EUROPEAN CENTRAL BANK

EUROSYSTEM

MONETARY POLICY

BCE ECB EZB EKT EKP

20

A JOURNEY
FROM THEORY TO
PRACTICE

AN ECB COLLOQUIUM
HELD IN HONOUR OF
OTMAR ISSING
16-17 MARCH 2006

EUROPEAN CENTRAL BANK

EUROSYSTEM

MONETARY POLICY

A JOURNEY FROM THEORY TO PRACTICE

AN ECB COLLOQUIUM
HELD IN HONOUR OF
OTMAR ISSING
16-17 MARCH 2006

CONTENTS

FOREWORD

On 16-17 March 2006, the European Central Bank organised a colloquium in honour of Otmar Issing, after his eight years in the Executive Board of the European Central Bank (from May 1998 till May 2006). This volume collects the five papers presented at the colloquium, as well as the various contributions to the three panel discussions and the speeches on the occasion of the conference dinner. The truly exceptional list of participants, a global "who-is-who" in central banking and Academia, is a tribute to Otmar Issing's invaluable contribution to the success of the European Central Bank and its monetary policy strategy. The papers and the panel discussions cover a wide range of monetary policy issues that are close to Otmar's heart: the role of pre-commitment and the Bundesbank's experience with monetary targets, the importance of anchoring inflation expectations, the role of asset prices in monetary policy, the focus on price stability and the ECB's experience with monetary policy in an uncertain and challenging environment. The volume covers both the art and the science of central banking. Also this reflects Otmar Issing's own journey from being a Professor at the University of Würzburg to becoming the Chief Economist first at the Deutsche Bundesbank and then at the European Central Bank. Otmar Issing has been a constant source of inspiration for the European Central Bank. I am sure this book will equally be a very useful source of inspiration for central bankers and academics over the world.

Jean-Claude Trichet
President of the European Central Bank

SESSION I

PRE-COMMITMENT AND GUIDANCE LESSONS FROM THE BUNDESBANK'S HISTORY

MANFRED J. M. NEUMANN[1]

I   INTRODUCTION

Let me start with a personal note. We have come together today to honour Otmar Issing, an eminent scholar and central banker, who has served as chief economist of the European Central Bank since the Bank's foundation and who in this capacity has put his stamp on the Bank's strategy of monetary policy making. He has impressed us with the strength of his convictions as regards the importance of the price stability objective and of the role of money.

As you know, Otmar Issing entered the exciting scene of central banking not in 1998 but much earlier, namely in 1990, when he was appointed board member and chief economist of the Deutsche Bundesbank. Should you ever look up the Bundesbank's Annual Report for the Year 1990 you will find that Otmar Issing took up that post on October 2 instead of October 1. Now you may wonder what did Otmar do on October 1 – was that day a Sunday or was it one of the too many German holidays? Well, my research tells me that October 1 was a Monday. Apparently, Otmar took a "blauer Montag" or a let's say a premature Bank holiday. I assume he needed a little time to prepare for the big step from armchair economics of academia to the down-to-earth work of practical men.

In contrast to eight years later, Otmar was certainly not expected to design a new policy concept for a new institution. Rather, he was confronted with the Bundesbank's established tradition of policy making and was expected to continue along the lines that had been paved by Helmut Schlesinger since the mid-1970s. In 1974, the year I met Otmar for the first time at Karl Brunner's Konstanz Seminar on Monetary Theory and Monetary Policy, the Bundesbank's governing council decided to start the new strategy of publicly announcing annual monetary targets.

Public monetary targeting was used by the Bundesbank for more than two decades to provide guidance with respect to its intended policy course and this way to influence the public's expectations of inflation. In this brief presentation, I will first recall the background to the introduction of formal targeting. That was the need for a nominal anchoring of monetary policy after the break-down of the Bretton-Woods-System of fixed exchange rates. Next, I will review the Bundesbank's track record by examining the largest target misses. And, finally, I will discuss why the Bundesbank has been able to preserve its credibility even though missing the target has not been a rare event.

---

[1] Institute for International Economics, University of Bonn, April 2006.

2   THE BACKGROUND

The background to the adoption of monetary targeting was the systemic need for a reorientation of monetary policy after the final break-down of the Bretton-Woods-System in 1973.

The move to flexible exchange rates freed central banks from having to stabilise the exchange rate vis-à-vis the dollar and provided them with the potency of controlling domestic money and credit creation. However, along with this potency goes the burden of responsibility for securing domestic price stability. It is not easy to fulfil this task successfully because in the absence of a binding exchange rate constraint monetary policy is not anchored anymore. Since rational private agents understand that the independent central bankers are free to choose any monetary expansion path, excessive inflation expectations may build up if the authorities are not able to provide credible guidance. To put rhetorical emphasis on the objective of price stability is not enough because rational agents will monitor the policy implementation as closely as possible in order to learn about the underlying objective function. If they get the impression that the structure of that function is not conducive to maintaining price stability, inflation expectations will not settle at the officially desired level but go beyond, and this, in turn, will force rational authorities to validate the excessive expectations by a sufficiently high level of money growth in order to avoid the generation of a recession. The unfortunate equilibrium outcome of this policy game will be a persistently higher inflation than desired as was proven analytically by Barro and Gordon in 1983.

In the mid-1970s this analysis was not known, of course. Nevertheless, quite a few central bankers in Germany and, by the way, in Switzerland appeared to understand that the regime change from fixed to floating rates required a new policy strategy in order to be able to check inflation expectations. They concluded that it would be useful, if not necessary, to commit to some type of rule that credibly constrains monetary policy. Though Milton Friedman's famous k-percent rule was dismissed, as it does not allow for any contingencies, it served as an intellectual guide. In fact, the Bundesbank's governing council had held a confidential debate about its pros and cons as early as 1970 (Neumann, 1999). Similarly, German academics and the German Council of Economic Experts, in particular, began discussing monetarist analysis and argued in favour of a steadier, rules-based monetary policy oriented to the medium run.[2]

The historic opportunity to start the new policy regime of monetary targeting came in 1974 when, due to the quadrupling of the oil price and a sharp monetary deceleration, the German economy began cooling down. The Bundesbank desired to switch towards easing without giving labour unions a signal for higher wage demands. Announcing a monetary target appeared to be the solution.

---

[2] See Richter (1999) for a detailed account.

3   REVIEWING THE TARGETS

The first annual target was a point target of 8 percent for the year 1975, applied to the central bank money stock. That target aggregate was a variant of the monetary base, summing private cash holdings and bank reserves, except that the reserve component was calculated by applying stylized reserve ratios instead of the actual reserves ratios. In its first announcement, the Bank declared that it intended to finance the growth of the economy at a "declining rate of inflation" and that the success would depend on whether the Bank's projection would be taken into consideration in wage and price decisions. Unfortunately, the target was overshot by 2 percentage points. In fact, it is easy to miss a point target if some unaccounted shock hits during the last month of the targeting period. Another drawback of a point target is that it does not constrain much the path of money creation during the course of the year.

3.1 AVERAGE GROWTH TARGETS 1976-78

This experience led the Bank to switch to average growth targets. For the years 1976-1978 annual average targets of 8 percent were announced; see the dashed line in Figure 1. But again, each of them was overshot, by 1 percentage point in 1976 and in 1977 and by even 3 percentage points in 1978. The main reason, it seems, was less a failure of implementation techniques but a deliberate subordination of money supply control to exchange rate policy. A huge wave of inflation in the U.S., with inflation rising from 5 percent in late 1976 to 9 percent two years later, had generated a dramatic loss of confidence in the dollar, driving the effective exchange rate of the dollar down by about 20 percent. All major central banks reacted by intervening heavily in support of the dollar. The net contribution of accumulated German intervention to central bank money growth

Figure 1 Monetary targeting 1976-1998

percent
- central bank money stock
- money stock M3
- annual average target
- fourth quarter to fourth quarter target corridor
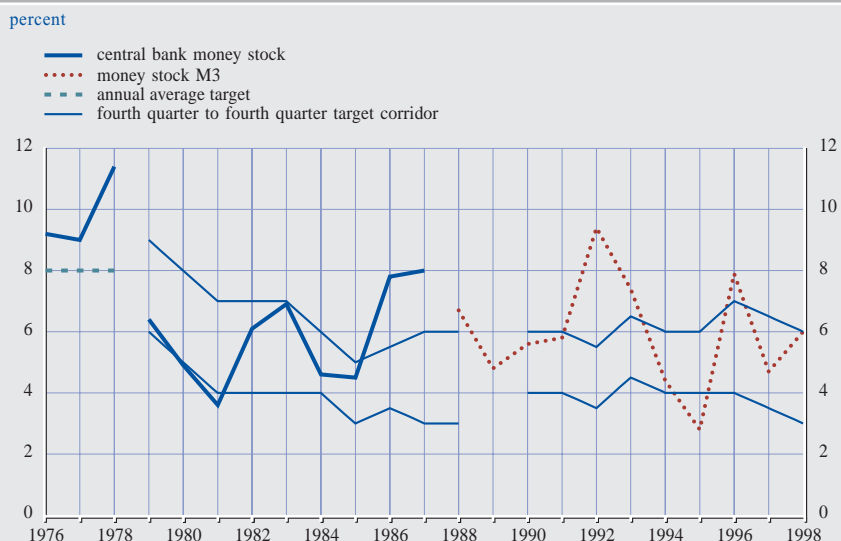
amounted to 21 percent in 1978, at a time when the target aggregate was supposed to grow by no more than 8 percent.

The unfortunate experience of a repeated overshooting of the annual targets led to a heated debate in the Bundesbank's governing council on whether it was time to end the experiment of targeting. And the discussion was echoed in the Swiss National Bank that had not fared better with its approach to monetary targeting. While the Swiss National Bank suspended money control for a year, by announcing an exchange rate target for the year 1979, the Bundesbank' governing council eventually decided to continue the practice of monetary targeting. A decisive argument was that the targeting procedure might and should be used as a shield against the dominance of exchange rate considerations, within the Bank as well as outside. This appeared to be the more important as the start of the European Monetary System (EMS) was imminent. Note that the council accepted the new exchange rate system with great reservations because the EMS was understood as a challenge to the Bundesbank's status of independence and to its power of safeguarding the internal value of the D-mark. An additional argument in favour of continuing the targeting experiment resulted from the historic coincidence that the Bank considered a turn-around of monetary policy to a significantly lower money growth overdue. To give up targeting under those conditions appeared to be the wrong signal.

3.2 CURRENT GROWTH TARGETS

Thus it was decided to set a lower target rate for 1979 but to switch from average targets to targets that indicate the desired growth of central bank money for the course of the year. The new target rate was defined as the planned growth rate linking the average central bank money stock of the fourth quarter of a year with the corresponding fourth-quarter average of the next year. In addition, the Bank announced a target range instead of a single number and explained that "depending on domestic economic developments on the one hand and the movement of exchange rates on the other it would endeavour to aim more at the lower or at the upper limit of the target range" (Report for the Year 1978, p. 29). The new procedure became the Bank's standard practice.

Figure 1 shows the target ranges, represented by the dashed lines, and the track record of current growth targeting for the twenty-year period 1979-1998. To be sure, at first sight the track record is not impressive at all given the observed high volatility of actual money growth. Moreover, the target ranges were over- or undershot in nine years out of the twenty between 1979 and 1998. This, it can be argued, should put a question mark on the claim that the Bank's strategy of monetary targeting was a useful devise for controlling inflation.

However, in evaluating the track record two obvious considerations have to be taken into account.

First, money growth is not an end in itself but is an intermediate variable that affects the rate of inflation and the business cycle among other variables. Even if price stability were the only objective of monetary policy, stabilizing the rate

of inflation would require moving the money growth rate in order to make up for undesired effects of other shocks. The resulting volatility of money growth would then reflect the responses to those shocks.

Second, in accordance with its mandate the Bundesbank considered price stability the overriding medium-run objective. At the same time, the Bank did never completely ignore secondary objectives, such as the stabilization of the business cycle and, probably more so, the stabilization of the mark's exchange rate vis-à-vis the dollar and EMS-currencies.

It is useful to briefly examine the largest misses. They happened in 1986/87 and in 1992.

1986/87

In 1986 and 1987 the targets were overshot by about 2 percentage points each year. Why did it happen? Recall that due to the rather expansionary fiscal policy of the first Reagan-administration the dollar had risen steeply during the early 1980s, reaching the maximum value of 3.47 mark (i.e. 1.77 euro) in early 1985. To fight this overvaluation the G-5 countries concluded the famous Plaza-agreement and tried to bring the dollar down by concerted intervention. Even though the U.S., Germany and Japan did not cooperate closely, the operation was a success. The dollar fell to 2.50 mark by the end of 1985 and continued to decline throughout 1986 (to 2 mark by year-end). In parallel, the prices of imported raw materials and energy fell in Germany by 10 percent in 1985 and by another 20 percent during 1986.

As a result, the German rate of inflation declined during 1986 from 1.5 percent to even minus 1 percent by year end, hence it undercut the Bundesbank's normative rate of inflation of 2 percent. In the cautious language of the Bank that was an "almost spectacular" success (MB March 1986, p. 6). And this experience is at the heart of the explanation of why the Bank decided not to avoid an overshooting of the target range (of 3.5 to 5.5 percent) during 1986. It responded to the unexpectedly strong fall of the inflation rate by a deliberate switch to reflation. Thus the overshot of 1986 was not an accident.

The reasons for the target miss in 1987 were different. The continued decline of the dollar raised concerns as regards competitiveness in Europe and Japan. Thus, the Bundesbank and other central banks began to buy dollars at larger scale to stop the decline, and this was formally endorsed by the Louvre-accord of February 1987. In addition, the Bundesbank was forced by EMS-rules to conduct supporting operations vis-à-vis EMS-currencies that tended weak together with the dollar. At the end of the day, the accumulated net-purchase of external assets blew up central bank money creation; in fact, it exceeded it by 40 percent. In principle, the Bundesbank could have tried to redress money growth more strongly, but the attempt would probably have turned out counterproductively as it had required raising interest rates. And that was out of the question, the more so after the stock market crash of October 1987.

While the Central Bank Council acknowledged that the overshooting of the target for 1987 was mainly caused by the subordination of monetary policy to exchange rate aims, it was disappointed and – in parallel to 1978 – the abandonment of monetary targeting was seriously considered. A group of academics, including Otmar Issing, wrote a letter to the editor of the Frankfurter Allgemeine Zeitung in support of continuation and, thereafter, the council decided to continue monetary targeting – but to replace the central bank money stock by the broadly defined money stock M3 as target aggregate. The argument was that the overshot to some extent was due to the fact that currency in circulation had grown much faster than (demand and time) deposits and that had mattered because the definition of the central bank money stock gave a five times larger weight to the currency component than it is the case with M3.

