The role of academics in monetary policy: a study of Swedish inflation targeting[1]

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The way in which monetary policy is conducted has changed considerably in recent decades. The process can be divided into two phases. The first involved changes in the general formation of policy (a change of regime), whereby low and stable inflation was given higher priority than before and central banks were made more independent. The second phase involves changes that in various respects have resulted in further developments of the new regime. Starting from experience of the Swedish inflation-targeting regime, this article describes the role academic research has played for the way in which monetary policy is currently formed. The article also presents a picture of the interplay between researchers and practitioners in the course of this process of change.

1. Introduction

In general terms, monetary policy can be said to be represented by a central bank's instrumental-rate decisions with a view to influencing aggregate demand and the rate of price increases in the economy. The way in which monetary policy is conducted has changed considerably in recent decades. The clearest difference from earlier periods is that policy now focuses to a greater extent on keeping *inflation low and stable*.

A consistent focus on price stability had admittedly existed earlier in a few countries, for example Germany. A broader application of this approach began with the realignment in the United States around 1980. Later, the tendency spread to other countries and in many cases, starting with New Zealand in 1990, it included the introduction of an *explicit numerical target* for inflation.

The results of the changes in monetary policy have been generally favourable. In addition to lower and less variable rates of price increases,

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many observers consider that the revised policy has contributed to the more stable economic development in general that has prevailed in many countries in the past ten to twenty years (see e.g. Bernanke, 2004, and Summers, 2005). In the light of the positive outcome in the period with low, stable inflation, today price stability is increasingly seen both as a goal in its own right and as a means of attaining other macroeconomic goals (see Bernanke, 2006).

This article has two main aims:

- The first aim is to shed light on the *role* played by academic research in the current formulation of monetary policy and thereby indirectly in the favourable economic development.
- The other aim is to depict the *interplay* between academics and practitioners, an interplay that has facilitated, perhaps even been a prerequisite for, the transmission of research results to central banks.

The first topic has already been mapped relatively clearly but here we strive for a picture that is more detailed than usual. Less has been done on the other topic, probably because economists have traditionally not been particularly interested in the specific processes whereby research is spread to and applied in practical domains.[2] Moreover, in disciplines that do focus on such processes, monetary policy is not a matter that has attracted much attention.

We believe that an account of the interplay between academics and central banks as regards the development of monetary policy may be more widely relevant, partly because the experience that has been gained can also be pertinent in other policy fields. There is, for example, the way in which monetary policy has been delegated and "depoliticised" and how the interplay with the world of research has assisted in the development of policy and in making it more understandable and generally accepted. Other policy fields also stand to learn from the prompt way in which new research findings have been utilised in the production of analyses and material for making decisions.

The article is arranged as follows. As a background to the subsequent discussion, section 2 presents a brief *historical survey* that describes both the problems which led to the introduction of an inflation-targeting policy in Sweden in the early 1990s and economic developments since then. In section 3, various *research findings* are discussed that have contributed to the development of Sweden's inflation-targeting monetary policy and an attempt is made to assess the ways in which contacts with the academics have been important. Section 4 describes the

[2] Two exceptions that to some extent deal with this issue are Blinder (2004) and King (2005).

forms for the *interplay between researchers and practitioners* that have facilitated the application of research findings in the practical domain. Effects in the other direction – practical policy's influence on academic research – are also considered to some extent.

2. A retrospect

In the early 1990s Sweden experienced a profound economic crisis. There were a number of specific causes but speaking more generally, the crisis can be seen as a dramatic finale to almost two decades of problems with stabilisation policy.

In the 1970s and '80s, policy in Sweden had for various reasons tended to be unduly expansionary and this had generated an environment that made it difficult to keep price and wage increases at a reasonable level. Thus, the policy regime with a fixed exchange rate did not serve, as had been intended, to keep inflation in line with the rate among Sweden's main trading partners. Instead, the development of prices and wages repeatedly undermined the fixed exchange rate. These costs crises were temporarily resolved by devaluing the currency, the Swedish krona, but this did not do away with the underlying problem – the excessively rapid upward trend in domestic prices and wages.

In this way the economy came to be characterised by "devaluation cycles" in which sudden "stops" alternated with powerful "goes". When yet another cost crisis meant that the fixed exchange rate finally had to be abandoned in November 1992 – after resolute but fruitless efforts to defend the krona and break the negative trend – it was clear that fairly drastic measures were needed to put the Swedish economy on a sounder footing.

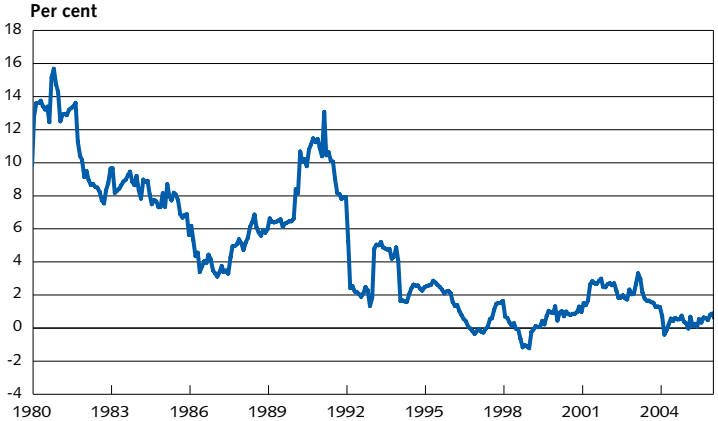
The solution was a *shift in the stabilisation policy regime,* involving a fundamental reformulation of the tasks assigned to monetary and fiscal policy. Having previously been unduly expansionary and a factor behind the rapid inflation, fiscal policy would now be required to ensure long-term stability and sustainability in the public finances. Monetary policy in turn was assigned a considerably more central role than before. With a flexible exchange rate, monetary policy's primary function would be to act more directly to keep the rate of inflation low and stable, in the first place by using the interest rate to influence aggregate demand.

Monetary policy's assignment was interpreted by the Riksbank as being to keep the annual change in the consumer price index (CPI) at 2 per cent as of 1995. In this way, when the inflation target was announced in 1993 Sweden became one of the first countries to introduce

an *inflation-targeting policy*.[3] Since then, this approach to monetary-policy has become increasingly popular and is now applied by more than twenty central banks around the world (see e.g. Berg, 2005).

Considering how the Swedish economy has developed under the inflation-targeting regime, it seems reasonable to conclude that this approach has worked well. Inflation has been low and considerably more stable than before (see Chart 1). Moreover, economic growth has fluctuated less and been stronger than in the 1970s and '80s. Employment has not developed as favourably, though the situation today is better than in the mid 1990s, shortly after the crisis. Moreover, the combination of the earlier devaluation policy and an ultimately unsustainable expansion of public sector employment is commonly considered to have simply postponed the need to tackle the Swedish economy's employment problems (see e.g. Lindbeck, 2003).

Chart 1. Inflation in Sweden 1980-2005
Per cent



Note. Inflation is measured as the twelve-month change in the consumer price index (CPI).

Source: Statistics Sweden.

3. Important contributions from research

The realignment of monetary policy in Sweden can be seen as an item in a broader international process. The change to a new policy regime occurred later in Sweden than in many other countries and under more dramatic circumstances. But once it had happened, Sweden was an early starter in deciding to focus policy on an explicit inflation target as well as in moving towards a high degree of openness and clarity in policy.[4]

[3] The early countries include New Zealand (1990), Chile (where a gradual lowering of inflation began in 1990 with the aid of annual inflation targets), Canada (1991), Israel (1991), the United Kingdom (1992), and Australia (1993). An interesting point in this context is that a price-stability target for monetary policy had actually been implemented briefly in Sweden in the 1930s, when decision-makers had been inspired by contacts with academics, in the first place through the work of the Swedish economist Knut Wicksell (see Berg and Jonung, 1999).

[4] See Eijffinger and Geraats (2006) for a study of how transparency has been developed in central banks. The study ranks Sveriges Riksbank as one of the world's most open central banks.

The following account has been structured by dividing the process of change into two phases. The first concerns changes directly connected with the *regime shift,* in Sweden's case with the transition from a fixed exchange rate to an inflation target and an independent central bank. The second phase concerns changes whereby the *new regime has been developed* in various respects. The review accordingly deals with insights and contributions from academic research that have influenced the regime shift as such (sub-section 3.1) and the subsequent development of the regime (sub-section 3.2).

