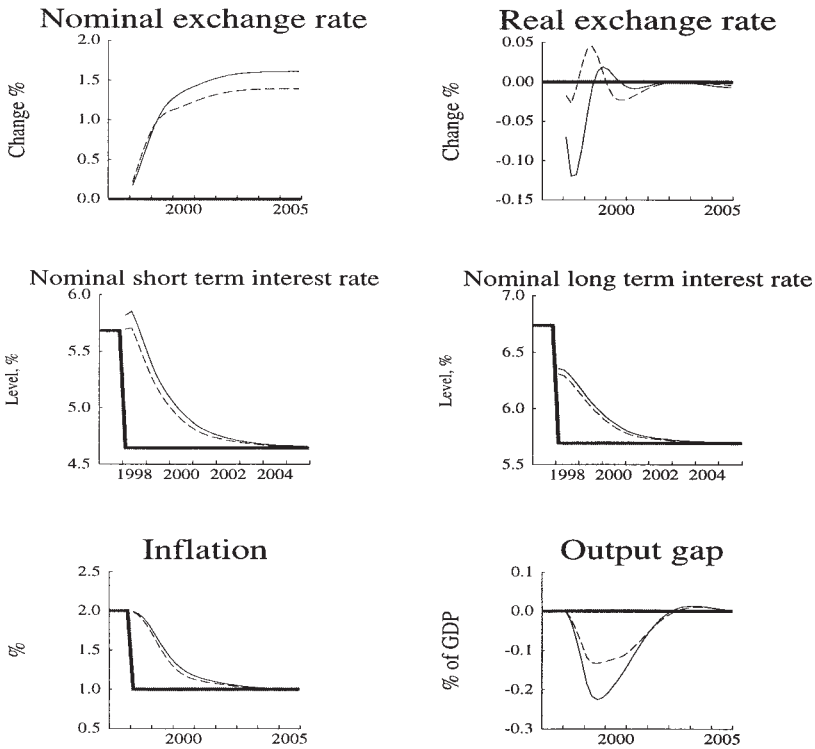
Basic setting solid line, more weight on output-dashed line.

output gap explicitly in the reaction equation, again using the disinflation case and keeping at 0.3.¹³ We see that this leads to some improvement in real variables but at the cost of a deterioration in nominal performance.

In figure 7 (overleaf) we use the same approach as above in that we compare the outcome with and without full private comprehension of the new central bank behaviour. Remember that we study the combined effect of a change in transparency, in that the share of model consistency in prices increases from about 0.3% to 0.4%, and a change in policy. The solid line represents the response to the disinflation shock when the public is fully aware of the weight on output considerations in the policy equation and that transparency has increased as well. Compared to the outcome in figure 6, real variability has decreased.

¹³ More precisely, we increase the coefficient on the explicit output term (4 quarters ahead) from 0.14 to 0.20 in the policy response equation.

Figure 7
 Permanent 1% decrease in P_DQ



More weight output (exp. endog.) solid line, more weight output (exp. exog.) dashed line, model consistency share 0.4 in prices.

But even more improvement is possible. The dashed line, in figure 7, shows the result when the private sector initially still believes that the central bank is following the "old" policy response and gradually incorporates the new behaviour. In this case there is no need for the central bank to "fight" destabilising inflation expectations and a smoother outcome in both real and nominal variables is possible. In this example, "predetermined" expectations work in the same direction as the new monetary policy intentions. The introduction of new insights, together with increases in transparency, has a superior outcome when the new policy is not fully understood initially. This is an example of the ambiguity of changing transparency in the short run.

5.0 Conclusions

In this paper we have tried to analyse the effects of transparency using the simulation model RIXMOD. An important feature of RIXMOD is that expectations can be modelled very flexibly. In this study we assume that increased transparency will result in more model-consistent (or forward-looking) expectations of future key variables. It is worth emphasising that we have used the model mainly for gaining qualitative insights rather than strong quantitative results.

The results of the simulations broadly confirm the view that increased transparency leads to a more efficient policy. Transparent policy reduces uncertainty and normally often increases the credibility of monetary policy (inflation expectations are in line with the central bank's intentions), which leads to more stable economic development. However, transparency may have some potential costs: (i) if the policy analysis is based on a fixed view of how expectations are formed, then the transparency of policy may affect expectations in such a way that the analysis loses much of its validity; and (ii) if the central bank gains new insights and wants to deviate from its previous intentions, this may be more costly if its previous intentions have been transparently announced.

Some of the above results do not appear in traditional models based on optimising behaviour. In these models the central bank knows the optimal policy, which it has no reason to deviate from, and transparency is often beneficial. RIXMOD is not based solely on optimal behaviour, partly because we do not know exactly what constitutes optimal policy. The justification behind many studies is to find a better policy. We think that the effects of non-optimal behaviour and non-rational expectations deserve more attention in future analysis. In this context we consider that models like RIXMOD are useful.

The results should not be taken to mean that we are sceptical about transparency. Transparency is generally good and its potential costs should not be exaggerated for several reasons. Some costs mentioned above are costs *ex post*. For instance, the consequences of a transparent policy if new insights lead to a change in the policy rule will depend on the nature of the new insights. The nature of new insights is, by definition, unpredictable and transparency (before the new insights are gained) may generate benefits instead of costs, ie *ex ante* transparency appears to be good.¹⁴ Moreover, the costs associated with changes in expectations that are caused by transparency tend to be temporary and the long-run gains should dominate. Note that it is the change in transparency rather than its level that gives rise to short-run stabilisation problems.

To sum up, we think that the analysis has shed some light on important issues. First, one should be aware of potential problems that (premature) transparency may cause and transparent announcements should be based on solid analysis. Second (and maybe of greater importance), there is the effect of transparency on expectations and credibility. We conceive that in a future re-calibration of RIXMOD we need to consider the possibility of more forward-looking expectations as a result of increased transparency. As a consequence of such recalibration we also have to consider a shortening of the targeting horizon.

References

Amano, R, D Coletti, and T Macklem, (1998), "Monetary Rules when Economic Behaviour Changes," unpublished manuscript, Centre for Economic Policy Research, Stanford University, and Federal Reserve Bank of San Francisco.

Barro, R J, and D Gordon, (1983), 'A Positive Theory of Monetary Policy in a Natural Rate Model.' *Journal of Political Economy* 91, 4 (Aug), 589-610.

Batini, N, and A G Haldane, (1998), "Forward-Looking Rules for Monetary Policy," Unpublished manuscript, Bank of England.

Dillén H, T Karlsson, and J Nilsson, (1997), "Disinflation and credibility effects: the Swedish case," Conference papers Vol. 4 - Monetary Policy and the Inflation Process, Bank of International Settlements, Basle, 1997.

Dillén H, (1998), "A re-calibration of the financial block in RIXMOD," unpublished manuscript, Economics Department, Sveriges Riksbank.

Drew A, B Hunt, and A Scott, (1998), "Efficient policy rules and the implication of uncertainty about potential output," unpublished manuscript Reserve Bank of New Zealand

Faust J, and L E O Svensson, (1997), "Transparency and credibility: Monetary Policy with Unobservable Goals," Seminar Paper No. 636, Institute for International Economic Studies.

Inflation Report 1997:3, Sveriges Riksbank.

Laxton, R, N Ricketts, and D Rose, (1993), "Uncertainty, Learning and Policy Credibility," in Economic Behaviour and Policy Choice Under Price Stability, October 1993, Bank of Canada.

Svensson, L E O, (1997), "Inflation targeting: some extension," working Paper No. 40, Economics department, Sveriges Riksbank.