1992

The largest target overshot since the start of targeting occured in 1992. It amounted to 3.9 percentage points, "an all-time high" as the Bank candidly noted in its annual report. To understand why that happened it is to be recalled that the German unification of late 1990 had unleashed a boom, pushing economic growth in 1990/91 up to about 4 percent and driving up the rate of inflation from 2.7 percent in 1990 to above 4 percent in early 1992. Liquidity was ample because the politically negotiated currency conversion rate was biased towards an overvaluation of the East-German mark. And this had forced the Bundesbank to extend in one stroke the money stock M3 by almost 15 percent, while the gross domestic product of the "New Länder" was less than 10 percent of the West-German product.

To be sure, the overshooting of the target would have come out smaller, had the Bundesbank in view of the high inflation level decided to replace in the calculation of the target the normative rate of inflation by the expected higher rate. But the decision to stick to the normative rate, hence to announce an unrealistically low monetary target, was considered necessary to keep credibility. As Issing (2005, p. 57) notes, sticking to the normative rate of inflation "…conveyed the central role of the inflation norm in the strategy and the fact that this was not subject to short-run revisions simply because of the arrival of shocks – not even exceptional ones."

In view of the rising inflation, the Bundesbank had started already in 1991 to drive up interest rates, at a time when outside Germany interest rates began to decline. Unavoidably, the divergent trends in interest rates led to tensions in the EMS during 1992 and culminated in the crisis of September 1992 that exited the pound and the lira from the EMS. From hindsight, a revaluation of the mark vis-à-vis EMS-currencies in 1991 might have helped but it was not negotiable at the time. In the attempt to soften, if not to avoid, the EMS-crisis, the Bundesbank intervened during 1992 at unprecedented scale. The net-acquisition of foreign assets reached 69 billion mark, thus exceeded concurrent base money creation by almost 80 percent.

To sum up this brief review of historic cases: the largest misses of monetary targets were caused by the Bundesbank's temporary subordination of monetary policy to exchange rate considerations either with respect to the dollar or/and

with respect to EMS-currencies. An exception was 1986 when the Bank went for reflation but avoided a consistent increase of the target range.

4   GUIDANCE

When one checks the by international comparison impressive inflation record (see Figure 2), one cannot avoid the conclusion that the Bundesbank's monetary targeting has served its purpose well. Apparently, the procedure has enabled the Bundesbank to combine the credibility of its commitment to low inflation with the flexibility of occasional deviation from announced promises to achieve other aims – "pragmatic monetarism" as the central bankers at the Bundesbank used to call it.

But isn't this a puzzle? Why was the Bundesbank able to get away with its practice of deviating time and again from announced targets? Why was it able to keep nevertheless the credibility that it truly cared about price stability?

The answer, I believe, is that the Bundesbank was the first central bank that provided the public with an intelligible numerical framework that facilitated the evaluation of its policy course from the outside (Neumann, 1999; Lohmann, 2003). Naturally, the population at large does not understand much about central banking and hardly knew anything about monetary targeting or its implications for inflation at the time. But there is and was an elite audience consisting of bankers, economists and financial journalists. By offering public monetary targeting, the Bundesbank invited to be put under closer scrutiny as regards its aims, its model of how the economy works, its implementation procedures, its capability to do a good job. It enabled the elite to differentiate more closely from the outside between monetary policy actions that were defendable and those that were not.

Figure 2 Inflation record 1974-1998
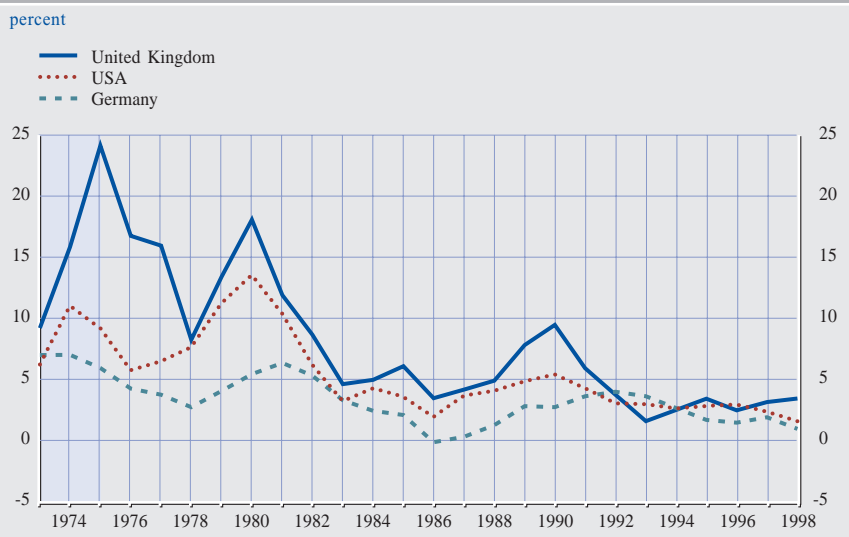
Facilitating intellectual control is raising the risk of being punished if one fails. And the elite are able to punish severely by addressing the broader public as well as by using the exit options in financial markets. When the elite favour an uncoupling of inflation expectations from the central bank's desired level, this generates a utility loss for central bankers, part of which is the loss of reputation. The elite monitor and evaluate the central bank's actions and explanations and can make life very difficult for central bankers if they dare to renege on promises.

If this reasoning has empirical content, it implies that the Bundesbank by introducing the more transparent numerical framework of monetary targeting raised the likelihood and the size of potential punishment. While it may sound masochistic, it was not because, first, no punishment was to be expected if the Bank was frank about its actions and behaved consistently, and, second, monetary policy can be conducted less aggressively when the elite understand the rationale of the policy. Thus, the institution of monetary targeting served to create and maintain trust and credibility and this way the power of the Bank as an independent player in the policy game vis-à-vis the unions and the public at large as well as the government. At the same time it enabled the Bank to deviate temporarily from targets without punishment, provided it was able to convince the elite that the action was defendable.

To be sure, the institution of targeting as such was not sufficient. The Bundesbank needed to provide detailed reasoning for the numbers it offered and for the final outcomes. And that the Bank did from the outset. Each year the Bank explained in detail what its evaluation was as regards last year's target fulfilment, on which expectations the target range for the following year was based on and on which particular developments it would aim at the upper or the lower region of the range. During the course of the year the Bank reported and commented on ongoing developments and the degree of target fulfilment and mid-year the Bank checked officially whether the target was to be kept or revised.

Finally, it may be noted that the Bundesbank, if not all times, for most of the time was quite frank in its explanations. Remember that the Bank had no scruple to point out that the target overshot of 1992 was an all-time high. It fits that the Bank even admitted lack of knowledge on several occasions.

5   CONCLUDING REMARKS

As a final remark, I have tried to show that the Bundesbank's concept or strategy of monetary targeting has served its purpose well as a devise for keeping inflation expectations checked. The picture of monetary targeting I have drawn may have come out sharper than the actual practice has been. What counts at the end of day is that the Bundesbank managed to supply an impressively stable currency over decades.

REFERENCES

Barro, R. J. and Gordon, D. B. (1983), Rules, Discretion and Reputation in a Model of Monetary Policy, *Journal of Monetary Economics 12*, pp. 101-121.

Deutsche Bundesbank, *Annual Report*, various years.

Deutsche Bundesbank, *Monthly Report*, various years.

Issing, O. and Gaspar, V. (2005), *Imperfect Knowledge and Monetary Policy*, Cambridge: Cambridge University Press.

Lohmann, S. (2003), Why Do Institutions Matter? An Audience-Cost Theory of Institutional Commitment, *Governance: An International Journal of Policy, Administration, and Institutions* (16), pp. 95-110.

Neumann, M. J. M. (1999), Monetary Stability: Threat and Proven Response, Deutsche Bundesbank (ed), *Fifty Years of the Deutsche Mark*, Oxford: Oxford University Press, pp. 269-306.

Richter, R. (1999), German Monetary Policy as Reflected in the Academic Debate, Deutsche Bundesbank (ed), *Fifty Years of the Deutsche Mark*, Oxford: Oxford University Press, pp. 525-74.

THE DANGER OF INFLATING EXPECTATIONS OF MACROECONOMIC STABILITY: HEURISTIC SWITCHING IN AN OVERLAPPING GENERATIONS MONETARY MODEL[1]

ALEX BRAZIER, RICHARD HARRISON, MERVYN KING, TONY YATES[2]

FOREWORD BY MERVYN KING

I first met Otmar Issing on Monday 14th September 1992 at the Bundesbank in Frankfurt. The mission was to persuade Otmar Issing and his colleagues that an exchange rate of DM2.95 to the pound was appropriate. Sterling had, in the preceding days, been subject to significant speculation. And the scene on that Monday morning was truly Wagnerian with thunder and lightening breaking over the Bundesbank.

I presented my arguments to Otmar with the aid of many coloured charts. He listened carefully but, at the end, he looked at me and said "Mr King, a good answer, pity it's the wrong question." He was, of course, correct. In practice, the question should have been dictated by the theory and it was whether the level of short term interest rates that were appropriate to Germany in September 1992 was also appropriate to the United Kingdom in September 1992.

Two days after our visit, sterling was forced out of the Exchange Rate Mechanism, leading many commentators to describe the trip as the least successful diplomatic mission in history. What happened that week set, on the face of it, the Bank of England and the Bundesbank on a path of divergence. But in fact it started a much deeper convergence as the United Kingdom, with the help and encouragement of Otmar Issing, Hans Tietmeyer and their colleagues, embarked on a path towards a commitment to price stability and an independent central bank.

That convergence was not just a professional one, it was also personal. Otmar and I have become close friends and he has taught me many things in life. One of them is that whenever a central banker is tempted to think he knows enough about the economy to fine tune it with monetary policy, the right response is to go and listen to Mozart.

This paper is a tribute to Otmar. It's not a paper about current monetary policy or, in fact, about monetary policy at all in a realistic sense. And it is somewhat perverse given the title of this colloquium because it makes a journey from practice

to theory. The practice is that monetary policymakers talk a great deal about inflation expectations but the theory in many standard economic models is that inflation expectations add no independent information about the state of the economy. This paper is a contribution to bridging that gap.

I   INTRODUCTION

The United Kingdom has experienced a period in which the volatility of both real and nominal variables has fallen. In the ten years to 2005, the standard deviation of output growth was less than a third of its value in the ten years to 1985; the standard deviation of inflation was less than a tenth of its value in the ten years to 1985. Inflation persistence has also fallen dramatically. Similar developments are apparent in other advanced economies such as the United States and the Euro Area. These changes have found various names: the 'Great Stability', 'Great Moderation' or the 'NICE' (non-inflationary consistently expansionary) decade[3]. Policymakers face a challenge in judging how to react to these changes because their causes, and therefore their durability, are uncertain, as Velde's (2004) lucid survey of the research so far makes clear.

There are two types of explanation for these changes. The first is that the reduction in volatility is due to better monetary and fiscal policy. The second is that it reflects either smaller shocks, or changes in the way those shocks are propagated into output and inflation volatility. Thus far, econometric studies have tended to put most of the improvement down to what Velde described as policymakers having a 'good hand' rather than engaging in 'good play': witness the line of work including Stock and Watson (2002), Sims and Zha (2004), Cogley and Sargent (2005) and many others. But Bernanke (2004) suggested that what is counted as good luck in such studies includes the effect of better monetary policy in anchoring inflation expectations.

Our paper presents a model in which the link between fluctuations in the time series properties of inflation and expectations-formation is explicit. We work with a monetary overlapping generations model, in which we assume agents form expectations by choosing amongst simple rules of thumb or 'heuristics'. Agents work when they are young and sell their output to the old in exchange for money, which is the only store of value available to them. They consume using that money when they are old. Young agents seek to minimise the disutility from working when young and maximise the utility they will gain from consuming when old. In doing this, they face the problem of forecasting the future purchasing power of the money balances they accumulate when young. In other words, they need to forecast the change in the price level. Uncertainty about future inflation is generated by our assumption that the productivity of young agents is subject to shocks.

We contrast the rational expectations equilibrium with that which emerges when agents use a finite set of heuristics to make their forecasts of inflation. They

---

[3] See, for example, Bernanke (2004) and King (2003).

choose between the heuristics on the basis of their performance in forecasting inflation in the recent past. We assume they observe that performance with some noise but, the better the true past performance of a heuristic, the greater chance there is that an agent uses it to make the next period's forecast. These heuristics, as Gigerenzer et al. (1999) and others have noted, are both fast to compute and frugal in their information requirements. Model-consistent expectations are attractive devices for those who work with model economies, but it may actually not be rational for agents to have acquired them, given the informational and computational costs of doing so. Our agents choose between two heuristics: one that sets forecast inflation equal to the steady state value, which we term loosely an 'inflation target' heuristic, and one in which forecast inflation is set to the latest realisation of inflation, which we term the 'lagged inflation' heuristic.

Our model is closed by a process for nominal money growth, which characterises central bank behaviour. We use two such processes to study the dynamics of inflation: one in which the central bank follows the rule that would be optimal in the event that expectations were rational; and another that assumes the central bank attempts to take account of heuristic behaviour.

Our strategy is to use a model of heuristics to explain the Great Stability. We are therefore exploring an idea put forward by Branch and Evans (2005). And in combining a monetary overlapping generations model with heuristics, we are borrowing from Brock and de Fontnouvelle (2000), who did this in their quest to see whether heuristic behaviour could sustain equilibria in which paper money is valued.

When agents switch between inflation-forecasting heuristics, the time series properties of inflation change over time. On average, the majority of agents use the inflation target heuristic. But there are times when everyone does, and times when no-one does. The way the economy propagates productivity shocks into inflation depends on the proportion using each heuristic. Because this proportion fluctuates, so does the way shocks are propagated into inflation. So the volatility of inflation is higher than in a rational expectations version of the model. It also means that there are greater *fluctuations* in the volatility of inflation and in the persistence of inflation. This model, for either of the money processes we use, exhibits pronounced episodes of high, followed by low inflation volatility and persistence. When agents use the inflation target heuristic, inflation tends to be less variable and less persistent than when more agents use the lagged inflation heuristic.

We contrast the money process that would be optimal under rational expectations with one that attempts to take account of heuristics. We do so with the usual caveats that must accompany welfare analysis in overlapping generations models. Our welfare criterion is the unconditional expectation of the sum of the welfare of the old and young in any time period. This is equivalent to maximising the average level of welfare over all generations.

Under rational expectations, the optimal policy is for money growth to respond to the level of productivity. Such a rule eliminates both the volatility of labour

supply, which is costly to the young, and the volatility of consumption, which is costly to the old. The success of monetary policy under rational expectations can be attributed to its leverage over expectations. By committing to future policy actions, monetary policy has extra leverage over current labour supply and inflation.