3.1 The regime shift to an inflation target and an independent central bank

PRIORITY FOR LOW AND STABLE INFLATION

Academic researchers have put forward a number of theories about why inflation in many countries was so high in the 1970s and, in some cases, in the 1980s as well. A common feature of these theories is the basic premise that economic policy at the time was unduly expansionary and that a more restrictive policy would have been required to keep inflation low and stable. However, the theories differ in what they see as the reasons *why* policy was too expansionary. Simplifying somewhat, they can be said to start from the notion that the expansionary line had to do either with excessive optimism about the possibility of influencing real economic developments, that is, output and unemployment ("*output optimism*"), or with excessive pessimism about the possibility of controlling inflation ("*inflation pessimism*").[5] The research has tended to concentrate on conditions in the United States but the hypotheses are also applicable to many other countries.

One hypothesis is that economic policy decision-makers counted on the existence of a long-term trade-off between the real economy and inflation (see e.g. Taylor, 1992). This notion stems from a study by Phillips (1958) on UK data over many decades. It was assumed that the negative slope of the so-called *Phillips curve* implied that economic policy decision-makers could choose between different combinations of inflation and unemployment. It was believed that an expansionary policy could lead to lastingly higher output and employment, albeit at the price of higher inflation.[6]

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[5] This view is found in e.g., Bernanke (2004).

[6] Another hypothesis, which to some extent can also be said to focus on "output optimism", is that inflation (in the United States) was high because the economy's underlying potential growth rate was overestimated over long periods. Monetary policy was therefore more expansionary than was intended; see e.g. Orphanides (2002). This hypothesis, unlike those outlined in the text, does not envisage that the decision-makers' "model" was fundamentally wrong, simply that an error was made in the assessment of the economys' unutilised resources.

However, theoretical work in the late 1960s indicated that this notion did not allow for the fact that a systematically expansionary policy would also influence inflation expectations of households and firms (see e.g. Phelps, 1967, and Friedman, 1968). One reason why a rapid price rise can boost employment is that real wages fall, enabling employers to use more labour. But this effect depends on the inflation expectations of wage-earners being at fault initially. In time, wage demands will be adapted to the higher rate of price increases so that real wages are restored, whereupon employment and unemployment return to their earlier levels (often referred to as natural levels) while the higher inflation persists.

Today it is generally accepted that the long-term levels of output and employment are determined by factors that monetary policy cannot influence directly, such as the rate of technological development and how well markets function. This insight has had a major impact on how the approach to monetary policy has changed in recent decades.

An alternative hypothesis as to why policy was unduly expansionary is that decision-makers underestimated the role played by the level of demand in generating the higher inflation.[7] Statements by central bank representatives and politicians suggest that it was commonly believed that the high inflation was more or less exclusively due to specific non-monetary factors such as high increases in labour costs and rising costs for oil and other raw materials. This seems to have been accompanied by the view that inflation was relatively insusceptible to changes in demand and thereby, for instance, to monetary policy. This "inflation pessimism" meant that monetary policy decision-makers virtually abdicated from their role as inflation fighters. Hence, the well-known statement by Milton Freidman that "inflation is always and everywhere a monetary phenomenon" was not fully acknowledged at that time.

Academic research had accordingly generated valuable insights that were already circulating when the earlier way of conducting stabilisation policy failed to work in the 1970s and a search began for alternative approaches. One fundamental insight was that monetary policy is *incapable of permanently* influencing output and employment; another was that inflation is basically a monetary phenomenon, so that monetary policy *is capable* of steering inflation in the somewhat longer run.

[7] See Nelson (2005) for an analysis of this hypothesis about "monetary policy neglect" in the United States and the United Kingdom.

The promotion of low and stable inflation to be monetary policy's overriding objective has been accompanied by greater central bank independence vis-à-vis the political system. Arguments for a change in this direction were provided by research into the problem of economic policy's *time inconsistency* (see Kydland and Prescott, 1977, and Barro and Gordon, 1983). This research drew attention to the fact that keeping inflation down can be hard on account of difficulties in making binding commitments. The basic problem is that economic policy decision-makers' motives for the short run may conflict with a long-term ambition for low inflation. It will then not be easy to convince economic agents that policy will be maintained, that is, consistent over time (hence the term time inconsistency).

Suppose the government declares that inflation will be held at a low level in the future and that at first economic agents believe this will be the case. Inflation expectations in the economy will then adjust to this low rate of inflation. When this has happened, however, the decision-makers may be tempted to depart from the long-term ambition for low inflation. A temporary reduction of unemployment, for example, achieved by stimulating the economy and allowing inflation to move up, may be perceived as politically worthwhile, even though the benefits do not last. As inflation is low initially, moreover, the costs of a higher rate will not be considered all that serious. It is not hard to see that such a policy can be particularly tempting in certain situations, for instance in the run-up to an election.

However, as economic agents are aware that economic policy decision-makers can be tempted in this way, their inflation expectations will be geared from the start to this fact rather than to the low inflation that was aimed for initially. In this situation, the best option from the government's point of view will be to implement an accommodating policy, which means that the high inflation expectations will be fulfilled. The end result is a level of inflation above the low level initially declared – an inflation bias – without this leading to higher output or employment.[8]

This seems to be a fairly good description of what happened in Sweden in the 1970s and '80s. The recurrent assurances that inflation would be held down were simply not seen as credible. As a result, employers and employees did not perceive high wage increases as all that serious – they counted on a devaluation of the exchange rate if employment was

[8] The problem of time inconsistency can accordingly be seen as a further explanation, in addition to those discussed above, for the high inflation. Interpreted in this way, the problem is a variant of "output optimism", though without the assumption that decision-makers believe that output can be stimulated permanently.

endangered. One can say that there was a lack of sufficiently convincing arrangements in support of the ambitions that evidently existed to keep inflation down.

In the new regime in Sweden from the early 1990s, the responsibility for maintaining price stability was specifically assigned to the Riksbank. In the 1970s and '80s, with a fixed exchange rate that prevented monetary policy from being used to influence demand, it had not been clear where this responsibility rested. It was not until 1999 that the independent status of Sweden's central bank was confirmed in law but in practice, monetary policy was able to strive for price stability with a considerable degree of independence right from the start. This was probably an important reason why inflation expectations were adapted relatively quickly to the official inflation target. Economic agents evidently reckoned that a central bank with a clear target for inflation would not implement the same kind of accommodating policy as before the change of regime.

It is, after all, rather natural that the temptation to implement an excessively expansionary policy will be resisted more readily by a central bank than by a government that continually has to make decisions under pressure from important groups in the electorate. When this temptation has been removed, economic agents will count on inflation being kept low, which means that the inflation bias also disappears.

The influence from academic research on the decision on the Riksbank's independence is hard to gauge exactly. The change that came in the early 1990s was crucially bound up with the international context of which Sweden was a part – central bank independence was becoming the norm – together with the acute domestic crisis that restricted the freedom of action in economic policy. When the law that formally established the Riksbank's independence eventually was amended in 1999, there was a direct link to Sweden's undertakings vis-à-vis the European Union. But academic research was naturally an underlying factor in all these phases. Moreover, the problem of time inconsistency in economic policy received comparatively much attention in the Swedish debate in the early 1990s.

3.2 Subsequent development of the regime

THE MONETARY POLICY STRATEGY

The decision to introduce an inflation target and the Riksbank's high degree of practical independence by no means put an end to the discussion of monetary policy. Given the assignment to an independent central bank to focus on price stability, a good deal of work remained to be

done on the details of the monetary policy strategy.[9] In this context, the academic contribution mainly concerned formal analyses that helped to systematise and discipline ideas about the best way of conducting an inflation-targeting policy.

It was evident that many decision-makers right from the introduction of inflation targeting realised that policy ought to be conducted in a "flexible" manner. A one-sided focus on the inflation target could entail unnecessarily large fluctuations in output and employment. Despite this insight, many central bankers have tended to be cautious in their accounts of how an inflation-targeting policy takes output and employment into consideration. The well-known American economist Stanley Fischer, a former deputy head of the International Monetary Fund and currently governor of Israel's central bank, put it like this:

"Central bankers have a tendency to say that price stability should be the only goal of monetary policy, and to shrink from the point that monetary policy also affects output in the short run. That is not hard to understand, for explicit recognition of the powers of countercyclical monetary policy encourages political pressures to use that policy, with the attendant risk that inflation will rise. But it is also problematic and destructive of credibility to deny the obvious, as well as to undertake countercyclical policies while denying doing so." (Fischer, 1996, p. 26.)[10]

In the early years with the new regime, many central banks, not least the Riksbank, focused particularly strongly on inflation in their rhetoric. In the light of high and variable inflation, it was considered important to make it clear that stabilising inflation was the priority and to convince everyone that this was policy's overriding objective. In many cases, this rhetorical focus continued even when the inflation target started to gain credibility. This had to do in part with a concern that changing the focus all too quickly could lead to policy being regarded as erratic and changeable.