That leverage is not available when agents use heuristics so we investigate how policy might adapt in those circumstances. The model under heuristics is highly non-linear. There is no analytical expression for optimal policy available, so we confine ourselves to a search for a rule that responds linearly to two important state variables in the model: productivity and expected inflation. The best rule – according to our welfare criterion – amongst this 'two-pillar' class of rule increases money growth when productivity is high, and by more than under rational expectations; and it reduces money growth when inflation expectations rise. The welfare benefits from shifting away from the rational expectations policy are greater during periods when agents are using the backward-looking heuristic. Despite a monetary policy that attempts to take account of heuristics, heuristic switching still occurs and so there are still fluctuations in inflation volatility and inflation persistence. At the same time this model generates fluctuations in the estimated disturbances to linear autoregressive equations for inflation, echoing the findings of econometricians on real data.

The message from the paper to this point is that very stable macroeconomic outturns should not be taken for granted. But we go on to explore the notion that the widespread adoption of explicit inflation objectives by central banks can be modelled as the provision of a heuristic to which agents did not previously have access. When we introduce an inflation target heuristic to agents, we find that at least some adopt it immediately, and that subsequently the volatility of inflation is lower, despite the heuristic-switching that ensues. We illustrate how the impact of the introduction of the inflation target depends on how poorly performing is the heuristic with which agents start out.

2   THE MODEL

Our model is an overlapping generations model with money. It is deliberately stylised and was chosen as the simplest possible model in which agents must forecast future inflation.

Agents live for two periods. They work when young and consume when old. Young agents minimise the disutility from work (L) when young and maximise the expected utility from consumption (C) when old.[4] Their output is produced with a linear technology, denoted $A_t L_t$, where A_t is productivity, known at time t when young agents determine their labour supply. Their output is sold at price P_t. Young agents accumulate nominal money balances (M_t) to the value of their output. Their consumption when old is determined by the real value of those

---

[4] Note that, for simplicity, we assume that there is no discounting of future consumption.

same money balances $\left(\dfrac{M_t}{P_{t+1}}\right)$. We denote expectations formed by agents using the operator E_t. In some cases that will refer to rational expectations and in others will refer to a heuristic. At each stage we will make clear how agents are forming their expectations.

Formally, young agents solve the following problem:

$$\max_{L_t} E_t \left[-\frac{L_t^{1+\eta}}{1+\eta} + \frac{C_{t+1}^{1-a}}{1-a} \right] \quad \eta > 0, 0 < a < 1 \tag{1}$$

subject to:

$$M_t = A_t L_t P_t \tag{2}$$

$$C_{t+1} = \frac{M_t}{P_{t+1}} \tag{3}$$

The problem that old agents solve is degenerate. They maximise utility by spending all their real balances on consumption goods. The young accumulate money from the old and from the government. The government's budget constraint implies that the nominal money stock evolves according to:

$$M_t = M_{t-1} + P_t D_t \tag{4}$$

where $D_t > 0$ is output purchased from the private sector in exchange for money. We assume that government purchases are used for purposes that do not yield private utility.[5] The instrument of monetary policy is the growth rate of the nominal money stock, G:

$$M_t = M_{t-1} + G_t M_{t-1} = (1 + G_t) M_{t-1}$$

so that, since $P_t D_t = G_t M_{t-1}$, the nominal value of government purchases equals the increase in the nominal money supply: there is no distinction between fiscal and monetary policy in this model.

The young consumer's problem can now be written as:

$$\max_{L_t} E_t \left[-\frac{L_t^{1+\eta}}{1+\eta} + \frac{1}{1-a} \left(A_t L_t \frac{P_t}{P_{t+1}} \right)^{1-a} \right]$$

Denoting inflation as $\Pi_{t+1} = \dfrac{P_{t+1}}{P_t}$, the first order condition for labour supply is given by:

$$L_t^{\eta+a} = E_t \left(A_t \Pi_{t+1}^{-1} \right)^{1-a}$$

[5] We could, analogously, assume that government purchases are redistributed back to agents, and that these redistributions enter utility in a way that was additively separable from other components. Our marginal condition for labour supply would be identical in this model, although consumption and mean levels of welfare would not be. Dropping the simplification used here would not affect the impact of heuristic switching on the dynamics of macroeconomic outcomes.

This equation makes it clear that young agents have to make forecasts. If expected inflation tomorrow is high, agents' expect the value of any money balances they accumulate by working when young to be eroded when they are old. Their demand for money balances will be lower.

Uncertainty about the future price level is introduced by a simple, stochastic process for productivity (A_t):

$$A_t = A_{t-1}^\rho Z_t \tag{5}$$

where Z_t follows a lognormal distribution.

For ease of exposition, we proceed by taking a first order approximation around the non-stochastic steady state. Using lower case letters to denote log deviations from steady state, the (log-linearised) first order condition for labour supply is:

$$l_t = \frac{1-\alpha}{\eta+\alpha}a_t - \frac{1-\alpha}{\eta+\alpha}E_t\pi_{t+1} \tag{6}$$

We use m_t to denote the log deviation of *real* money balances, $\frac{M_t}{P_t}$, from steady state. The *real* money demand condition is:

$$m_t = a_t + l_t$$
$$m_t = \frac{1+\eta}{\eta+\alpha}a_t - \frac{1-\alpha}{\eta+\alpha}E_t\pi_{t+1} \tag{7}$$

The linearised version of the government budget constraint is given by equation (8) below, where we denote the steady state inflation rate as Π and use g_t to denote the absolute (note, not log) deviation of the growth rate of nominal money from its steady-state level.[6]

$$m_t = \Pi^{-1}g_t + m_{t-1} - \pi_t \tag{8}$$

We linearise around a positive steady state inflation rate ($\Pi > 1$) to ensure that the frequency of negative government spending levels D implied by money growth g is negligible: we do not regard such outcomes as economically meaningful.

Linearising the productivity process gives:

$$a_t = \rho a_{t-1} + \zeta_t, \zeta_t \sim N(0,\sigma^2) \tag{9}$$

where lower case ζ_t is the log deviation of the disturbance Z_t from its steady state value, 1.

To summarise the model: to maximise their expected utility, young agents must forecast inflation. Uncertainty about future inflation is introduced by fluctuations in the demand for real money balances arising from shocks to productivity. If those movements are not matched by equal movements in the nominal money

[6] The coefficient on g results from the fact that $(1 + g) = \Pi$ in steady state.

stock, inflation will fluctuate. In the next section we calculate the monetary policy that maximises welfare when agents form rational expectations of inflation.

3   RATIONAL EXPECTATIONS AND OPTIMAL POLICY

The model is described by equations (6), (7), (8) and (9) together with an equation for money growth, g_t. We assume that monetary policy is characterised by the design of a rule for money growth to which the policymaker commits. The rule is designed to maximise a particular measure of welfare. It is designed before any realisation of productivity is observed so although money growth can respond to realisations of productivity, the policy rule itself is invariant to changes in productivity.

Our welfare measure is the sum of the utility of the young and old agents:

$$W_t \equiv -\frac{L_t^{1+\eta}}{1+\eta} + \frac{C_t^{1-a}}{1-a}$$

This differs from the utility function of a young agent (equation (1)) because it adds the utility of today's old to the disutility of work experienced by today's young. We assume that policy is designed to maximise the unconditional expectation of welfare. This maximises the average level of welfare across all generations and across all possible realisations of productivity.[7]

We assume that monetary policy maximises welfare taking the steady-state level of money growth as given. In this model, there would be welfare improvements from lowering the mean level of money growth and the associated government purchases (which do not yield private utility). We abstract from that component of policy to focus on the stabilisation role of monetary policy. Hence, the curvature of the welfare function means that, by stabilising the economy, we maximise the average level of welfare. Note that, conditional on a level of productivity that is known and different from the steady-state level of productivity, agents will not prefer steady-state levels of labour supply and future consumption. But, before the value of productivity is revealed, they will prefer stable over variable labour supply and consumption because of the curvature in utility. Welfare is maximised when labour supply and consumption do not deviate from their steady state levels.

Our welfare function is

$$E[W_t - W] = -\frac{\eta}{2} E[l_t^2] - \frac{a}{2} E[c_t^2] \tag{10}$$

which we derive as the second-order Taylor approximation to the welfare measure. Policy maximises the unconditional expectation of a weighted sum of the variances of young agents' labour supply and old agents' consumption. Note that the linear terms that are anticipated in a second-order Taylor expansion drop out: the

---

[7] Our procedure is similar to the practice of maximising 'period utility' in the monetary policy design literature that uses representative agent models.

unconditional expectation of linear terms in log deviations from the steady state are zero.

Under rational expectations, we now demonstrate that monetary policy can stabilise labour supply and consumption completely by committing to a rule for money growth that feeds back from the model's driving variable, productivity:

$$g_t = \chi a_t \tag{11}$$

It is straightforward to show that, for an arbitrary value of χ, the rational expectations solutions for real money balances and inflation are given by:

$$m_t = a_t + l_t = \frac{1 + \eta - (1-a)\rho_\pi^x}{1 + \eta - (1-a)\rho} a_t \tag{12}$$

and:

$$\pi_t = \left[\frac{\chi}{\Pi} \rho + \frac{1 + \eta - (1-a)\rho_\pi^x}{1 + \eta - (1-a)\rho} (1-\rho) \right] a_{t-1} \tag{13}$$

$$+ \left[\frac{\chi}{\Pi} - \frac{1 + \eta - (1-a)\rho_\pi^x}{1 + \eta - (1-a)\rho} \right] \zeta_t$$

Policy can completely stabilise employment when $m_t = a_t$ From equation (12), this is the case when $\chi = \Pi$. Under this rule there are no welfare costs to young agents from macroeconomic volatility. But what happens to the volatility of inflation and (hence) the utility of old agents? We know that the consumption of the old generation is determined by their accumulated money balances adjusted for subsequent inflation:

$$c_t = m_{t-1} - \pi_t$$

and, when $\chi = \Pi$, the equilibrium inflation equation (13) can be simplified to:

$$\pi_t = a_{t-1}$$

We already know that real money balances equal productivity because labour supply is stabilised:

$$m_t = a_t \Rightarrow m_{t-1} = a_{t-1}$$

so that:

$$c_t = m_{t-1} - \pi_t = 0$$

A policy rule in the form of equation (11), setting $\chi = \Pi$, eliminates all of the welfare costs of macroeconomic instability. Such a rule generates movements in inflation in the next period that are equal to the realisation of productivity in the current period. This strategy means that the real value when old of any money balances accumulated when young is unaffected by realisations of productivity.

Anticipating this, the young have no incentive to change their labour supply in response to changes in productivity. With labour supply constant and the impact of productivity on real money balances offset by inflation, the consumption of the old is constant. The key to the success of monetary policy in stabilising both labour supply and consumption is its leverage over not only the current money stock but also over anticipated future inflation. Indeed, it is clear from (6) that monetary policy can stabilise labour supply in the face of productivity disturbances *only* through its leverage over inflation expectations.

To re-emphasise: note that complete stabilisation of consumption and employment is optimal because of the curvature of agents' utility (a feature preserved by our quadratic approximation). Note too that monetary policy does not prevent agents responding to productivity shocks; it simply creates conditions that means that it is optimal for agents not to.

4   MODELLING THE CHOICE OF HEURISTIC

So far we have assumed model-consistent expectations to provide a benchmark against which to compare subsequent departures from that assumption. Many have argued that in reality agents would find it too costly, or would not have the means to collect the information and carry out the computations required for a rational expectations equilibrium to be achieved. The route we choose is to adopt a model in which agents may have heterogeneous expectations and in which those expectations are based on simple heuristics.

4.1 THE HEURISTIC CHOICE LITERATURE

The literature on heuristics is itself now very large and ably surveyed by one of its recent leaders in Hommes (2005). He charts the history of this strand of thought from the suggestion by Keynes (1936) that fluctuations in sentiment would influence the macroeconomy; through Simon (1957), who explained that agents were 'boundedly rational' in the face of costs of collecting information and computing the outcomes of their decisions. Another landmark is the emergence of experimental evidence that agents use simple heuristics to make decisions, culminating in Kahneman's (2003) Nobel lecture. This led to a large research programme exploring why it may have proven beneficial for nature to endow us with such heuristics: a topic that occupies, for example, Gigerenzer et al. (1999). We use a model in which agents choose between a finite set of heuristics based on noisy observations of past forecast performance. The papers from which we draw most inspiration in this respect are Brock and Hommes (1997), Brock and de Fontnouvelle (2000) and Branch and Evans (2005, 2006) who in turn ground their decision making model in the discrete decision, multinomial logit models set out in Manski and McFadden (1981).[8]

[8] See also de Grauwe and Grimaldi (2006). They show how exchange rate dynamics, and fluctuations in the performance of fundamentals models of the exchange rate, are affected by heuristic-switching, embedding the Brock and Hommes approach, using the same model of predictor choice that we employ.

We are not the first to combine a monetary overlapping generations model with a model of heuristic expectations formation. Brock and de Fontnouvelle (2000) do just this. But their concern is very different. Early students of rational expectations, monetary overlapping generations models noted that these models generated equilibria in which money had value and equilibria in which it did not. This was a source of discomfort since paper money in reality is pervasive, and yet there was no guide as to which amongst the model's equilibria should or would be selected. Brock and de Fontnouvelle (2000) is an effort to see whether heuristic behaviour can lead to monetary equilibria: they find that it can.

4.2 HEURISTIC CHOICE IN OUR MODEL

Our agents select from two heuristics described by:

$$E_{1,t}\pi_{t+1} = \pi_{t-1}$$
$$E_{2,t}\pi_{t+1} = 0$$

The first predictor ($E_{1,t}\pi_{t+1}$) sets expected inflation equal to the latest observed outturn. We term this the 'lagged inflation' predictor. This predictor is based on lagged inflation (π_{t-1}) and not current inflation (π_t) which will itself depend on agents' expectations and will not be realised at the time agents are forming their expectations. The second predictor ($E_{2,t}\pi_{t+1} = 0$) sets expected inflation equal to the target (since π represents the deviation of inflation from target we have $E_{2,t}\pi_{t+1} = 0$). This we term the 'inflation target' predictor.[9] This particular set of predictors includes plausible models for agents to use to forecast, but is itself arbitrary. For most of our analysis, exactly what is in this set of predictors is not important. What is important is that there are different predictors and that switching amongst them will generate changes in the way the model propagates shocks. However, later in the paper, we interpret the inflation target predictor as one that can be added to the set of available predictors if the central bank declares an explicit inflation objective. At that point it will be crucial to consider predictor sets that initially exclude, and later include, the inflation target predictor, so our predictor set must be taken more literally.

Agents in our model differ from those embedded within adaptive learning models. In those models, the tools that agents use to forecast encompass the true model. In variants where agents have access to the entire history of data, they may eventually learn the true coefficients. Our agents' models are both misspecified, and agents have a fixed window for evaluating their predictors that prevents the apparent performance of these predictors converging over time.

We follow our predecessors in this literature and assume that the heuristics are selected according to their recent forecast performance. Specifically, we define the objective function as:

$$F_{i,t} = -\frac{1}{H}\sum_{j=1}^{H}\left[\pi_{t-j} - E_{i,t-j-1}\pi_{t-j}\right]^2 \tag{14}$$

---

[9] Mojon and Diron (2005) document how using the central bank's stated target as a forecast rule of thumb can perform well relative to alternative models.

for $i = 1, 2$. The term on the right hand side is the 'mean squared error' of the heuristic, calculated over the previous H periods. This captures the ability of the heuristic to match the behaviour of inflation in the recent past. The objective can be thought of as some form of 'utility function': agents prefer heuristics with higher F scores.[10]

The proportion of agents choosing each predictor, $n_{i,t}$ is determined by the following function:

$$n_{i,t} = \frac{\exp(\theta F_{i,t})}{\Sigma_{j=1}^{2} \exp(\theta F_{j,t})} \quad (15)$$

where the parameter $\theta > 0$ is referred to in previous work as the 'intensity of choice'. Brock and de Fontnouvelle (2000) note that in this model θ is related to the amount of noise in observing the forecast error function F.[11] The larger is θ, the more accurately agents observe the past forecast performance of the heuristics, and the more the portion of agents using each heuristic responds to forecast performance. The limit of $\theta = \infty$ represents the case in which all agents observe perfectly – and hence choose – the best heuristic in each period. As θ approaches zero, we approach a situation in which the noise in observing predictor performance is so large that predictor choice is entirely non-systematic. To emphasise, with a finite θ, the presence of measurement error means that agents will not always pick the best-performing heuristic. But the probability that they will pick a particular heuristic will increase with its past forecasting performance. The share of the population using each of the two heuristics will equal the probability that any individual picks that heuristic.

Aggregating across young agents, we have the following:

$$E_t \pi_{t+1} = n_t \pi_{t-1}$$

Thus the real money demand relation under heuristics is given by:

$$m_t = \frac{1 + \eta}{\eta + a} a_t - \frac{1 - a}{\eta + a} n_l \pi_{t-1} \quad (16)$$

5 MODEL PROPERTIES UNDER RATIONAL EXPECTATIONS AND A SINGLE HEURISTIC

We simulate the model comprising the equation for n_1, the portion using the lagged inflation heuristic, (15), and the linearised equations for real money demand, the

---

[10] The thought experiment that agents are conducting here is flawed, and highlights the difference between their behaviour and that under rational expectations: the performance of a heuristic in forecasting actually depends on how many agents use it for forecasting. Agents neglect this fact when they compute F from recent observations on π.

[11] The authors steer the reader to the unabridged (1996) version of this paper, University of Wisconsin working paper no 9624, for a complete account of this interpretation (and others) of the model.

government budget constraint, and the productivity and money processes (equations (16), (8), (9) and (11) respectively).

We use the following parameter values: $\eta = 0.2$, $\alpha = 0.41$, $\Pi = 1.02$, $\theta = 100{,}000$, $\rho = 0.925$, $\sigma^2 = 0.000075$ and $H = 50$. Critically assessing the suitability of these parameters is difficult, given the highly stylised structure of the model. We emphasise simply that we are using this model in the hope that it can say something interesting about the dynamics of an economy over business cycle frequencies, and be of interest to monetary policy makers who have to design a policy to stabilise the economy over such time periods.

Nevertheless, some discussion of our chosen parameters is warranted. Our choices for η and α imply that the elasticity of real money demand to expected inflation (equal to $\frac{1-a}{\eta+a}$) is close to unity, which means that real money balances are relatively responsive to expected inflation. Marcet and Nicolini (2003) use parameter values that imply that real money demand is relatively less responsive to changes in expected inflation (their parameters would imply a slope $\frac{1-a}{\eta+a}$ of around 0.15), but simulations under this type of parameterisation are qualitatively similar to those we present here.

Our choice of Π implies that the steady state inflation rate is 2 per cent per period, which matches the rate chosen by some central banks if we interpret a period as one year. This choice bounds our choice for the variance of the productivity disturbance: this, together with the design of the process for monetary policy, g, will govern the frequency with which the implied level of government spending is negative, which we want to keep to a minimum. The degree of persistence in the shocks affects the chance of lagged inflation proving to be a good forecaster of future inflation, and therefore of agents using it as a heuristic. The variance of productivity implied by our assumed values for σ^2 and ρ is of a similar order of magnitude to cyclical output variations.[12]

The ability of the model to generate switches in heuristic use is also determined by the evaluation horizon H and the intensity of choice θ (which we prefer to interpret as the accuracy with which heuristic performance is observed). The shorter the evaluation horizon, the larger the fluctuations in observed forecast performance. The greater the intensity of choice, the larger the response of heuristic choice to movements in forecast performance. The important thing for the story in this paper is that some economically significant degree of heuristic-switching occurs.

The table below records some time series properties of four versions of our overlapping generations model. We report variances as an index for which 100 equals the rational expectations case. In each case the model is solved under the money process that is optimal under rational expectations. The first column reports the rational expectations version of the model discussed in Section 3. The variance

---

[12] The standard deviation of log productivity (a) is given by $\sqrt{\sigma^2/(1-\rho^2)} \approx 0.023$. . The variance of residuals from a regression of annual UK (log) GDP on a time trend is around 0.03.

Table 1 Time series properties of the rational expectations and single heuristic models			
	Rational Expectations	**Lagged Inflation**	**Inflation Target**
var(Π)	100	959	135
var(var(Π))	100	23220	108
$\rho(\Pi)$	0.92	0.55	0.72

Note: Variances relative to rational expectations case (= 100)

and autocorrelation of inflation are calculated from the equivalent moments of the forcing process, productivity. For the other cases, statistics are computed from a 20,000 period simulation with all variables initialised at steady state values. 'Lagged inflation' refers to a model in which agents are restricted to the heuristic that inflation tomorrow is equal to inflation yesterday. 'Inflation target' refers to a model in which they are restricted to the inflation target heuristic.

These results serve as a benchmark against which we compare our model when agents switch between the two heuristics. They also provide some intuition about what happens to the time series properties of variables as the number using each heuristic switches between the extremes implied by these first simulations. The first row of Table 1 shows the variance of inflation, which is about ten times larger when all agents use the lagged inflation heuristic compared with the rational expectations benchmark. The second row shows the variance of the variance of inflation. This is computed by first forming a time series of a rolling fifty-period variance of inflation and then calculating the variance of that. When all agents use the lagged inflation heuristic, this measure is about 200 times larger than in the rational expectations case. The final row shows the coefficient from a first order autoregression of inflation. This illustrates how the estimated time series behaviour of inflation depends on the method with which agents are forecasting inflation. The results for the 'inflation target' model are similar to those for 'rational expectations'.

6   MODEL PROPERTIES UNDER HEURISTIC SWITCHING

In this section we report the results from simulating the model when agents switch between the two heuristics depending on their past forecasting performance. As a benchmark, we continue to assume that money growth follows the process that would be optimal if agents formed rational expectations. The summary statistics are shown in Table 2. Once again, these simulations are over 20,000 periods. We continue to normalise all variances to equal 100 in the rational expectations case. Overall, the variance of inflation in this heuristic-switching economy is higher than when all agents were forced to use the inflation target heuristic but lower than in the economy where all agents used the lagged inflation heuristic. The same is true of fluctuations in the small-sample variance of inflation.

In Chart 1 below, we extract from our 20,000 period simulation an illustrative subsample of 1000 consecutive periods. The top panel of the chart shows how

Table 2 Time series properties of heuristic-switching model	
var(Π)	190
var(var(Π))	1336
$\rho(\Pi)$	0.70

Note: Variances relative to rational expectations case (= 100)

the portion using the lagged inflation heuristic, n_1 fluctuates. It sometimes reaches the upper bound of 100%, but is generally close to zero. On average, the number using the lagged inflation heuristic is about 30%. Switching between the two heuristics is an important determinant of the time series behaviour of variables.[13]

Chart 2 is an alternative – histogram – representation of these movements in n_1. It shows that the distribution of n_1 is bimodal. If the intensity of choice (θ) was infinite, then we would expect the observations to be either $n_1 = 0$ or $n_1 = 1$ as agents are able to perfectly observe the best performing predictor. But since θ is finite (though large) there are some observations between these extremes.

While the model spends most of the time in a region where the majority of agents are using the inflation target heuristic, there are episodes where almost all are using the lagged inflation heuristic. These results reflect the fact that agents in

Chart 1 Heuristic switching under rational expectations policy

(first and second order autocorrelations are regression coefficients on first and second lags of inflation)
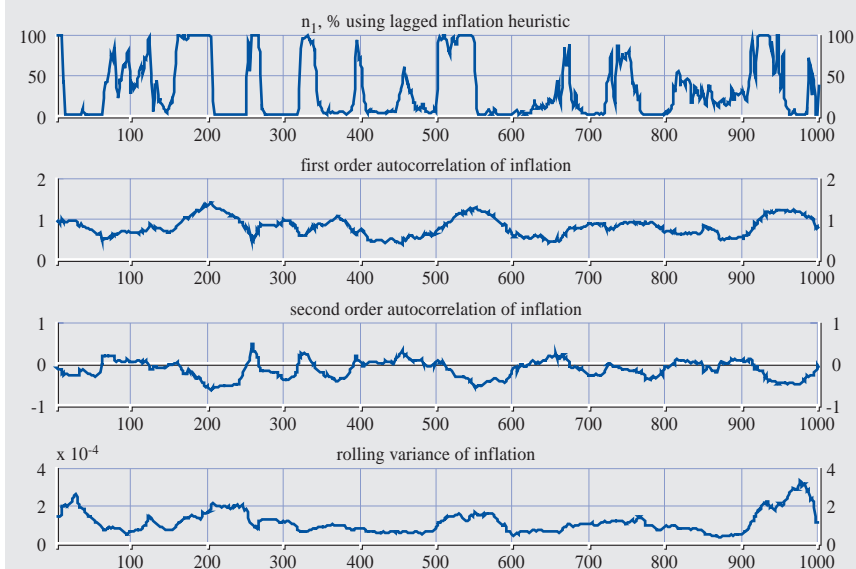
[13] Indeed, when plotting inflation alongside the series for productivity (a_t) it is difficult to discern by eye how the productivity shocks are transmitted into inflation outcomes. The reason is simply that heuristic switching changes the coefficients in the model equations: that is, the mapping from exogenous shocks to endogenous variables.

frequency

Share using lagged-inflation heuristic (n_1)
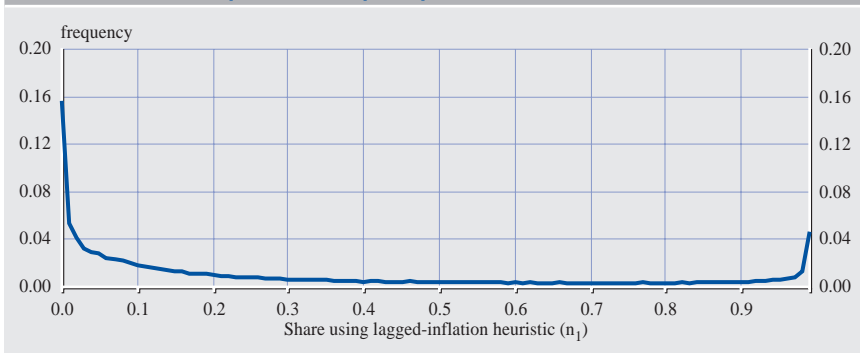
our model use a finite sample of recent data to evaluate predictor performance: in the jargon of the learning literature, they assess forecast performance using 'constant gain'. If instead we allowed agents in the model to learn with 'decreasing gain' (that is, using the entire history of the data), the model would generate a histogram centred around a single, interior value of n_1. This is because our model exhibits what has been called 'negative feedback' from heuristic use to heuristic performance. These aspects of macroeconomic models with predictor choice are discussed in Branch and Evans (2005) who suggest that this negative feedback effect may be relatively uncommon in macroeconomic models. Instead, they construct a simple model with 'positive feedback', characterised by multiple equilibria, some of which are unstable. At such equilibria, disturbances that, for example, increase the proportion of agents using a given predictor improve the relative performance of that predictor, further increasing the proportion, and so on.

Positive feedback and multiple equilibria can be generated in our model under suitable parameterisations for the productivity process and the conduct of monetary policy. For example, we found that the monetary reaction function[14]

$$\Pi^{-1}g_t = -m_{t-1} + 0.5a_t - 0.25n_{1,t}\pi_{t-1}$$

was able to generate these properties when we set $\rho = 0.6$. But under policy that is optimal when agents form rational expectations, and indeed, under the policy that attempts to take account of heuristic switching that we derive below, we have negative feedback between heuristic use and performance.

The bottom three panels of Chart 1 illustrate how heuristic-switching generates small sample fluctuations in the time series properties of inflation. The panels labelled first and second order autocorrelation report rolling coefficients from a regression of inflation on two lags of itself. The bottom panel plots the variance of inflation. These moments are calculated over a horizon of 50 periods. When

---

[14] The coefficient on the lag of real money balances is suggested by the form of the reaction function used by Branch and Evans (2005).

the proportion of agents using the lagged inflation heuristic is high for a sustained period, so is the variance of inflation; at these times the coefficient of the first lag of inflation in an autoregression of inflation is high, and the coefficient on the second lag is low. We gain some insight into these fluctuations by fixing n_1 and writing the reduced form for inflation:

$$\pi_t = \Pi^{-1} g_t - \frac{1+\eta}{\eta+a} a_t \frac{1+\eta}{\eta+a} a_{t-1} + \frac{1-a}{\eta+a} n_1 \pi_{t-1} - \frac{1-a}{\eta+a} n_1 \pi_{t-2}$$

As we see in the simulations, so in this reduced form equation for inflation we notice that the higher is n_1 the higher is the coefficient on π_{t-1} and the lower is the corresponding coefficient on π_{t-2}.

These fluctuations in the autocorrelation function for inflation echo the debates about what has caused the fluctuations in inflation persistence, documented by, amongst others, Benati (2004) and Levin and Piger (2004). That debate has thrown up two broad answers: that changes in inflation persistence have come about because of structural change; or that they reflect changes in monetary policymaking and the introduction of inflation targeting. Our model generates changes in small-sample moments of inflation that reflect neither, but instead are the result of heuristic-switching.