To illustrate how the Riksbank has gradually modified its description of the inflation-targeting policy, statements at different times can be compared with the implications from a theoretical model for an optimal inflation-targeting policy. For the comparisons presented here we have used a model by Lars Svensson (Svensson, 1997) that is simple but still serves to convey the basic principles.

[9] We use the term monetary policy strategy to denote how policy is conducted by a central bank within the framework of an inflation-targeting regime.

[10] See also Faust and Henderson (2004) for a similar argument.

At a very general level and simplifying somewhat, Svensson's model is made up of relationships that describe how the economy functions and indicate what the central bank ought to do.[11] Monetary policy is assumed to be a matter of minimising the following loss function:

$$L = (\pi - \pi^*)^2 + \gamma(y - y^*)^2, \qquad (1)$$

where γ measures the importance attached to stabilising output, y, in relation to stabilising inflation, π ($\gamma = 1$ denotes equal importance). The inflation target is represented by π^* and the long-term sustainable level of output by y^*. The equation implies that the central bank attains perfect target fulfilment when $\pi = \pi^*$ and $y = y^*$ (i.e., when $L = 0$).[12]

In more realistic models, it is assumed that the central bank aims to minimise (1) not just over a particular period but from today and forever. The central bank then has to tackle the problem of minimising the discounted sum of (1), summed from today to an infinite future. As future outcomes are not available, what this amounts to is that the central bank aims to minimise the *expected* discounted sum of (1). In simple terms, the optimal policy is then derived by solving this optimisation problem given the other relationships that describe how the economy functions.[13]

In the model, monetary policy is assumed to be capable (via the instrumental rate) of influencing aggregate demand (y above) in the next period. The duration of a period is not self-evident but is often assumed to be one year. Changes in demand lead in turn to changes in inflation in the following period. So in this model monetary policy is assumed to act with a time lag of two periods (years) before an interest rate adjustment has an impact on inflation. Note that the model's time lag is a consequence of how the economy functions and does *not* imply that for some reason the central bank postpones it response to deviations from the inflation target (π deviates from π^*). This means that no matter how much the central bank chooses to adjust the interest rate after a shock, it *cannot* restore inflation to the targeted level sooner than in two years time.[14]

The assumed behaviour in accordance with (1) clarifies that the central bank is not solely concerned with the development of inflation but also attaches some weight to real economic factors (as long as γ is not

[11] Our discussion closely resembles that in Apel et al. (1999). A more digestible and reader-friendly account of the model will be found in Svensson (1998).

[12] The assumed behaviour in accordance with equation (1) (or very similar variants) has a long tradition in monetary policy analyses (see e.g. Kydland and Prescott, 1977, Barro and Gordon, 1983, and Rogoff, 1985).

[13] The solution for the interest rate is sometimes called a monetary policy reaction function. If this function, instead of being based on an explicit optimisation, is just postulated, it is sometimes known as a simple rule. The best-known simple rule is the so-called Taylor rule (Taylor, 1993).

[14] This simplified assumption is perhaps slightly unrealistic but is not crucial for the points of principle we want to make here. What matters is not that the time lag is exactly two years but that there is a certain interval during which a monetary policy measure has no (appreciable) impact on inflation.

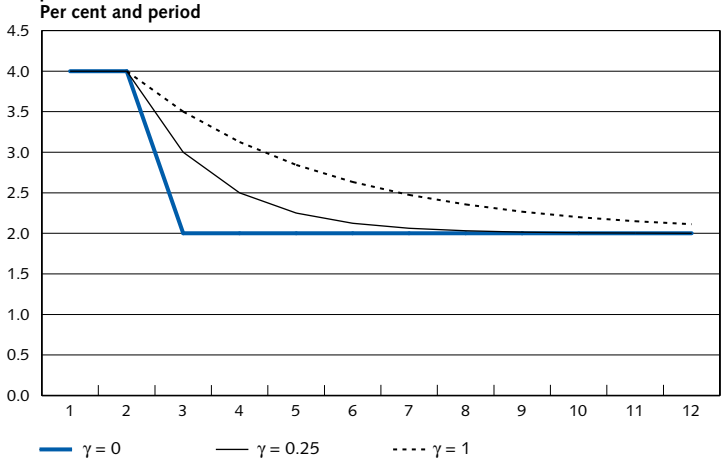
zero). At times, the goal of stabilising inflation (around π^*) may conflict with the goal of stabilising output (around y^*). If inflation suddenly increases, the central bank will want to counter this so that the discrepancy between π and π^* in equation (1) is reduced. This it does by raising the interest rate so that y falls below y^*.[15] However, the sooner the central bank wants to curb inflation (reduce the discrepancy between π and π^*), the more it has to tighten the interest rate at the cost of impairing the stability of output (an increased difference between y and y^*). It has been shown that in this situation there is an *optimal trade-off* in the sense that the central bank raises the interest rate just sufficiently for the deviation of y from y^* to relate in a particular way to the deviation of π from π^* (for details see Svensson, 1997). Exactly how the deviation of y from y^* should relate to that of π from π^* depends on the model's parameters, of which one is the weight the central bank attaches to stabilising output relative to stabilising inflation (γ).

Chart 2 illustrates how the central bank's optimal trade-off is affected by its *stabilisation policy preferences* (values of the parameter γ). The economy is in equilibrium initially, so that inflation is on the target (assumed here to be 2 per cent). For some reason inflation then suffers a shock and jumps up to 4 per cent. The central bank observes this and reacts with an interest rate increase. But as it takes time (two years) for this increase to affect inflation, the latter's rate continues to be 4 per cent for the next two years. What happens after that depends on the central bank's stabilisation policy preferences. If the bank considers that variations in output are not particularly serious (γ is comparatively low, in this example 0.25), inflation returns to the target fairly quickly (which means that when the central bank observes the inflation shock, it raises the interest rate fairly markedly). On the other hand, if the central bank is more averse to real economic fluctuations (γ is higher, in this example 1.0), it takes longer for inflation to fall back because the bank raises the interest rate more cautiously so as not to generate an unduly large deviation of y from y^*.

Briefly, then, a monetary policy that is derived from the assumed behaviour (1) will involve arriving at a trade-off between the goals of stabilising inflation and output, respectively. The optimal trade-off depends on how the economy functions and on the central bank's preference for tackling deviations in inflation relative to deviations in output. In this model, it can also be shown that the shock's magnitude matters for the speed of adjustment of inflation back to target.

[15] The situation we consider here is a permanent inflation shock, so that in order to eliminate the discrepancy between π and π^* the central bank is obliged to act.

Chart 2. Basic outline of inflation's adjustment with alternative stabilisation policy preferences
Per cent and period



Source: Own calculations based on Svensson (1997).

The model can also be used to illustrate the consequences of a monetary policy that focuses *solely* on keeping inflation stable. This corresponds to the case where $\gamma = 0$.[16] The thick solid curve in Chart 2 shows that in this case monetary policy concentrates on returning inflation to the target as quickly as possible (after exactly two years here).

How, then, do the Riksbank's descriptions of its inflation-targeting policy on various occasions tally with this model? As mentioned earlier, the bank's rhetorical focus on inflation was notably strong in the early years. The following excerpt from a speech in 1994 illustrates the early emphasis:

"If inflation deviates from the target, policy has to be designed to bring it back to a level which is in keeping with the objective of price stability. The time schedule for this is governed by the substantial lag before effects of monetary measures materialize. The interval before the full effect of a change in the instrumental interest rates shows up is commonly estimated to be between one and two years. … [P]olicy should be constructed so that forecast inflation one to two years ahead … is 2 per cent." (Bäckström, 1994, p. 6.)

This statement can be said to imply that in the event of a deviation, inflation is to be brought back on target as soon as possible. There is no mention of circumstances that might warrant a more protracted adjustment. In the model, this corresponds to a monetary policy with the restriction that $\gamma = 0$. In this case the central bank, as indicated above, invariably aims to have inflation in line with the target as quickly as it can and the size of the shock is of no importance.