7   MONETARY POLICY UNDER HEURISTIC SWITCHING

So far we have worked with the money growth process that would be optimal under rational expectations. We now consider if the central bank can improve on this process in the light of its knowledge about expectations formation. There are two motivations. From a positive standpoint, we can check that the heuristic-switching explanation for the appearance (and possible disappearance) of low inflation volatility is robust to cases in which the central bank follows a more sensible policy. From a normative standpoint, we can highlight the cost of the central bank incorrectly assuming that expectations are rational.

In Section 3, we showed that, under rational expectations, a rule for money growth that responded to productivity could stabilise labour input and consumption. It did so through its impact on anticipated future money growth and inflation. When agents use heuristics, commitment to a policy rule no longer delivers any direct leverage on expected future inflation. Policy only affects expectations indirectly through past inflation. The lack of direct leverage over expectations means that, unlike the rational expectations case, policy cannot offset all the welfare losses arising from productivity shocks. It needs to adapt to the use of heuristics.

Additional complications arise in attempting a study of the welfare consequences of policy under heuristics. Heuristic-switching makes the model non-linear, even when the individual decision rules are linearised.[15] This non-linearity causes two problems.

---

[15] The fraction (n_1) of agents using the lagged inflation heuristic affects the coefficients of the decision rules. And n_1 itself varies over time, in response to the behaviour of the economy.

The first problem is that we cannot derive an optimal monetary policy analytically, even when we use the quadratic approximation to welfare explained above. So we have to resort to numerical methods. We define a class of candidate monetary policy processes, and then simulate the model under each rule within that class, compute welfare, and look for the rule that scores the highest. The particular non-linear nature of our model means that we have to simulate for millions of periods to get reliable estimates of our welfare function. So we must confine our search across alternative policy rules to make the exercise manageable. We will work with the following class of rules for money growth:

$$g_t = \chi_1 a_t + \chi_2 E_t \pi_{t+1}$$

This process allows the policymaker to respond to productivity and to data on expected inflation. In that sense it operates a 'two-pillar' strategy. We assume that policymakers receive data on expected inflation, but do not attempt directly to internalise the interaction between policy, endogenous inflation outcomes and n_1. (Indirectly, policymakers will choose the combinations of χ_1 and χ_2 that generate the most beneficial paths for n_1, the proportion using the lagged inflation heuristic.) We search for the values of χ_1 and χ_2 that deliver the best welfare for our agents, defined by our criterion in equation (10).

The second problem caused by the non-linearity of the model is that alternative policy rules will generate small differences in the mean rates of inflation. These will cause the average levels of utility to differ according to the policy rule, as the government budget constraint means that higher average inflation implies higher average government spending and higher resource destruction. The differences in means will not affect the welfare criterion we have chosen, which is defined on variances. So it must be stressed that our search can rank policy rules only according to their stabilisation properties, and not their effect on means.[16]

We focus on rules that respond to productivity and inflation expectations for two reasons. First, this class of rules allows us to nest the optimal policy under rational expectations, which responds to the only state variable in that model, productivity. Second, it also allows the policymaker to respond to another state variable in the heuristic-switching model, expected inflation. And that happens to echo the concerns of policymakers in reality.[17]

We can get some intuition for why a rule like this is likely to work by considering an extreme case that the policymaker will face: one in which all agents use the inflation target heuristic. When everyone is using the inflation target heuristic ($n_1 = 0$), the labour supply function (6) collapses to:

[16] These small differences in mean inflation will also have a small effect on the performance of the inflation target heuristic under the alternative policy rules. The higher the mean inflation rate, the worse the (zero) inflation target heuristic performs, and the smaller the portion of agents who use it.

[17] Note that expectations based rules have been argued to have benefits in other contexts. For example, Evans and Honkapohja (2003) have recommended them as devices for implementing monetary policy to ensure that the rational expectations equilibrium is stable under least-squares learning.

$$l_t = \frac{1-a}{\eta + a} a_t$$

Fluctuations in labour supply are inevitable. The average expected welfare of young agents is lower than when agents have rational expectations and policy responds optimally. Under heuristics, monetary policy is powerless to influence this. But monetary policy can help old agents. The consumption of old agents at date t is:

$$c_t = m_{t-1} - \pi_t$$

and the evolution of real money balances is given by:

$$m_t = \Pi^{-1} g_t + m_{t-1} - \pi_t$$

so that the policymaker can fully stabilise c_t by committing to the policy rule:

$$g_t = \Pi m_t$$
$$= \Pi \frac{1+\eta}{\eta + \alpha} a_t$$

which, since $\frac{1+\eta}{\eta + a} > 1$, implies a stronger response to productivity shocks than under rational expectations.

In the general case, where some agents use the lagged inflation heuristic, labour supply and the demand for real money balances depend on inflation expectations, which in turn depend on lagged inflation. In that case, even in the absence of a current productivity shock, labour supply and output can fluctuate. Without any policy action, inflation will move to bring the real value of money balances into line with output. These fluctuations are costly so monetary policy might do better by responding to inflation expectations as well as to productivity. Of course, one thing this discussion reveals is that the ideal response to productivity and inflation expectations should itself depend on n_1. However, to make the analysis more tractable, we stick to rules that involve constant, independent values of χ_1 and χ_2.[18]

The best rule in our grid search is one with values of χ_1 and $\chi_2 = -1.75$. This policy shares a feature with the optimal policy under rational expectations in that money growth is expanded when productivity is unusually high. A positive shock to productivity reduces the price level; a positive money growth response by policy therefore acts to offset that. The policy response under heuristics is to respond more aggressively (recall that under rational expectations, χ equals Π, the steady state rate of inflation, which is 1.02). We believe that this response allows the policy to perform well when few agents believe the inflation target: as described above, in this setting, an aggressive response to productivity can help to stabilise

---

[18] Using this short cut naturally raises the issue of whether it would be appropriate to build a model of heuristic policy design on the part of the central bank to go with the heuristic expectations-formation on the part of agents in the model. We leave that issue for future research.

Chart 3 Welfare generated by alternative policy rules as the share of agents using the lagged inflation heuristic varies
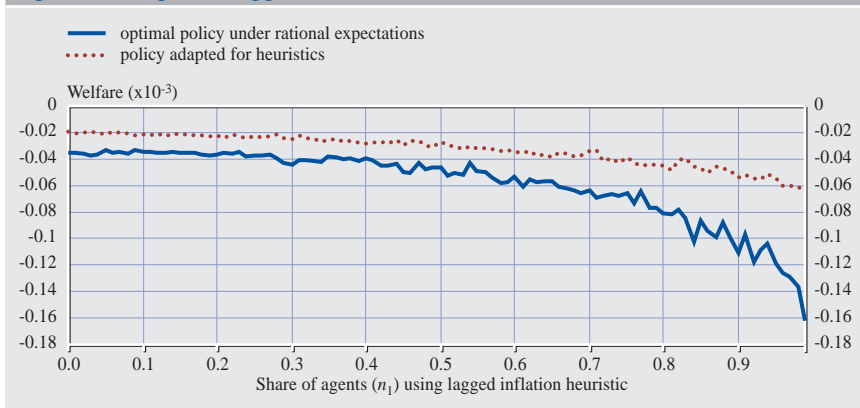
the consumption of old agents. The heuristics policy also suggests that money growth should fall when expected inflation rises. When expected inflation rises, labour supply and demand for real balances fall. Monetary policy can stabilise inflation by contracting the money supply.

The rule considered here generates higher welfare than arbitrary persistent processes for money growth, fixed money growth, and the policy that would be optimal under rational expectations (derived in Section 3). The welfare surface appeared well behaved in the space used for the grid search. Chart 3 above shows how welfare differs under the two policy rules at different values of n_1, the portion using the lagged inflation heuristic. We arrange the simulated periods according to their associated value of n_1 and calculate average welfare at each value of n_1.

As we can see, when the central bank tries to take account of heuristics, it delivers higher welfare than the rational expectations policy at all values of n_1. The welfare improvement achieved by the heuristics-adapted policy is greater for larger values of n_1: the more agents are using the lagged inflation heuristic, the greater the benefit of following the policy adapted for heuristics, or, put another way, the greater the cost of policymakers mistakenly following the policy that would be appropriate under rational expectations.[19]

Table 3 shows summary statistics to compare with earlier vintages of the model, once again based on simulations of 20,000 periods. We continue to report moments of inflation as an index where 100 is the value for the model under rational expectations and the associated optimal policy.

---

[19] We have calculated that the minimum value for these costs, when few or no agents are using the lagged inflation heuristic, is still more than ten times the welfare cost of mistakenly pursuing the heuristics policy when agents actually have rational expectations. This is an indication that if policymakers were unsure how agents arrived at their forecasts a safe policy would be to assume that agents did not have rational expectations. This contrasts somewhat with Gaspar et al. (2006), who found that the optimal RE policy does quite a good job of replicating the optimal policy in a model where agents are doing adaptive learning.

	Policy process	
	Rational Expectations	**Heuristics**
var(Π)	190	163
var(var(Π))	1336	255
$\rho(\Pi)$	0.70	0.62

Table 3 Time series properties of heuristic-switching model

Note: Variances relative to rational expectations case (= 100)

When agents switch between heuristics, the variance of inflation is somewhat lower when policy adapts to that, rather than following the policy that would be optimal under rational expectations. Under the policy that adapts to heuristics, the variance of small (fifty period) sample estimates of the variance of inflation is about a quarter that under rational expectations optimal policy. But note that it is still more than two and a half times the figure we observe for the model under rational expectations. Note too that inflation is a little less persistent.

Chart 4 plots data from 1000 consecutive periods of the simulation used to compute the figures in Table 3. Notice that the fluctuations in n_1, the proportion of agents using the lagged inflation heuristic, are, to the eye, as pronounced as those under the policy that would be optimal under rational expectations. Chart 5 compares the histograms for n_1 that are generated in the heuristic-switching

Chart 4 Heuristic switching under a heuristics policy

(first and second order autocorrelations are regression coefficients on first and second lags of inflation)
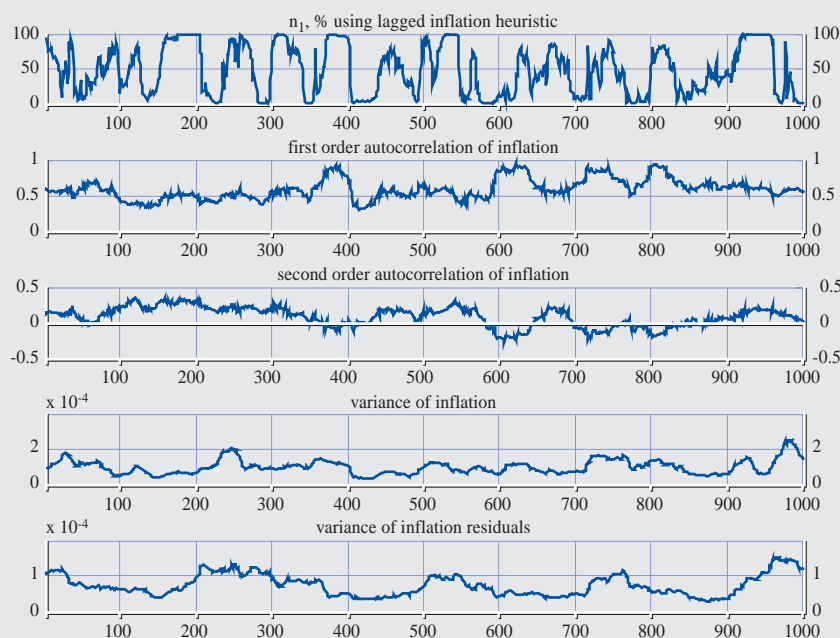
Chart 5 Share of agents using lagged inflation heuristic under alternative policy rules
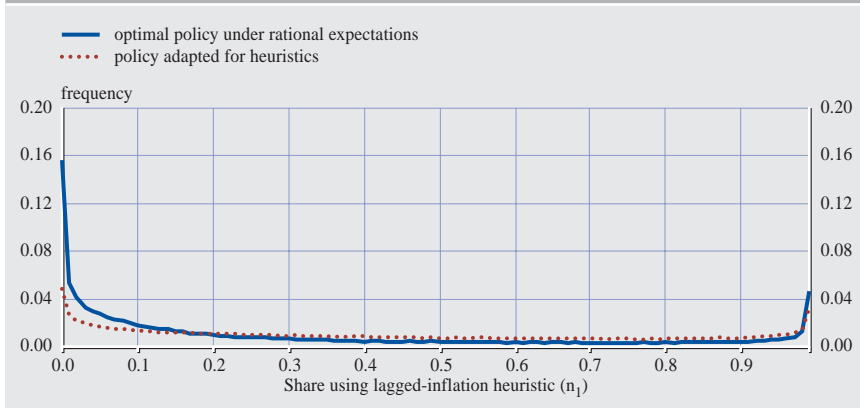
economy when policy follows both the rational expectations optimal rule and when it adapts to the use of heuristics. Relative to the rational expectations optimal policy, the heuristics adapted policy reduces the probability mass at both extremes of n_1 and increases it slightly at interior values.

Under both policies heuristic switching generates small sample fluctuations in the time series properties of inflation. We can see this from the volatility in the coefficients on lagged inflation in an autoregression for inflation. The bottom panel of Chart 4 plots the variance of the residuals from a rolling 50 period regression for inflation on its own lags. This variance is clearly moving over time and tends to be high when the variance of inflation is high, and vice versa. We plot this time series to link our analysis to the econometric studies that report that large fractions of recent declines in macroeconomic volatility are down to 'good luck'.[20] Here, very loosely, when the number using the inflation target heuristic is low, the variance of inflation is low, and the variance of the shocks in a simple autoregression is low. In the language of the applied literature on the Great Stability, the econometrician estimates there to have been a period of good luck, when the true variance of the disturbances to our model economy is unchanging.

8 MODEL PROPERTIES AFTER THE INTRODUCTION OF AN INFLATION TARGET HEURISTIC

Thus far, we have investigated whether switching amongst heuristics can generate fluctuations in small-sample estimates of the volatility of inflation that are consistent with the marked reduction in volatility seen in recent decades. And our contention is that it can. These fluctuations occur regardless of whether monetary policy adopts a different rule. So far we have considered the set of heuristics as something beyond the control of policymakers. In this section, we

[20] See, for example, Stock and Watson (2002) and Cogley and Sargent (2005).

Policy process:	Rational Expectations		Persistent	
Heuristic:	**Lagged Inflation**	**Self Confirming**	**Lagged Inflation**	**Self Confirming**
before target: var(Π)	100	14	144	18
var(var(Π))	100	0	248	0
$\rho(\Pi)$	0.55	0.72	0.53	0.65
after target: mean (n_1)	31	42	15	69
n_1 impact	0	43	0	89
var(Π)	18	14	17	16
var(var(Π))	1	0	1	0
$\rho(\Pi)$	0.71	0.72	0.57	0.60

Table 4 Impact of introducing the inflation target heuristic

Note: Variances relative to rational expectations case (= 100)

assume that the monetary policy framework can influence the set of heuristics from which agents choose, and consider what happens when agents are given access to an inflation target heuristic, that was not previously available to them. We suggest that this may be a way of formalising what happened when many central banks adopted numerical objectives for inflation. This exercise is related to one conducted by Orphanides and Williams (2005). They interpret the introduction of a numerical objective for the central bank as equivalent to giving agents knowledge of the constant in the inflation process, knowledge that they show improves agents' estimates of the dynamics of that process.

Table 4 presents simulations of the introduction of an inflation target heuristic into four different models. The four models correspond to the table columns, and comprise two different initial lagged inflation heuristics, derived under two different processes for monetary policy. Under the columns headed 'rational expectations' we have results that use our baseline process for money that would be optimal under rational expectations. Within this we use two heuristics. The first, 'lagged inflation' is our familiar lagged inflation heuristic. The column headed 'self confirming' refers to a model in which expectations of inflation are determined by the projection of inflation tomorrow on inflation yesterday which the model would generate as a self confirming equilibrium. Specifically, we assume that agents set $E_t\left(\pi_{t+1}\right) = \rho_h \pi_{t-1}$. We determine $E_t\left(\pi_{t+1}\right)$ by the following process. First, agents collect all data to time $t - 1$ and run a regression $\pi_s = \rho_h^{ols} \pi_{s-2}$ for $s = \{1, ..., t-1\}$. Second, agents use ρ_h^{ols} to form $E_t(\pi_{t+1})$. Third, another data point for time t is generated. Agents add this to their data set, and return to the second step. The value of p_h used to compute numbers under the 'self confirming' column in Table 4 is the number to which this iterative process converges.[21]

[21] The point to which this iteration converges might also be referred to as a Restricted Perceptions Equilibrium. Subject to the restricted perceptions of the inflation process that agents have, their projections are optimal.

The two columns under 'persistent' repeat this analysis, but using a persistent process for money growth where the persistence and variance are set equal to the values chosen for the productivity process (and with no correlation between the two). Results are computed from a 20,000 period simulation in which the target is introduced half way through.

We report several details. First, in the top rows, we give statistics for the economy before the introduction of the inflation target heuristic into the set of heuristics from which agents choose. These are: the variance of inflation (row labelled 'var(Π)'); the variance of short sample estimates of that variance ('var(var(Π))'); and the persistence of inflation ('$\rho(\Pi)$'). For the second half of the simulation, after the introduction of the inflation target, we report these same statistics, but with two additions. First, we report the average value of n_1 in the five periods immediately following the introduction of the target, and label this row 'n_1 impact'. Second, we report the mean of n_1 over the life of the rest of the simulation (labelled 'mean(n_1)'). In this table, we normalise variances and the variance of variances relative to those computed for the top left hand case in this table, the case where agents have a single, simple lagged inflation heuristic, and policy is conducted according to the rule that would be optimal under rational expectations.

The basic message is that the immediate impact effect of the introduction of the inflation target heuristic is maximal when, prior to that, agents use only the lagged inflation heuristic. In both the 'lagged inflation' simulations, n_1, the number using the lagged inflation heuristic, drops to zero in the period immediately following introduction of the inflation target (albeit rising again thereafter). This is shown by the zeros recorded in the row labelled 'n_1 impact'. It turns out that in our model, if we exogenously impose that $n_1 = 1$, it greatly worsens the forecast performance of that heuristic, which is why when agents are free to choose between two heuristics, they jump to using the inflation target for a while.

This begs the question of why agents were content to use only the lagged inflation heuristic prior to the introduction of the target. It is beyond the scope of this paper to model the complete process that specifies the evolution of the set of heuristics that agents use. But for comparison, we have the simulations where agents start out life using a lagged inflation heuristic based on an optimal projection of inflation tomorrow on inflation yesterday (the 'self confirming' simulations). Able to use such a projection, one which performs better than the simple lagged inflation heuristic, the effect of the new target heuristic is more muted: this is true under both our 'rational expectations' and 'persistent' monetary policy processes.

Similarly, we see that when agents are constrained to use the simple lagged inflation heuristic, the introduction of the inflation target has its largest effect on the time series properties of inflation, reducing the variability of inflation and the fluctuations in small sample estimates of this variability.[22]

[22] We repeated the simulation many times and found that the main determinant of the impact effect was the assumption about the heuristic that agents used before the introduction of the inflation target. This was more important than, for example, the recent history of productivity shocks in the periods preceding the target introduction.

9   CONCLUSIONS

In the past decade both inflation and output growth seem to have become more stable in advanced economies. This coincided with the convergence of inflation expectations on inflation targets. We have illustrated how an economy populated by agents who choose amongst heuristics for forecasting inflation can generate fluctuations in the variance of inflation. There are periods in which agents use the inflation target heuristic, and there are periods when many agents choose to use a heuristic based on lagged inflation. In the former, a given shock will generate less variability in inflation. But a sequence of shocks that reduces the ability of the inflation target heuristic to match inflation in the past can lead agents to switch to the lagged inflation heuristic.

We asked how monetary policy might adapt to agents' use of heuristics. Under rational expectations, a rule for money growth that responded to productivity could stabilise completely labour supply and consumption. It did so through its leverage over expectations. When agents use heuristics, monetary policy has no direct leverage over inflation expectations, which are determined entirely by the past behaviour of inflation. Relative to the policy that would be optimal under rational expectations, a money growth rule which reacts to both productivity and to inflation expectations can better stabilise the economy. Even under such a policy, agents switch back and forth between heuristics and the time series properties of inflation tend to fluctuate.

Our final exercise was to simulate the introduction of an inflation target heuristic. When we did this, there was some evidence that the introduction of this heuristic improves macroeconomic outcomes by reducing the volatility of inflation. By how much, and to what extent agents use the new heuristic depends on the performance of the heuristics they had before. These results suggest that some of the improvements seen in the UK and elsewhere could be locked in, at least if the inflation targeting regime can be thought of as having made available the simple heuristic that 'inflation will equal the target'.

REFERENCES

Benati, L. (2004), UK monetary regimes and Macroeconomic Stylised Facts, *Bank of England Working Paper* no 290.

Bernanke, B. (2004), The Great Moderation, remarks delivered at the meetings of the Eastern Economic Association, Washington, DC February 20.

Branch, W. and Evans, G. (2006), Intrinsic heterogeneity in expectations formation, *Journal of Economic Theory*, 127(1), pp. 264-295.

Branch, W. and Evans, G. (2005), Model uncertainty and endogenous volatility, *unpublished manuscript*.

Brock, W. and Hommes, C. (1997), A rational route to randomness, *Econometrica*, 65, pp. 1059-1095.

Brock, W. and de Fontnouvelle, P. (2000), Expectational diversity in monetary economies, *Journal of Economic Dynamics and Control*, 24, pp. 725-759.

Cogley, T. and Sargent, T. J. (2005), Drifts and volatilities: monetary policies and outcomes in the post WWII US, *Review of Economic Dynamics*, 8 (2), pp. 262-302.

Evans, G. and Honkapohja, S. (2003), Adaptive learning and Monetary Policy Design, *Journal of Money Credit and Banking*, 35, pp. 1047-1072.

Gaspar, V., Smets, F. and Vestin, D. (2006), Adaptive Learning, Persistence and Optimal Monetary Policy, *Journal of the European Economic Association*, Papers and Proceedings, May.

Gigerenzer, G., Todd, P. and the ABC Research Group (1999), *Simple heuristics that make us smart*, New York, Oxford University Press.

de Grauwe, P. and Grimaldi, M. (2006), Exchange rate puzzles: a tale of switching attractors, *European Economic Review*, 50, pp. 1-33.

Hommes, C. (2005), Heterogeneous agent models in economics and finance, in Judd, K. and Tesfatsion, L. (eds) *Handbook of Computational Economics (Volume 2)*, Elsevier.

Kahneman, D. (2003), Maps of bounded rationality: Psychology for behavioural economics, *American Economic Review*, 93, pp. 1449-1475.

Keynes, J. M., (1936), *The general theory of employment, interest and money*, New York, MacMillan, 1936.

King, M. (2003), Speech delivered to East Midlands Development Agency Dinner, *Bank of England Quarterly Bulletin*, Winter.

Levin, A. and Piger, J. (2004), Is inflation persistence intrinsic in industrial economies?, *ECB Working Paper* no 334.

Manski, C. and McFadden, D. (eds) (1981), *Structural analysis of discrete data with econometric applications*, MIT press, Cambridge.

Marcet, A. and Nicolini, J. P. (2003), Recurrent hyperinflations and learning, *American Economic Review*, 93 (5), pp. 1476-1498.

Mojon, B. and Diron, M. (2005), Forecasting the central bank's objective is a good rule of thumb, *ECB Working paper* no 564.

Orphanides, A. and Williams, J. (2005), Imperfect knowledge, inflation expectations, and monetary policy, in Bernanke, B. and Woodford, M. (eds) *The Inflation-Targeting Debate*, Chicago: University of Chicago Press, pp. 201-234.

Simon, H. (1957), *Models of man*, Wiley, New York.

Sims, C. and Zha, T. (2004), Were there regime switches in US monetary policy?, *Federal Reserve Bank of Atlanta Working Paper* no 14.

Stock, J. and Watson, M. (2002), Has the business cycle changed and why?, in Gertler, M. and Rogoff, K. (eds) *NBER Macroeconomics Annual 2002*, MIT Press.

Velde, F. (2004), Poor hand or poor play? The rise and fall of inflation in the United States, *Economic Perspectives*, 28(1), Federal Reserve Bank of Chicago.

MONETARY POLICY AND ASSET PRICES

DONALD L. KOHN[1]

I am honored to participate in this tribute to Otmar Issing. I have known and admired Otmar for some time. It has been a source of great pride that he has considered me a worthy intellectual sparing partner over the years. From the hiking trails of Jackson Hole to the restaurants of Frankfurt and at many conferences in between, we have challenged each other to state our assumptions, examine the evidence, and adjust our conclusions accordingly. I have derived enormous benefit from that give-and-take – a sentiment, I am sure, that many others in this room share.

I can think of no better way to celebrate the signal contributions of this leading force in the world of monetary policymaking than to address an issue of great importance to central banks, and one that has drawn considerable public attention and comment of late – namely, the proper role of asset prices in the determination of monetary policy. Otmar and I have debated this issue on many occasions, and these discussions – together with recent research carried out at the European Central Bank, the Bank for International Settlements, and elsewhere – have been both challenging and stimulating. The preparation of this talk has afforded me a welcome opportunity to reexamine my thinking on this subject. So, today, I will review the arguments and the evidence as I see them and draw out the conclusions to which I am currently led.

At the outset, let me stress that I will be expressing my own opinions, which are not necessarily shared by my colleagues on the Federal Open Market Committee.[1]

TWO STRATEGIES FOR DEALING WITH MARKET BUBBLES

Most fluctuations in stock prices, real estate values, and other asset prices pose no particular challenge to central banks, as they are just some of the usual factors influencing the outlook for real activity and inflation. But many argue that pronounced booms and busts in asset markets are another matter, especially if actual valuations appear to be misaligned with fundamentals. What should a central bank do when it suspects it faces a major speculative event – one that might be large enough to threaten economic stability when it unwinds? To help frame the discussion, I will focus on two different strategies that have been proposed for dealing with market bubbles.

The first approach – which I will label the conventional strategy – calls for central banks to focus exclusively on the stability of prices and economic activity over the next several years. Under this policy, a central bank responds to stock prices, home values, and other asset prices only insofar as they have implications for

---

[1] Vice Chairman, Federal Reserve Board. David Reifschneider, of the Federal Reserve Board's staff, contributed substantially to the preparation of these remarks.

future output and inflation over the medium term. Importantly, the strategy eschews any attempt to influence the speculative component of asset prices, treating any perceived mis-pricing as, rightly or wrongly, an essentially exogenous process. Following this strategy does not imply that policymakers ignore the expected future evolution of speculative activity. If policymakers suspect that a bubble is likely, say, to expand for a time before collapsing, the implications of that possibility for future output and inflation need to be folded into their deliberations. Practically speaking, however, I view our ability to act on such suspicions as limited given how little we know about the dynamics of speculative episodes.

Despite its approach to perceived speculative activity, the conventional strategy does recognize that monetary policy has an important influence on asset prices – indeed, this influence is at the heart of the transmission of policy decisions to real activity and inflation. It occurs through standard arbitrage channels, such as the link between interest rates and the discount factor used to value expected future earnings.

The second strategy, by comparison, is more activist and attempts to damp speculative activity directly. It was described at length in "Asset Price Bubbles and Monetary Policy," an article published by the ECB last year. I quote from the article: "This approach amounts to a cautious policy of 'leaning against the wind' of an incipient bubble. The central bank would adopt a somewhat tighter policy stance in the face of an inflating asset market than it would otherwise allow if confronted with a similar macroeconomic outlook under more normal market conditions. … It would thus possibly tolerate a certain deviation from its price stability objective in the shorter term in exchange for enhanced prospects of preserving price and economic stability in the future."[2] I am labeling this second approach extra action, as it calls for steps that would not be taken in ordinary circumstances.[3]

Compared with the first approach, the extra-action strategy responds to a perceived speculative boom with tighter monetary policy – and thus lower output and inflation in the near term – with the expectation of significantly mitigating the potential fallout from a possible future bursting of the bubble. Thus, the strategy seeks to trade off the near-certainty of worse macroeconomic performance today for the chance of disproportionally better performance in the future, on the theory that the repercussions of a major market correction could be highly nonlinear. But the extra-action proposal is by no means a bold call for central banks to prick market bubbles. As the ECB article stresses, such an attempt would be extremely dangerous given the risk that a concerted effort at stamping out a speculative boom would lead to outsized interest rate hikes and recession. Rather, the extra-action strategy is intended only to provide some limited insurance against the possibility of highly adverse events occurring down the road.

[2] European Central Bank (2005), "Asset Price Bubbles and Monetary Policy" (1.7 MB PDF), *Monthly Bulletin* (April), p. 58.
[3] The article's label for this strategy — leaning against the wind — has been used for many years to describe the standard behavior of central banks. Given this history, I think that using the term *extra action* is less confusing.

COMMON GROUND

I will be talking at length about the differences between the two strategies, but I must stress up front how much they have in common. Both policies aim to achieve the same general objectives of monetary policy, using the same broad analytic framework. Most central banks, I believe, share these basic features of monetary policymaking, notwithstanding important differences in their official mandates and the nature of their economies.