[16] In the research literature, the cases with $\gamma = 0$ and $\gamma > 0$ are sometimes respectively called "strict" and "flexible" inflation targeting (see e.g. Svensson, 1997).

However, it was not all that long before the argument started to shift. The following description comes from a speech two years later, in 1996:

"[In] the construction of monetary policy, the development of production is an implicit consideration. … Excessively strong growth is liable to generate rising inflation, bringing this above the inflation target. That calls for a tighter monetary stance. Conversely, weaker growth [brings] … inflation down below the target, which by the same token warrants an expansionary monetary stance. This illustrates how, with an inflation target, monetary policy serves to smooth unduly large fluctuations in economic growth … ." (Bäckström, 1996, p. 4.)

In contrast to the preceding description, this underscores a need to stabilise real economic developments. However, the cited case is one where an interest rate adjustment automatically stabilises both inflation and demand and does not require an active trade-off between these objectives. In terms of our model, one cannot tell whether $\gamma = 0$ or $\gamma > 0$, though the reference to a need of real economic stabilisation does implicitly indicate that $\gamma > 0$.

One year later, the considerations behind monetary policy were formulated as follows:

"The inability of monetary policy to affect long-term employment and the fact that it should focus on maintaining price stability does not mean that its capacity to condition production and employment in the short run cannot sometimes be used for stabilising activity. Monetary policy can contribute to an economic recovery in so far as this is feasible without jeopardising price stability." (Heikensten, 1997, p. 5.)

Further steps were taken in 1999, when the Riksbank's Executive Board came into being and endorsed a clarification of how Swedish monetary policy is conducted. This clarification included a specification of various situations in which it might *not* be pertinent to adjust inflation to the target as quickly as possible after a shock:

"Monetary policy acts with a considerable time lag, with the largest effect on inflation in the interval of 1 to 2 years. … Monetary policy is normally conducted so as to be on target … one to two years ahead. Departures from this general rule may be warranted for two reasons. One is that the CPI can be pushed upwards or downwards in the relevant time perspective by one or more factors that are not considered to affect inflation more permanently. … The other reason for departing from the rule can be that a quick return to the target in the event of a sizeable deviation can sometimes be costly for the real economy." (Heikensten, 1999, pp. 8 and 16.)

This description of policy makes it clear that stabilising inflation could be at odds with stabilising real economic activity. Here, then, the ambition to stabilise the real economy is of direct importance for the formulation of monetary policy. In terms of our model one can say that the Riksbank describes a monetary policy characterised by a *time varying* value of γ; this parameter can "normally" be virtually zero but a positive value can sometimes "be warranted" (when inflation changes temporarily or there are sizeable shocks).[17]

In the following years, much of the discussion of monetary policy concerned the extent to which policy should be flexible and related to economic issues that then occurred. One such issue was how to deal with changes on the supply side of the economy that were likely to have a downward effect on inflation that was only transitory. Another was whether policy ought to take the development of asset prices into consideration (equity prices around the turn of the century and later on house prices). Published speeches indicate that the Riksbank's view was that a flexible policy was needed, i.e. there could be grounds for departing from the inflation target. The crucial reason for adopting this view was the risks involved and how they were evaluated.[18]

The next step was taken in 2006 when the Riksbank presented a further clarification of its monetary policy strategy, which it described as follows:

"Monetary policy is normally focused on achieving the inflation target within two years. … The two-year horizon can be interpreted as a restriction as to how much consideration can normally be given to real economic developments, a restriction which – like the specified inflation target – the Riksbank has imposed on itself to make the target of maintaining price stability credible. In certain circumstances, deviations from the inflation target can be so large that it is reasonable to allow inflation to return to the target beyond the normal two-year horizon, provided this does not undermine confidence in monetary policy. … The pace at which it is desirable to bring inflation back to target after a deviation depends on the disturbances the economy has been affected by." (*Monetary policy in Sweden*, pp. 13 and 14.)

A comparison with the earlier formulations about the need to consider the real economy and the principles embodied in our simple model makes two points. The first is that the Riksbank now considers that targeting inflation in the two-year perspective means *per se* that γ

[17] The clarification in 1999 meant that the Riksbank went further than most other central banks in its ambition to specify its strategy for monetary policy. One reason was that the (independent) Riksbank wanted to facilitate Parliament's evaluation of monetary policy and exaction of accountability.

[18] See e.g. Heikensten (2000, 2001).

is positive. There can still be a case for varying γ over time but its normal value is positive and there are "certain circumstances" that can call for an increased value. The other point is the *explicit explanation* as to why the theory's recommendations are not followed fully in practice: the Riksbank has *chosen* to adopt the two-year horizon as a "restriction" so as not to jeopardise the inflation target's credibility. This restriction does not occur in the theoretical model (where the optimal target horizon varies) for the simple reason that the model has no cause to worry about the policy's credibility (which is invariably taken for granted).

To sum up, since the inflation target was introduced in the early 1990s the Riksbank has gradually moved towards describing its monetary policy as a trade-off between stabilising inflation and the real economy, respectively.[19] This tendency has by no means been confined to Sweden. Virtually every country with an inflation target has followed a similar path from a strong focus on the target to a more open discussion about taking real economic developments into account.

Of course this does not mean that inflation-targeting theory is now indistinguishable from practice. Practical applications may depart from theory for a number of reasons. A notable example is that practice does not fully apply the theoretical models' *continuous* trade-off between different goals of stabilisation policy. All inflation-targeting central banks still employ some kind of target horizon for the attainment of their inflation target under normal circumstances.[20] This is presumably connected with the risk that the inflation target would otherwise be perceived to be too vague and, in a worst-case scenario, perhaps no longer even fulfil its function as a "nominal anchor".

TRANSPARENCY AND COMMUNICATION

"The received wisdom in central banking then was: Say as little as possible, and say it cryptically. But attitudes toward transparency have changed dramatically since then, and central banks around the world have opened up." (Blinder, 2006, p. 12.)

[19] An early account of this is found in Heikensten and Vredin (1998). They write: "We believe that the greater awareness among economists and politicians that inflation-targeting policy should be 'flexible' rather than 'strict' has helped to make monetary policy and an independent central bank more acceptable. Central banks have traditionally tended to deny that in practice monetary policy decisions are to some extent influenced by other considerations than long-term price stability. An effort is made to create an impression that low inflation is their sole concern. Like Fischer [(1996)], we believe that this strategy is unwise. It is rather the case that an open discussion about trade-offs of this kind can strengthen policy's credibility" (Heikensten and Vredin, 1998, p. 580.)

[20] Today, the central banks that are commonly considered to adhere most closely to the theoretical models for an optimal inflation-targeting policy are those in Norway and New Zealand. But even they do not described monetary policy as a completely continuous trade-off between the stability of inflation and output, respectively. Like the Riksbank, for example, they both start from a certain horizon for the normal fulfilment of the inflation target (see Berg, 2005).

There are a number of reasons why central banks have become considerably more open in recent decades and paid so much attention to the issue of communication. Virtually all public institutions have cause to be clear about how they function, the results they achieve and how much they cost. In a democracy, voters need this information to form an opinion about whether resources should be increased or reduced and, ultimately, whether the activity is necessary at all. This has always been the case for central banks but in Sweden's case it has become increasingly important for two reasons in particular. With the change to a flexible exchange rate, monetary policy decisions have a continuous and more direct impact on households and firms. This has made the central bank's operations a matter of wider concern and focused attention on it in the public debate. Moreover, the increased independence entails, as in many other countries, a greater need make monetary policy generally understood, accepted and legitimate. If the grounds for a central bank's actions are not understandable and broadly accepted, there is a risk of its *legitimacy* being undermined.

Another reason why clear communication with the outside world is important is that it can help to make policy *credible.* When the Riksbank presented the basis for its policy more clearly and began to publish its forecasts and other decision-making material, this made it easier not only to exact accountability but also for economic agents to follow what was happening continuously and be sure that decisions really did aim to fulfil the declared target and were not influenced by improper influences. In other words, clear communication served as a short-cut to credibility. This aspect of the need for transparency and communication was probably particularly important at a time when a new, low-inflation regime was being established.