At the risk of considerable oversimplification, policymakers can be described as seeking to set policy over time so as to minimize the present value of future deviations of output from potential and inflation from a desired level. Of course, we may not be prepared to write down a specific loss function and say, "There, that's what I'm minimizing." But our deliberative processes and our actions seem broadly consistent with that characterization of the general problem. This statement is true whether our institutions have a specific mandate to keep inflation low and stable and output close to potential, as in the United States, or whether our mandate is defined primarily in terms of stabilizing prices, as in the euro area. Stabilizing output complements maintaining price stability in the medium to long run, and often in the short run as well.

We also can agree that asset prices play critical and complicated roles in determining real activity and inflation – roles that may be changing over time because an increasing share of wealth is market-determined and easily liquified. Movements in stock prices and real estate values affect household wealth and thus consumer spending. Changes in bond prices, stock prices, and exchange rates imply movements in the cost of capital and relative prices that influence investment and foreign trade; exchange rate movements also directly affect the prices of goods and services. Finally, asset prices can affect the value of collateral and thus the provision of credit, thereby influencing aggregate spending. In cases of sharply falling market valuations, these adverse credit-channel effects may even be exacerbated by the deteriorating health of banks and other financial institutions. In sum, asset prices influence the economy in complex and subtle ways over potentially extended periods of time.

Finally, I think it fair to say that most central banks, faced with only a limited understanding of asset prices and their interactions with the full economy, engage in a form of risk management when dealing with market booms and busts. In part, they do this because any particular policy under consideration is never associated with a single forecast for the future paths of output and inflation but, instead, with a large set of possible scenarios with differing odds of coming to pass. While no one uses formal Bayesian methods to solve this difficult problem, I think most policymakers do engage in at least an informal weighing of the various possibilities and their implications when setting policy.

THREE CONDITIONS FOR EXTRA ACTION TO LEAD TO BETTER OUTCOMES

Now let me turn from areas of agreement to more contentious issues, ones that have a strong bearing on the relative merits of the two strategies. As the ECB article notes, extra action is often seen as a type of insurance. And as with any insurance policy, before you buy you have to ask whether the expected benefits outweigh the costs. As I see it, extra action pays only if three tough conditions are met. First, policymakers must be able to identify bubbles in a timely fashion with reasonable confidence. Second, there must be a fairly high probability that a modestly tighter policy will help to check the further expansion of speculative activity. And finally, the expected improvement in future economic performance that would result from a less expansive bubble must be sizable. You may be thinking that, in stating the three conditions, I have slanted the case with such phrases as "reasonable confidence" and "fairly high probability." But stick with me, and I hope to persuade you that these probabilistic qualifiers are needed to judge the merits of extra action.

For the moment, let me set aside the first condition and assume that central banks can distinguish an emerging bubble from improving fundamentals at an early stage. What about the other two conditions? Should we presume that a limited application of restrictive policy would materially restrain the speculative boom and make its eventual unwinding less disruptive for the overall economy?

Consider the U.S. stock market boom of the mid-to-late 1990s. The boom was fueled by a sustained acceleration of productivity and an accompanying rise in corporate profits – fundamental changes that justified a major rise in equity prices. How high those prices should have risen was difficult to judge in real time because no one, not investors or central bankers, could be sure how fast profits would grow in the future. In the event, share prices increased more than was justified by improved fundamentals. But overly optimistic expectations for long-run earnings growth were not being driven by easy money, and I see no reason to believe that an extra 50 or even 100 basis points on the funds rate would have had much of a damping effect on investor beliefs in the potential profitability of emerging technologies. At present, we just do not have any empirical evidence of a link between interest rates and corporate equity valuation errors, as opposed to standard arbitrage effects.

In general, we have a very poor understanding of the forces driving speculative bubbles and the role played by monetary policy. In fact, we cannot rule out perverse effects.[4] Again, consider the U.S. experience of the late 1990s. When the FOMC tightened in 1999 and early 2000, the trajectory of stock prices actually steepened, and equity premiums fell – perhaps because investors became more confident that good macroeconomic performance would be sustained. Since mid-2004, we have seen a marked decline in bond-term premiums, even as the funds rate has

---

[4] From a theoretical standpoint, the "rational bubble" literature demonstrates how a rise in interest rates might lead rational agents to boost the growth rate of asset prices during a speculative episode.

risen steadily. These episodes illustrate that risk premiums often move in mysterious ways, and we should not count on the ability of monetary policy to nudge them in the intended direction.

Perhaps housing markets differ from equity and bond markets. For example, homeowners, who may have a less sophisticated understanding of the economy than professional investors, might mistakenly view a one-time rise in home prices – resulting, say, from a decline in interest rates – as evidence of a more persistent upward trend. If so, a monetary easing directed at stabilizing output and inflation might, conceivably, drive up real estate values by more than fundamentals alone would merit. Still, you would expect any mis-pricing from these sources to be reversed over time as interest rates returned to normal. In any event, empirical evidence on this issue is scanty. More broadly, further research into the causal connections, if any, between monetary policy and bubbles would seem to be needed before we would know enough to be able to act on such linkages with much confidence.[5]

However, let us suppose a situation arises in which we are convinced that tighter policy would check the future expansion of an emerging speculative bubble. Even then, with the second condition now met, the third condition might not hold: The expected improvement in future macroeconomic performance from moderating the bubble's expansion may not be enough to more than offset the up-front costs of extra action. To explain this statement, I note again that extra action with near-certainty weakens the economy and reduces inflation before the bubble bursts in exchange for the chance of better macroeconomic performance in the future.

Admittedly, if the worst-outcome scenario associated with an unchecked bubble is judged sufficiently dire and if the scenario is not seen as too improbable, then a risk-averse policymaker might regard the expected return from extra action insurance as worth its upfront cost. However, our confidence in such an assessment would seem to hinge on believing that the effects of market corrections could be markedly nonlinear. Proponents of extra action often cite an increased risk of severe financial distress as a potential source of such effects. However, without the onset of deflation, how large is this risk? In recent history, the health of the U.S. financial system remained solid after the collapse of the high-tech boom, despite the bankruptcy of dozens of telecom and dot-com firms, the loss of more than $8 trillion in stock market wealth, and stress in the nonfinancial corporate sector. Moreover, the financial sectors of most other developed economies also weathered the worldwide drop in corporate equity values fairly well.

Of course, the nonlinear risks associated with a collapsing bubble may depend on the initial health of the financial system, and under some circumstances we could be worried about the potential for significant financial distress to

[5] Recently, ECB staff economists Carsten Detken and Frank Smets have taken a laudable first step at addressing this issue in a paper that establishes some of the basic empirical facts about the correlations among interest rates, money, credit, asset prices, financial distress, and macroeconomic performance. See Carsten Detken and Frank Smets (2004) "Asset Price Booms and Monetary Policy" (882 KB PDF), European Central Bank Working Paper Series 364, (Frankfurt: ECB, May).

accompany the bursting of a bubble, should that bubble expand further. Even in such cases, however, I wonder whether good prudential supervision in advance and prompt action to clean up any lingering structural problems afterward would not be better ways to deal with this possibility. Certainly, closer oversight of banking systems during the 1980s, including the United States, would have left many economies in a stronger position during the early 1990s. This lesson has been absorbed by supervisory authorities around the world, as evidenced by our successful efforts to strengthen bank capital and our financial systems.

I do agree that market corrections can have profoundly adverse consequences if they lead to deflation, as illustrated by the United States after the 1929 stock market crash and the more recent experience of Japan. But it does not follow that conventional monetary policy cannot adequately deal with the threat of deflation by expeditiously mopping up after the bubble collapses. In Japan, deflation could probably have been avoided if the initial monetary response to the slump in real estate and stock market values had been more aggressive; in addition, macroeconomic performance would have been better if the government had dealt more promptly with the structural problems of the banking sector.[6] As for the Great Depression, the Federal Reserve actually worsened the situation by allowing the money supply to contract sharply in 1930 and 1931, after unwisely attempting to prick the stock market bubble in the first place. Rather than demonstrating the need for preemptive extra action to restrain emerging bubbles, these examples are object lessons concerning the wisdom of central banks' easing promptly and aggressively following market slumps when inflation is already low, so as to head off the threat posed by the zero lower bound. By doing so, policymakers should be able to avoid the severe nonlinear dynamics of deflation.

Proponents of extra action often argue that it should reduce the risk of hitting the zero bound, but we should recognize that under some circumstances extra action may actually exacerbate the problem. To see this, suppose that a speculative bubble has emerged and that a central bank, operating under a conventional strategy, has raised interest rates to keep the projected output gap closed and expected inflation at its desired level before the bubble bursts. Now the central bank contemplates taking extra action. In a low-inflation environment, such a step would be a bad idea if, after averaging across all the possible outcomes weighted by their likelihoods, the predicted moderation in the bubble from tighter policy is small. In this case, the expected weakening in real activity after the bubble bursts would be only marginally less severe under extra action, but inflation would be substantially lower because the extra action policy would have generated persistent economic slack beforehand. With inflation having already started out at a low level, such a decline would be extremely dangerous because the zero bound would now be much more likely to constrain monetary policy after the bubble bursts. Under these conditions, extra action would therefore worsen expected economic performance, not improve it.

[6] See Alan G. Ahearne, Joseph E. Gagnon, Jane Haltmaier, and Steven B. Kamin (2002), "Preventing Deflation: Lessons from Japan's Experience in the 1990s," International Finance Discussion Paper Series 2002-729 (Washington: Board of Governors of the Federal Reserve System, June).

Another purported benefit of extra action is that, by raising the cost of capital to firms and households, it helps reduce overinvestment fostered during speculative booms, thereby making it easier for the economy to recover after the bubble collapses. However, we should be careful not to exaggerate the macroeconomic importance of such capital mis-allocation. True, the U.S. high-tech boom led to overinvestment in some sectors, wasting resources and creating lingering difficulties while capital overhangs were eliminated. But it is hard to see much of a cost in terms of diminished aggregate productivity, given the robust growth of output per hour over the past few years.

Furthermore, even if tighter monetary policy would have damped the enthusiasm for dot-com firms in the late 1990s, higher interest rates would have also led to less housing and less business investment outside the high-tech sector, where valuations were not obviously out of line with fundamentals. Thus, mitigating capital misallocation in one sector would have created capital misallocations elsewhere, making the assessment of the net gain from extra action difficult. And, as I have been pointing out, extra action would have idled some capital entirely for a time as economic activity fell short of its level consistent with stable inflation.

Now I would like to return to the first condition, the one I sidestepped a few minutes ago – the question of identifying market bubbles in a timely fashion. The ECB article stressed that such identification is a tricky proposition because not all the fundamental factors driving asset prices are directly observable, as the productivity acceleration and stock market boom of the 1990s illustrate. For this reason, any judgment by a central bank that stocks or homes are overpriced is inherently highly uncertain.

Under extra action, mistakenly identifying a bubble has significant costs. By acting to mitigate a nonexistent problem, the central bank reduces real economic activity and inflation below their desired levels to no purpose. Admittedly, policymakers, once they recognize their mistake, would presumably want the economy to run hotter for a time to restore the previous rate of inflation and would thereby make up for the initial output losses. But coming to the realization that the original assessment was mistaken and that asset prices were in line with fundamentals is likely to take some time. And the mistaken call would have reduced welfare by needlessly inducing fluctuations in the macroeconomy.

Timing is also an issue. Let us suppose that the evidence is so compelling that policymakers become fairly confident that valuations are excessively rich. Unfortunately, I suspect that this call would often come so late in the day that, given the lags in the monetary transmission mechanism and uncertainty about the duration of bubbles, raising interest rates might actually risk exacerbating instability. The market correction could occur with policy in a tighter position but before extra action had enough time to materially influence speculative activity.

Notwithstanding the controversial aspects of identifying bubbles, policymakers may still want to warn the public about the possibility of asset price misalignments when the evidence merits. Such talk might do some good by prompting investors to stop and rethink their assumptions. And talk by itself should not do much

lasting harm even if valuations turn out to be justified – provided, however, that words are not seen as precursors to action under circumstances in which conventional policy would still be the best approach.

To wrap up this critique, I summarize as follows: If we can identify bubbles quickly and accurately, are reasonably confident that tighter policy would materially check their expansion, and believe that severe market corrections have significant non-linear adverse effects on the economy, then extra action may well be merited. But if even one of these tough conditions is not met, then extra action would be more likely to lead to worse macroeconomic performance over time than that achievable with conventional policies that deal expeditiously with the effects of the unwinding of the bubbles when they occur. For my part, I am dubious that any central banker knows enough about the economy to overcome these hurdles. However, I would not want to rule out the possibility that in some circumstances, or perhaps at some point in the future when our understanding of asset markets and the economy has increased, such a course of action would be appropriate.

ASYMMETRIES AND MORAL HAZARD

Proponents of extra action have their own bones to pick with the conventional strategy, especially as it relates to the alleged asymmetric nature of the policy's response to asset market booms and busts. In particular, the claim is often made that, based on the FOMC's actions over the past twenty years, the Fed actively works to support the economy in an event of a sharp decline in asset markets but does little or nothing to restrain markets when prices are rising, thereby creating moral hazard problems.

This argument strikes me as a misreading of history. U.S. monetary policy has responded symmetrically to the implications of asset-price movements for actual and projected developments in output and inflation, consistent with its mandate. The most convincing evidence for this statement can be found in the results: Interest rates have been consistent with underlying inflation remaining reasonably stable for some time now, accompanied by relatively mild fluctuations in real activity.[7]

Conventional policy as practiced by the Federal Reserve has not insulated investors from downside risk. Whatever might have once been thought about the existence of a "Greenspan put," stock market investors could not have endured the experience

[7] As evidence of asymmetry, observers often cite Claudio E. V. Borio and Philip Lowe (2004), "Securing Sustainable Price Stability: Should Credit Come Back from the Wilderness?" Bank of International Settlements Working Paper 157 (Basel: BIS, July). The authors purport to show that the federal funds rate was unusually low during the headwinds period of the early 1990s but not correspondingly high before the onset of the 1990 recession. But their assessment is made in relation to the Taylor rule, which is not a particularly good description of monetary policy during this period of opportunistic disinflation. In the event, inflation in the United States came down steadily over the first half of the 1990s, accompanied by significant economic slack – results that seem to belie the claim that policy was overly easy.

of the last five years in the United States and concluded that they were hedged on the downside by asymmetric monetary policy. Nor, for that matter, should they have concluded that the Federal Reserve does not act on the upside: If asset prices had been more closely aligned with fundamentals in the late 1990s, our policy would almost certainly have been easier, all else equal, because aggregate demand would have been weaker and hence inflation pressures even more muted than they were. The same considerations apply to homeowners: All else being equal, interest rates are higher now than they would be were real estate valuations less lofty; and if real estate prices begin to erode, homeowners should not expect to see all the gains of recent years preserved by monetary policy actions. Our actions will continue to be keyed to macroeconomic stability, not the stability of asset prices themselves.