A third argument in favour of central bank transparency and clarity is that the more understandable and predictable policy becomes, the less risk will there be of unnecessary economic shocks. Economic theory holds that interest rates for different maturities are interconnected, so that expectations of short-term interest rates (over which a central bank exerts almost perfect direct control) are important for the prevailing levels of long-term interest rates (over which a central bank exerts no direct control). It follows that by influencing expectations about short-term rates, a central bank can also indirectly affect longer-term rates. A greater influence on the entire range of interest rates (the so-called yield curve) obviously makes *monetary policy more powerful.*[21] Michael Woodford, a

[21] This actually applies not only to interest rates for longer maturities but also to other financial prices that are influenced by expectations, e.g. exchange rates and equity prices. However, this merely underscores that by influencing expectations a central bank can render monetary policy more powerful.

leading researcher in the field of monetary policy, has formulated this as follows:

"Insofar as the significance of current developments for future policy are clear to the private sector, markets can to a large extent 'do the central bank's work for it,' in that the actual changes in overnight rates required to achieve the desired changes in incentives can be much more modest when expected future rates move as well." (Woodford, 2005, p. 4.)

When the Riksbank started publishing numerical forecasts in the second half of the 1990s, the underlying assumption was that the instrumental rate would be unchanged in the forecast period. This approach was chosen by most of the few central banks that published forecasts at all in those days. The aim was to present forecasts and discuss potential risks in order to provide a solid basis for assessing the future path of interest rates. The fact that the bank's decision-makers endorsed the forecasts gave the aim greater force.

The approach the Riksbank adopted worked satisfactorily on the whole as far as communication was concerned. The assumption of a constant instrumental rate was pedagogic in that the forecasts spoke straightforwardly about the need for monetary policy action. If inflation was forecast to rise above the target, for instance, this indicated that an increase in the instrumental rate was called for and vice versa if the forecast was below the target.

However, the approach also posed problems that had to do with the fact that assuming a constant instrumental rate over a comparatively long period is not particularly realistic. Forecasts based on this assumption will hardly be credible at times when it is reasonable to suppose that over a longer period the instrumental rate will need to be raised or lowered. It also means, of course, that the forecasts will subsequently be difficult to evaluate.

In 2005 the Riksbank chose to base its forecasts on a more realistic assumption about future monetary policy, namely that the instrumental rate would follow market expectations. By then the inflation-targeting policy was firmly established and similar changes had already been made by the central banks in Norway and the United Kingdom.

Besides providing better conditions for making credible forecasts, the assumption that the interest rate will follow market expectations facilitates the central bank's communication of future monetary policy. Even if the market's expectations fail to coincide exactly with those of the central bank, by describing the extent to which this is the case the central bank can indirectly communicate information about its own expectations.[22]

Clarity about future monetary policy might be further enhanced by a central bank basing forecasts directly on its own interest rate expectations and publishing these, instead of making a detour via market expectations. This is, in fact, what the Riksbank has chosen to do from the beginning of 2007.[23] This is the approach that most academic researchers now recommend.[24] Many central bankers have been less enthusiastic to date, though they have recently become more interested in looking further into this matter.

One objection has been that with this method, central banks would "stick their necks out". It may be asked whether they are better informed about the economy than other observers. And what would the public reaction be if what actually happens were to differ markedly from the declared intention (because forecasts are uncertain and interest rate expectations are therefore revised over time)? That might be particularly serious if the deviations entailed substantial costs for economic agents. The Riksbank's view is however that the uncertain nature of assessments is now widely understood, as is the circumstance that new information is liable to entail appreciable changes in the conditions for monetary-policy decisions.

Another difficulty in this context is that today, in many central banks, including the Riksbank, decisions are made by a committee (executive board). This form of decision-making introduces the problem of arriving at interest rate expectations which represent the opinion of a group (as a consensus or a majority).[25]

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[22] In an interesting paper, Faust and Leeper (2005) show that drawing conclusions about a central bank's own interest rate expectations (and expectations about macroeconomic developments) is difficult if one has to rely solely on information about the bank's conditional forecasts (forecasts based, for example, on the market's interest rate expectations). As a rule, these forecasts do not provide sufficient information for conclusions about the central bank's own plans for monetary policy. That is why it is so important in such cases that the central bank conveys its view on the market's expectations.

[23] The Reserve Bank of New Zealand has used its own interest rate expectations for some time and today such expectations are also used by the central banks in Norway, the Czech Republic, and Colombia (Berg, 2005).

[24] See e.g. Faust and Leeper (2005), Svensson (2005), Woodford (2005), Blinder (2006), and Rudebusch and Williams (2006). Note, however, that not all scholars agree about this; for two exceptions, see e.g. Mishkin (2004) and Cukierman (2005).

[25] The fact that for more and more central banks, increased independence has been combined with arrangements for decision-making by a board or committee has in practice influenced the degree of transparency. The changes have been accompanied by the publication, in the form of minutes and speeches, of more information about the underlying deliberations. The ways in which this has influenced decisions and the effects on the legitimacy, credibility and clarity of policy have not yet been elucidated at all extensively by research.

The development toward more openness has had to do with a combination of changes in society in general – the rapid growth of financial markets and increased attention from media, for instance – and more specific factors such as greater central bank independence in many countries and, in Sweden, the move to a flexible exchange rate. The contribution from academics has mostly been to provide an impetus by stressing the value of transparency, clarity, and making policy assessable and accountable. For the Riksbank, matters such as these were frequently on the agenda in the second half of the 1990s when policy makers met their academic advisors (see section 4 for further details). Vivid discussions turned established practices inside out and demonstrated shortcomings in the methods that were being employed.

THE BASIS FOR MONETARY POLICY DECISIONS

A sound strategy and functional communication do not suffice to ensure that monetary policy contributes to a favourable macroeconomic outcome. This also calls for high quality in the analyses underlying the interest rate decisions. At the Riksbank, by far the most important part of the analytical work has been to produce forecasts of inflation as well as of factors, primarily real economic developments, that to a high degree steer inflation and can in themselves influence decisions.

In the past five years the empirical characteristics and forecasting potential of large macro models have undergone an almost revolutionary development.[26] Much progress has also been made with models that focus more directly on data regularity and have less of a basis in economic theory (time-series models). Various factors have contributed here, not least that powerful computers can perform highly advanced and time-consuming calculations and that macro models are now constructed to a greater extent on the basis of relevant theories about the behaviour of households and firms (micro foundation).[27]

Work on the assessment of macroeconomic development has been a part of the Riksbank's activities for a long time. With a fixed exchange rate, however, there was less need of detailed and developed forecasts. Still, this work was already being reinforced at the beginning of the 1990s and when the fixed exchange rate had to be abandoned and the inflation target was introduced, it gained weight in the internal organisation.

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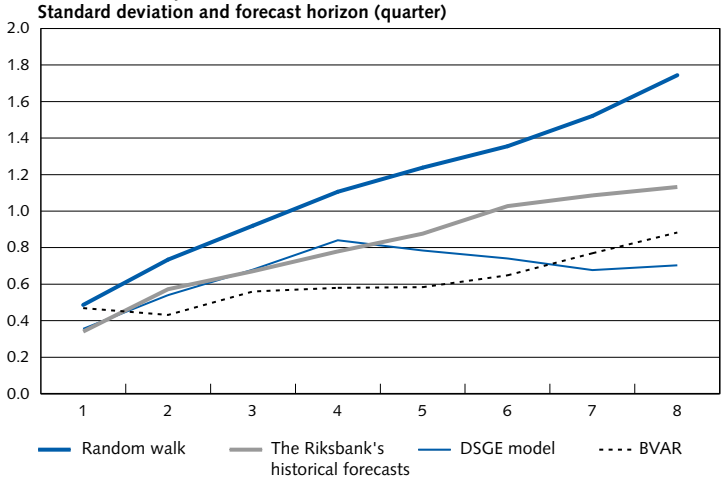
[26] In the research literature these models are labelled DSGE, which stands for Dynamic Stochastic General Equilibrium; they are based to a high degree on economic theory. See Sims (2002) for a discussion of developments in this field.

[27] Rebelo (2005) and Chari and Kehoe (2006) consider some of the research that has been important for achieving these micro foundations. This development can be said to stem from the well-known criticism by the American economist Robert Lucas (Lucas, 1976). In simple terms, he showed that unduly aggregated models (without micro foundations) were liable to produce misleading results concerning the consequences of economic policy.

The more traditional forecasting work (expert assessments unaided by models) was supplemented with efforts to produce a larger macro model and develop time-series models. The work on a macro model started from a version produced in the Bank of Canada that was judged to be applicable to conditions in Sweden. The model was used for a number of simulations but for various reasons it was never of much importance for forecasting. The time-series models were employed quite a lot in forecasting in the latter part of the 1990s.

In recent years the work of acquiring new and more appropriate forecasting instruments has had growing priority at the Riksbank. This has involved the recruitment of highly competent staff and led to the renewal and updating of the forecasting models to meet the requirements discussed above. An entirely new macro DSGE-type model has been installed; its basic structure relies on existing models developed by researchers in the United States and Europe but the Riksbank has managed to make a number of innovations. These include adapting the model's relationships and mechanisms to the fact that, compared with the US economy and the euro area, Sweden is much more dependent on the rest of the world, as well as the estimation method that are used to determine the values of the model's parameters.[28] Work has also been stepped up on the development and introduction of new, more modern time-series models.[29]

Chart 3. Accuracy of inflation forecasts from a selection of models
Standard deviation and forecast horizon (quarter)



Note. All the forecasts are produced in real time. i.e. using only the data that was available at the time of the forecast.

Source: The Riksbank.

[28] The model and its characteristics are documented in the Riksbank's Working Paper series; see Adolfson, Andersson, Lindé, Villani and Vredin (2005), Adolfson, Laséen, Lindé and Villani (2005a, 2005b) and Adolfson, Lindé and Villani (2005).

[29] See the box "GDP indicators" in Inflation Report 2005:3, pp. 35–39, for an account of the time-series models the Riksbank is using at present.

As mentioned above, the empirical characteristics of the new models (macro as well as time series) are considerably superior to those of their predecessors. Chart 3 presents an example of an evaluation of inflation forecasts (from one to eight quarters ahead) with some of the Riksbank's new models. The accuracy of the forecasts is measured as the standard deviation of the forecasting error.[30] The smaller the standard deviation, the more accurate the forecast (a perfect forecast that never errs at all has a standard deviation of zero).

The chart shows forecasts obtained with four alternatives: a random walk (the forecast is always the same as the outcome in the initial position), the Riksbank's historical forecasts (as published in the Inflation Report), a time-series model (here the forecasts with a Bayesian VAR model, BVAR[31]), and the Riksbank's new DSGE-type macro model.

First we can note that both the Riksbank's historical forecasts and the forecasts with the two model-based alternatives (BVAR and DSGE) are consistently more accurate than the random walk. It should be pointed out here that although the method is very simple, a random-walk forecast often proves hard to beat in evaluations of this kind. It will also be seen that the two model-based alternatives are at least as accurate as the Riksbank's historical forecasts in the Inflation Report. This suggests that there were times in the past when access to model forecasts of this type could have improved the Riksbank's predictions.[32] Another point is that the forecasts with the time-series model (BVAR) are superior to those with the macro model (DSGE) over the first six quarters but the latter is more accurate after that.[33] It is remarkable that a large macro model performs as well as this compared with an alternative that has been explicitly tailored to make accurate forecasts.

This general review prompts the conclusion that research in recent years, aiming at the further development of various empirical models, has clearly contributed to an improvement in conditions for producing sound forecasts and thereby ultimately to a monetary policy that functions properly. In the Riksbank's case, the research has been channelled both by the usual routes (publications, seminars and so on) and through

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[30] It is actually the root mean-squared error of the forecasts that is shown; this equals the standard deviation of the forecasting error if the forecasts are expected value accurate (if the mean of the forecasting errors is zero).

[31] VAR, which stands for Vector Auto Regression, denotes a type of time-series model that was introduced in economic research in the early 1970s by the American economist and statistician Chris Sims (see Sims, 1972). Today, VAR models are taught in almost every basic university course in applied macro analysis. BVAR, which stands for Bayesian Vector Auto Regression, is a VAR model where the parameters are estimated with a particular statistical technique (for an introduction to this technique, see e.g. Robertson and Tallman, 1999).

[32] The comparison is complicated by the fact that the Riksbank's historical forecasts are conditioned by the assumption that the instrumental rate is unchanged (see the discussion in the preceding section).

[33] That time-series models produce good forecasts mainly for the short run is in keeping with research in this field, see e.g. Robertson and Tallman (1999), Stock and Watson (2002), Wright (2003) and Hansson et al. (2005).

contacts between Bank economists and researchers that were established to a large extent as a result of the Research Department (see section 4 for further details). Models are inevitably simplifications and cannot take all the relevant information into account but they do facilitate forecasting and help to make it structured and comprehensible. The latter applies in particular to forecasts from macro models because, unlike those from time-series models, they can be interpreted in terms of economic theory.

4. The interplay of academics and practitioners

In the preceding section we considered how the design of monetary policy in Sweden (and other industrialised countries) has been influenced by various contributions from research. Much of what we discussed is familiar to central bank economists and academic researchers. As noted initially, there are fewer accounts of the interplay between researchers and practitioners that has facilitated, perhaps even been a prerequisite for, the transmission of the insights from academics to practical purposes. That is the topic of this section. There will also be some mention of influences in the other direction, from practice to research.

First, however, it should be borne in mind that some of the most notable changes in monetary policy have not resulted primarily from an interplay between academic researchers and central bank practitioners. Compared with a business enterprise, for example, a central bank is much more bound by *rules* imposed by the political system. The higher priority for price stability and the increased independence of central banks are examples of more general reassessments that have required decisions by governments and elected assemblies (see sub-section 3.1). While insights from academic research, together with practical experience, have no doubt been important for these reforms, their impact on practice has come via the political system and political decisions rather than in an (direct) interplay with central bank practitioners.[34]

There are, however, many other changes in monetary policy, above all in connection with the continuous development of day-to-day activities (see sub-section 3.2), where the consequences of this interplay have been more direct. The following account focuses on the forms for this interplay in Sweden in the period with an inflation target, that is, *after* the fundamental conditions for monetary policy had been established by the political system.

[34] Another matter is that conditions for monetary policy have changed markedly as a result of developments in the global economy in recent decades, perhaps above all the emergence of extensive global financial markets and the resultant massive cross-border capital flows.

4.1 Three types of interplay

To make it easier to follow the account, we have chosen to divide the forms for interplay between research and practitioners into three types:

- interaction
- formal collaboration
- internalisation

Interaction denotes the interplay of academic research and practice that occurs continuously in many fields and finds expression in an exchange of influences and ideas without involving more formal contacts and forms of collaboration.

Formal collaboration refers to contacts of various kinds between academic researchers and practitioners that are established in more organised forms. As with interaction, in formal collaboration there is still a dividing line between outsider academic researchers and insider organisational practitioners.

In the third type of interplay, referred to here as *internalisation*, central banks "internalise" the generation of knowledge, for instance by recruiting academic researchers to their own staff.

It should be emphasised that these types of interplay are not mutually exclusive. On the contrary, an effective practical application of research insights generated by *interaction* will be facilitated if a central bank has enhanced its competence through *internalisation,* not least if, as is increasingly common, the internalisation has included the central banks' decision-makers.

4.2 Examples from the Swedish inflation-targeting regime

INTERACTION

Through interaction, academic research gains inspiration and ideas from the practical side. Researchers then generate various types of insights and knowledge that can be used for the further development and improvement of practical activities. The process is completely informal and relies on voluntary initiatives.[35]

The theoretical foundation for targeting inflation came to a large extent from academic research, above all the emphasis that monetary policy's primary objective ought to be price stability and that central banks

[35] There is, of course, nothing new about this type of interplay. We have previously mentioned that in the 1930s monetary policy in Sweden was briefly focused on price stability, partly inspired by ideas from Knut Wicksell, active some decades earlier. Contacts with academics are a traditional feature of the central bank world, though in the post-war era this was not generally true of the Riksbank prior to the period considered here.

need to act independently of the political system. It seems, however, that the idea of focusing policy in practice on a numerical target for inflation took shape inside the central bank world.[36]

Once the inflation-targeting policy had been launched, however, academic researchers became very interested in the field and made important contributions to its development. Right from the start, this research was very much concerned with solving practical problems. Targeting inflation was a new phenomenon, with no "accepted practice" to go by, so central bank practitioners were interested in what research could show.

This is clearly illustrated by the research done by Lars Svensson (see sub-section 3.2). His close contacts with the Riksbank provided opportunities for discussions that benefited both parties: Svensson learned about the Riksbank's practical problems and his formal analyses helped to systematise and discipline the Riksbank's thinking.

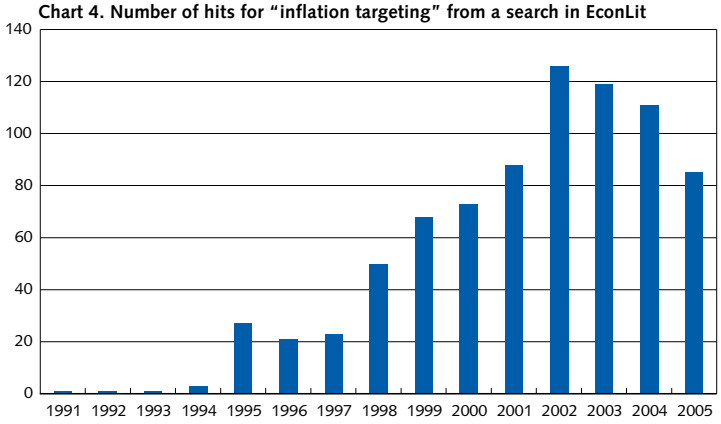
Research in this field has been extensive during the last 10–15 years and in the new regime with a flexible exchange rate the Riksbank has been able to utilise numerous contributions. Impulses also came via contacts with other central banks that had been working with a flexible exchange rate for some time, in the beginning in particular from the Bank of Canada.

As mentioned earlier, the traffic between research and practical monetary policy was not one-way – the influence was mutual. This is illustrated in Chart 4, which shows the time path for the number of hits for "inflation targeting" in one of the best-known data bases for scientific publications in economics. It was not until the mid 1990s – about five years after the initial introduction of inflation-targeting policy – that the subject began to attract more widespread interest in academic research. The first major international academic conference on inflation-targeting policy was held in Milan in 1994.[37] Academic interest grew rapidly, however, from the mid 1990s onwards.

[36] The decisive effort to introduce an explicit inflation target for monetary policy is said to have come from far-sighted officials in New Zealand's finance ministry and central bank. Sweden's relatively short-lived experiment with a price-stability goal in the 1930s was a thing of the past and can hardly have played a part – or even been known – when New Zealand decided to target inflation some 60 years later.

[37] The contributions to this conference are collected in Leiderman and Svensson (1995).

Chart 4. Number of hits for "inflation targeting" from a search in EconLit



Note. EconLit is the AEA's (American Economic Association's) electronic data base for scientific publications in economics.

Source: Own search in EconLit.

FORMAL COLLABORATION

The interplay of researchers and practitioners has not been confined to an informal exchange of ideas and influences. It has also found expression in various types of more established contacts, what we have chosen to call formal collaboration.

In formal collaboration one can say that in the generation of knowledge the Riksbank's primary role has been that of a commissioner and funder, accompanied in certain cases by the provision of personnel. Obviously, this is a different, more active role compared with interaction.

An example of formal collaboration is the system of scientific advisors the Riksbank introduced in 1990, when Lars Svensson, at that time professor at the Institute for International Economic Studies at Stockholm University, was attached to the Riksbank as an advisor in scientific matters. The introduction of inflation-targeting policy, of which there was still little practical experience, accentuated the Riksbank's need of academic support (see the section below on internalisation) and for that reason the Riksbank has since 1993 always had four or five scientific advisors, recruited from researchers abroad as well as in Sweden.[38]

The collaboration with scientific advisors was aided as the Riksbank adopted a more open attitude to the outside world. The publication of detailed material for decisions and an open public discussion, in speeches and other contexts, of problems confronting the bank opened up the possibility of a more detailed and in-depth dialogue with academics out-

[38] The Riksbank was not a pioneer in arrangements of this type. Similar solutions had already been found in Sweden in other policy fields, for instance labour market policy.

side the Riksbank. The discussions with advisors broadened in the latter part of the 1990s. Besides providing support for the bank's economists, topical policy issues were discussed with the decision-makers, drafts of speeches and reports were read and commented on, etc. The fact that a number of the senior officials had an academic background aided and stimulated the dialogue.

Another example of formal collaboration between researchers and practitioners is the conferences the Riksbank has arranged, often together with an academic institution. The first, Monetary Policy Rules, was held in 1998 together with the Institute for International Economic Studies at Stockholm University.[39] Since then, the Riksbank has arranged one or two conferences a year on subjects connected with monetary policy or financial economics. Examples are Inflation Targeting and Exchange Rate Fluctuations (1999), Asset Markets and Monetary Policy (2000), Central Bank Efficiency (2003), and Inflation Targeting: Implementation, Communication, and Efficiency (2005).

The conferences have regularly highlighted research that has practical applications for central banks. This is evident, for instance, from the concluding panels that have given researches and decision-makers an opportunity of discussing what the research findings have meant for policy. In this way, the conferences have promoted contacts and the dissemination of knowledge between these two worlds, elsewhere as well as in Sweden.

A third example is the Riksbank's occasional commissioning of external academic researchers to examine and elucidate a specific issue. Besides financing these projects, the Riksbank has often arranged for staff economists to participate in them. However, such commissions have not been particularly common. The only notable recent example is the collaboration with external researchers the Riksbank initiated in 2005 to broaden and deepen the analysis of the exchange rate's path and determinants.[40]

[39] The conference proceedings were published in a separate issue of Journal of Monetary Economics (Volume 43, No. 3, June 1999).

[40] Press release 28 November, 2005.

INTERNALISATION

One reason why external researchers have not been used more frequently to elucidate specific issues may be that the Riksbank has successively "internalised" the generation of knowledge and thereby gradually increased its own ability to undertake the necessary analyses. To understand what has driven this development, it may help to look briefly at how the change to a flexible exchange rate in November 1992 altered the conditions for monetary policy.

When the explicit target for inflation was introduced in the early 1990s, the demands on work at the Riksbank were very different from those that the fixed exchange rate had entailed. Under normal circumstances, the task of a central bank with a fixed exchange rate regime is rather simple and straightforward: the interest rate has to be set at such a level that currency inflows and outflows balance and the exchange rate is maintained.

Matters are different with a flexible exchange rate. The interest rate no longer has to defend a particular exchange rate relation. The central bank's monetary policy can concentrate instead, as the Riksbank has done since 1993, on steering inflation directly. Trying to hold inflation at a given level is, however, difficult because of the time lag before an interest rate adjustment affects inflation. The central bank has therefore to be able to produce forecasts of how inflation and other economic factors will develop in the future. The demands on the central bank's communication are also greater – policy must be explained to the outside world clearly and pedagogically.

It was therefore only natural that the change to a flexible exchange rate and an inflation-targeting policy triggered a more extensive reinforcement of the Riksbank's competence in economics or, as we have chosen to put, an internalisation of the generation of the knowledge. There are various ways of illustrating this.

A separate research department was set up in the Riksbank as of 1997 with the task of "developing methods for the analysis of issues of importance for the Riksbank's activities".[41] It was underscored that, besides producing research of good international standard internally, the new department should contribute to building a bridge between academics and practitioners. In this way, relevant findings could be channelled to the bank's activities and contacts could be established for purposes of, for example, making it easier to recruit qualified staff.[42]

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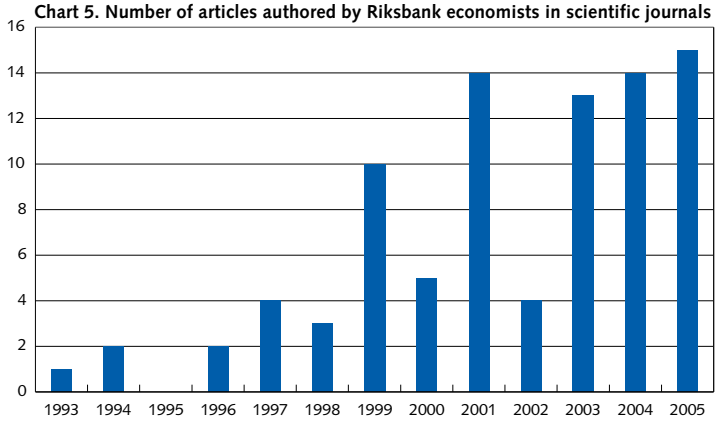
[41] Press release 5 December, 1996.

[42] These aims have to a large extent been achieved, see e.g. Jondeau and Pagès (2003) and St-Amant et al. (2005). The evaluation of Swedish monetary policy by Giavazzi och Mishkin (2006) also points out that the Riksbank is an organisation characterised by a high level of academic competence.

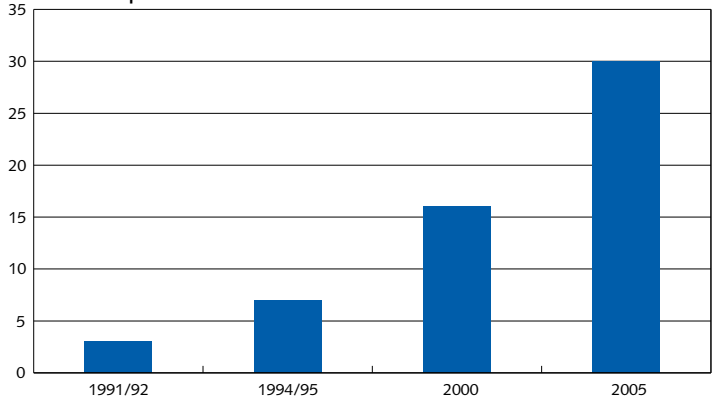
The "output" from internalisation can be measured by, for example, the number of articles written wholly or partly by Riksbank economists that have been accepted for publication in scientific journals. Chart 5 shows that in this respect, too, things have changed fairly dramatically in the past decade or so.

Chart 5. Number of articles authored by Riksbank economists in scientific journals



Source: The Riksbank.

Chart 6. Number of PhDs working in the Riksbank's monetary policy department at different points in time



Note. To make the bars commensurate with the present monetary policy department, adjustments have been made for reorganisations at the Riksbank.

Source: The Riksbank.

Another indicator of internalisation is the number of Riksbank employees who have a higher academic degree. Chart 6 shows how many economists with a doctor's degree were working in the monetary policy department on four occasions. In the early 1990s – before the change to a flexible exchange rate and an inflation-targeting policy – the number was rather small. During the 1990s it then rose rapidly. By 2005 the monetary policy department had 30 people with a doctor's degree – ten times the number in 1991/92. The pattern has been much the same in the other central policy unit, the financial stability department. The level of formal academic training has also risen among the policy-makers; since the new executive board was introduced in 1999, at least half of the members have held a PhD degree.

A similar process of internalisation has been in progress in many other central banks. Just as in Sweden, it has included analytical activities (Jondeau and Pagès, 2003, and St-Amant et al., 2005) as well as the policy-makers (Simmons, 2006). This process has been driven in general by the increased independence and transparency. In some countries the starting-point was the same as in Sweden, a changeover from a fixed to a flexible exchange rate, while others have a much longer academic tradition.

5. Summary and concluding comments

The way in which monetary policy is conducted has changed in recent decades. As regards policy's *general design*, two changes are particularly evident. One is that today, monetary policy in almost all countries is focused on attaining *low and stable inflation*. In many cases an explicit inflation target is used to demonstrate the commitment to price stability. Another change is that a growing number of central banks have been given a high degree of *independence* vis-à-vis the political system. These two changes in the general design of monetary policy are so far-reaching that they can be said to have resulted in a new regime.

Just what academic research has meant for this change of regime is, of course, difficult to tell. It is clear that research has generated insights that facilitated the fundamental reassessment that has been made. For the focus on low and stable inflation, there were the insights that monetary policy is not capable of permanently affecting output and employment and that inflation is basically a monetary phenomenon. From this it naturally followed that monetary policy's overriding objective should be price stability. For the greater independence of central banks, an important part was played by research into the problem of time inconsistency in economy policy. This research highlighted the fact that keeping infla-

tion low can be hard because of difficulties in making binding commitments. The problem could be greatly reduced by giving the central bank a clear mandate to conduct monetary policy independently. This type of fundamental reassessment of monetary policy naturally required political decisions and occurred more quickly in some countries than in others; but research did provide a firm foundation on which to base the new regime.

Given the new regime with independent central banks that focus on price stability, the way in which central banks work on monetary policy has also changed considerably. These changes have occurred in a number of important fields: how central banks perceive and describe their *monetary policy strategy* (how the interest rate is set), how they *communicate with the outside world*, and how they produce the *analyses on which interest rate decisions are based*. In all these respects we have attempted to present a picture, from the Riksbank's perspective, of the changes that have been made and how the course of events has been influenced by research.

As regards the monetary policy strategy, the contribution from research has mainly consisted in formal analyses, whereby thoughts about the best way of conducting an inflation-targeting policy have been disciplined and systematised. The academic analyses could not be ignored and kept central bankers on their toes. Today there is a broad consensus, among practitioners as well as academics, that inflation-targeting policy should be conducted "flexibly" and also communicated in this way.

Research has also clearly left its mark on central banks' external communication. The observation that policy needs to be assessable and accountable has underscored the need to make communication open and clear. It is partly thanks to the impetus from research in this field that there are good grounds for believing that the trend towards increased central bank clarity and transparency will continue.

Turning, finally, to the analyses on which interest rate decisions are based, much progress in recent years has been of specific importance for the practical formation of monetary policy. Researches have managed to develop new models with a better forecasting ability and theoretical underpinning, achievements that have been facilitated not least by the growing capacity of computers. That in turn has made it possible both to enhance the quality of central bank analyses and to make the analytical work more effective.

These changes have proceeded against the backdrop of an *interplay in various forms between practice and academic research* that has served as a driving force. One of the aims of this article has been to describe these forms of interplay. We found it appropriate to divide the forms into three types: interaction, formal collaboration, and internalisation.

The forms do not fit neatly into a chronological sequence but, simplifying somewhat, they can be said to match a pattern where central banks have moved from being an object for study and analysis by researchers (interaction), via a tendency to establish more formal links with the academic world (formal collaboration), to the internal "production" of academic research as an increasingly integrated component of the international research community (internalisation). A leading monetary policy researcher, Bennett McCallum, has commented on this integration as follows: "[I]n recent years there has been a large amount of interaction between central bank and academic analysts, so that today … one would be hard-pressed to tell, for many research papers, whether a particular one had been written by members of one group or the other." (McCallum, 1998, p. 12.)

We would like to conclude with some thoughts that our survey mentions only in passing or not at all. One interesting question is *why* academic research has happened to exert so much influence in the field of monetary policy. One hypothesis is that in recent decades stabilisation policy has been in what might be called a formative phase. When the Keynesian approach began to look shaky in the 1970s, a need arose to find new solutions. It was then only natural that the problem featured prominently in research and that practitioners and politicians were receptive to the insights research could provide. As we noted, academic research also played an important part in reaching the consensus that was ultimately achieved and which led to fundamental institutional changes. It is a striking fact that academics, not just in Sweden but internationally, were also engaged in questions associated with policy in the 1930s. That period, too, can be seen as a formative phase after the earlier regime had broken down.

Another explanation for the strong academic influence could have to do with the move to monetary policy independence and the clear focus on price stability. That has made it easier to "depoliticise" the issues and turn monetary policy into more of a technical matter. Perhaps that has made the analysis of issues more manageable than is the case in other policy fields. Moreover, the change, as in Sweden's case, from a fixed to a flexible exchange rate has called for a more elaborated analysis. Academic research has no doubt also been stimulated by the basic monetary policy issues in different countries being fairly similar.[43]

[43] An aspect of the interplay between academics and central banks that we have not considered at any length here is the importance of international contacts. Such contacts have a time-honoured tradition in the central bank world, as can be seen, for example, from the regular meetings and seminars under the auspices of the Bank for International Settlements (BIS) and the International Monetary Fund (IMF) and from the extensive joint training programmes.

It is also of interest to consider the lessons which the developments in connection with monetary policy may have for other policy fields. In our opinion, the combination of making an institution accountable for attaining a particular objective, guaranteeing independence in the performance of the task, and evaluating goal fulfilment should be applicable to the implementation of many more public activities than is presently the case. Much of the experience that has been acquired in the central bank world as regards distinct goals, public scrutiny, and accountability should be of value in this context.

A more independent status has heightened the importance of central banks being capable of motivating what they do and pointing to distinct results. But besides being democratically important by making it easier to exact accountability, openness has played a part in how activities have been developed. Continuously scrutinised, the Riksbank and other central banks have been obliged to strive for a leading position in every aspect of their activities. This has generated a strong need both to develop activities – by recruiting competent staff and not hesitating to adopt new methods and approaches as they arise in the academic world – and to undertake them effectively. It is not least against this background that we believe that other policy fields stand to benefit from a development that resembles what has happened in monetary policy.

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