Ironically, one can argue that extra action may pose a more significant risk of moral hazard. It is one thing for policymakers to raise questions about the relationship of asset prices to fundamentals and another for a central bank to take action to influence valuations in the direction of some "appropriate" level. How does this strategy play out if a central bank takes extra action and speculative activity continues unabated or even intensifies? Do policymakers raise rates even further above levels consistent with conventional policy and, if so, at what consequences for the economy? And what is the risk that, in taking such steps, a central bank would be seen by investors as taking on partial responsibility for asset prices? If so, would the pressure on central banks to support asset prices in market downturns increase?

CONCLUSION

My remarks today have been intended as a salute to Otmar and to all the valuable contributions he has made over the years to my thinking and to that of policymakers around the world. Otmar, you have taught me much about intellectual rigor in support of central bank contributions to economic welfare – and about friendship. Weighing the relative merits of extra action and conventional policy is not easy and requires a nuanced interpretation of the arguments and the evidence, as well as some hard thinking. Otmar and his colleagues have done this in advancing the case for extra action, and by so doing they have given me a good intellectual workout – and Otmar, I thank you for that. I hope my response has provided a good workout in return. I look forward to continuing the debate and especially the friendship for many years to come.

PANEL DISCUSSION:
THE ART OF CENTRAL BANKING

STANLEY FISCHER[1]

It is a great pleasure to take part in this event honoring Otmar Issing, an economist who commands such widespread respect, both personally and professionally. Throughout his career he has combined a seriousness of purpose and approach to economic theory and to the facts with an openness and willingness to entertain other views and possibilities. That is why among the remarkably large audience here today are present not only those who agree with his approach to monetary policy, but also many who do not share his views, but who have benefited from discussions with him, and who admire his professionalism, his capacity to take a clear policy line without becoming dogmatic, and his decency. And I would like to add that I know too how much Rudi Dornbusch valued and enjoyed his friendship with Otmar.

I am not the youngest member of this distinguished panel, but I am the youngest in terms of experience. Of the collective 32 years of service as Governor of all those on this panel, I account for less than one year – and since Jacob Frenkel is on the panel, I cannot even take refuge in my knowledge of the special case of the Bank of Israel. So in discussing the art of central banking, I will have to draw not only on my so far limited experience as a Governor, but also on academic writing, on some of the biographies and autobiographies of central bankers of the past, including those of Montagu Norman, Benjamin Strong, Emile Moreau, and Marriner Eccles,[2] and on personal observation of modern-day central bankers.

The art of central banking must focus around the essential task of the central banker, setting monetary policy. But there is much skill and art also in the other essential aspect of the task of the Governor, that of managing the central bank. The art here consists of finding the right people to do the managing, so that the Governor can focus on monetary policy and – in cases where the central bank is responsible for banking supervision – also on supervision of the banking system.

RULES VERSUS DISCRETION

The emphasis on the need for rules and predictability in the operation of monetary policy is not new. It began with Henry Simons or perhaps even with Bagehot.[3] In Simons' words (p.181), "The most important objective of a sound liberal

---

[1] Governor, Bank of Israel.

[2] Sir Henry Clay, *Lord Norman*, Macmillan, 1957; Lester Chandler, *Benjanin Strong, Central Banker*, Brookings Institution, 1958; Emile Moreau, *The Golden Franc*, (translation), Westview Press, 1991; Sidney Hyman, *Marriner S. Eccles*, Stanford University Graduate School of Business, 1976.

[3] Henry Simons, "Rules versus Authorities in Monetary Policy", pp 160-183 in Simons, *Economic Policy for a Free Society*, University of Chicago Press, 1948; Walter Bagehot, *Lombard Street*, Kegan Paul (London), 1906 (original edition in 1873).

policy … should be that of securing a monetary policy governed by definite rule. … To assure adequate moral pressure of public opinion against legislative (and administrative) tinkering, the monetary rules must be definite, simple (at least in principle), and expressive of strong, abiding, pervasive, and reasonable popular sentiments"

Central bankers operating under a gold standard had in principle little room for discretion and thus for the exercise of judgment and the art of central banking. But as is clear from Bagehot and other accounts of the operation of monetary policy in the nineteenth century, in crises there is a great deal of room for judgment, and a great need for the exercise of wisdom in deciding what interest rates to set to defend the gold peg, and not less important, in deciding when to violate gold standard rules. In modern times, the operation of a strict currency board approach would eliminate the need for discretion, but in many currency board arrangements even today there is room for judgment in deciding how to defend the currency peg, and whether to accept the strict rule that in principle links the domestic money stock to the balance of payments.

Similarly, implementation of a constant growth rate rule for money[4] would remove almost all judgment from monetary policy in its day-to-day execution, and would reduce the proportion of art in central banking to a minimum. Even in this case though, it would take judgment and art to decide what money stock to target, how technically to attain that target, and when to change it.

By contrast, monetary policy as conducted in the framework of typical central bank legislation of the first two-thirds of the twentieth century left a great deal of room for discretion and for judgment – in deciding on the operational goals of monetary policy, and on how to operate to attain those goals.

The inflation-targeting (IT) approach limits discretion with regard to the goals of monetary policy,[5] but not greatly with respect to the regular instrument decisions that central bankers operating in that framework have to make. Thus almost every central banker has to make essential discretionary judgments frequently. That is to say, to this point the rules versus discretion debate has been resolved in favor of constrained discretion, which leaves room for the art of central banking.

SCIENCE VERSUS JUDGMENT

I gather that pilots of commercial airliners are required to make at least half their landings manually, and that it is easy to tell which landings are manual and which automatic – the automatic landings are much smoother. Those who search for

---

[4] In setting out the case for a constant growth rate rule for the money supply, Milton Friedman refers to Henry Simons' famous article. See Milton Friedman, *A Program for Monetary Stability*, Fordham University Press, 1960.

[5] Interestingly Simons concludes his paper by arguing for a constant price level rule as an intermediate step en route to an eventual policy of fixing the stock of money. Until the inflation targeting approach to monetary policy was developed, I found it difficult to identify this suggestion as a monetary rule, rather than merely a specification of the appropriate goal of monetary policy.

ever more precisely prescriptive rules for monetary policy must believe much the same thing, that the less room there is for discretion in making monetary policy decisions, the smoother will be the performance of the economy.

This view is correct with respect to the need to specify the goals of monetary policy as clearly as possible, and to ensure that the goals are not only precisely stated, but also capable of being attained. The question then arises of how much further to go in attempting to use quantitative tools. If one had a fully reliable model, it would be possible to feed the objective function into the model and derive the monetary policy decision from the model.

In cases where there is more than one objective for monetary policy – for instance where the primary goal of monetary policy is price stability (a concept which only becomes operational when numerically defined) and the central bank is charged also with supporting growth and/or employment, to the extent that this does not endanger medium term price stability – it is necessary to specify the appropriate objective function. Lars Svensson has suggested eliciting the monetary policy committee's loss function by facing the committee with a series of choices of tradeoffs on the basis of which it would be possible to infer their underlying preferences. This would be an interesting exercise, but it would also be necessary to check that the committee's preferences are broadly consistent with those of the government and the society.[6]

However no models have yet reached the stage where they can be used to derive monetary policy decisions without the exercise of judgment. In the words of Paul Samuelson, "I would rather use Bob Solow than an econometric model to make a forecast, but I'd rather have Bob Solow with a model than Bob Solow without a model". Indeed, almost no-one advocates relying solely on models in formulating monetary policy decisions. Models do provide a coherent framework for thinking about the economy, and for tracking alternative scenarios – in other words they provide a baseline for systematic thinking about the monetary policy decision. And the better the models, the more use can be made of such exercises, and the better on average is monetary policy likely to be.

Nonetheless it is essential for the central banker to operate within his or her own framework that both takes advantage of the insights of the models, and enables him or her to take into account special factors that might not be accounted for in the models. This applies particularly when some underlying process may be changing – a classic example being the Fed's decision in 1995 not to raise interest rates in 1995, because the Chairman believed that the productivity trend in the United States had changed. Similarly, the Fed's decision to cut interest rates in the fall of 1998 in the wake of the Russian crisis relied on the exercise of judgment and insight – and in general, it takes judgment, experience and also knowledge of monetary history to make the right decisions during crises. Here lies much of the art of central banking.

[6] The exercise would raise a whole set of other interesting questions, including whether the committee's choices meet various consistency tests (e.g. transitivity) and whether they are consistent over time – and what to do if the estimated preferences do not meet these requirements.

LEADERSHIP

Above all, the art of central banking lies in leadership – the ability clearly and coherently to lay out the goals of monetary policy and of the central bank, to pursue those goals consistently but with sufficient flexibility to know what tradeoffs to make, and the ability to persuade people in the central bank and out of it that those are the goals that monetary policy should strive for. This is no small challenge, for the relevant players outside the central bank include the private sector, particularly the financial sector, the legislature, the government, and the public.

That is to say that a considerable part of the art of central banking lies in gaining credibility and support for the central bank and for its independence, for central banks do not operate in a vacuum, especially in a democracy. Not only that, there will come a time when every central bank has to make unpopular decisions, and then it will be crucial to have earned popular and political support. Of course, no amount of leadership and persuasive ability, no amount of transparency and accountability, no amount of formal independence, can succeed in gaining credibility for a monetary policy and an institution that have not earned that credibility through their performance. But it is also true that some central bankers are more persuasive than others, and that it is worth striving to be among the more persuasive.

The credibility of the central banker is critical not only in establishing his or her general standing as a leader of the economy, and in enabling the central bank to maintain its independence, but also in guiding expectations about inflation in the long run, and about upcoming monetary policy decisions. The ability to guide expectations is certainly a key aspect of the art of central banking, for markets do not take kindly to being surprised – and they are sometimes capable of locking their expectations in place too firmly too soon.

The exercise of leadership is relevant also within the central bank. Monetary policy decisions are typically made in committees. Leadership – leading a committee, combining the ability to listen to and benefit from the views of others on the committee, without blowing in the changing winds of the moment – is an essential art for a central banker. Even for the single-decision maker governor, as at present in the Bank of Israel, consultation with staff and other relevant players, and the capacity to evaluate the economic situation and the analysis of the staff, is essential for success.

THE SCIENCE AND ART OF CENTRAL BANKING

I have so far avoided defining the "art" in "The art of central banking". Implicitly I have been contrasting art with science, identifying art with judgment and wisdom, and accepting that the most successful central bankers are those who best understand and evidence the art of central banking.

But it is worth asking at this time when many central banks can point to a record of success in reducing inflation and keeping it low, whether we have learned a great deal about central banking – whether it is science that has enabled central banks to be so successful in the last decade. To a considerable extent I believe this is true – that much of the success in keeping inflation low in the last decade is not due to improvements in the art of central banking, but rather to improvements in the general understanding of monetary policy, that is, to the science of central banking. The science consists of developments in game theory that have made it possible to analyze concepts like dynamic consistency and credibility, and to those associated with improved understanding of the short- and long-run tradeoffs among inflation, unemployment, and growth, which have contributed to the development of the inflation targeting approach. And some of the success in reducing inflation is very likely in part due also to the impact of globalization on wage behavior.

Nonetheless, when one looks at the great central bankers, including those present today – for instance Paul Volker when he took over the Fed in 1979 with the mandate of defeating inflation – one cannot but conclude that it was important that they were in charge of monetary policy when they were, and that the history of their economies would have been different if they had not been responsible for monetary policy. What they did seems to have been a judicious blend of science, judgment, experience, and character – and that is the art of central banking.

ARMINIO FRAGA[7]

This note discusses the need to supplement science with art in the permanent search for the best possible way to conduct monetary policy.

WHAT SCIENCE TELLS US

Current wisdom amongst academics and practitioners of central banking includes the following:

• There is no permanent trade off between inflation and unemployment.
• High and unstable inflation hurts growth, so it makes sense to pursue price stability, usually understood as a low and stable rate of inflation.
• The best way to achieve this objective is to delegate the task to the central bank.
• Further efficiency gains are obtained when the commitment to price stability is made credible, typically by a law that gives the central bank independence.
• There is a trade off between the variances of inflation and unemployment.
• In going about its task a central bank can benefit from sophisticated statistical analyses of how the economy behaves in a variety of circumstances, including in response to changes in the monetary stance.
• Issues of financial stability are best handled by the prudential supervision of banks and other intermediaries, not by monetary policy.

---

[7] Founding partner, Gávea Investimentos, former president, Central Bank of Brazil.

WHERE ART COMES IN

There is no question science has come a long way in guiding the practice of monetary policy. Still, it seems unlikely that at any point in the future an element of judgment ("art") will be absent from policy making. Let's look at examples of situations where some art is needed for the actual practice of central banking.

First, the use of models and econometric analysis. If perfect data were available and economic relationships were stable, one could conceive of science helping construct models that could be relied upon to conduct monetary policy entirely on their own. But that is not the case: the information contained in the data typically available is imperfect, and statistical relationships change over time in ways that are never fully predictable. As a result, it is difficult to estimate, and even more difficult to forecast, most of the parameters needed for the implementation of monetary policy. Some key examples are: the rate of growth of potential GDP, the neutral rate of interest, the degree of inertia of inflation, the degree of passthrough of exchange-rate changes to inflation and the strength of the transmission mechanism. Often we may be dealing with uncertainty rather than risk, particularly in less developed countries, that tend be quite unstable. As a result, an element of judgment is essential, such as in the use of qualitative information and in the early identification of structural breaks (e.g., changes in the rate of productivity).

Second, the nature and behavior financial markets are such that we seem to live in a world of booms and busts that are hard to understand and predict. Moreover, the interaction of policy and markets can be quite tricky and complex, bringing to the forefront issues of psychology and confidence, which again place a premium on the judgment and the communications skills of policy makers.

ASSET-PRICE FLUCTUATIONS

The case of asset-price fluctuations and their impact on the economy is of great current interest. The key question seems to be whether central banks should care only to the extent that asset-price changes affect current and expected aggregate demand, or whether they should proactively take a stance when asset prices deviate significantly from fundamentals.

One possibility is the Greenspan-Fed approach. Here the view is that given the inherent difficulties in predicting market turning points it is best to let the show go on, as the Fed did in during the Greenspan era, and to mop up after a crash, as was done after the 2000/01 NASDAQ collapse.

It is hard to argue with the extraordinary success of the Fed over the last 25 years, but on this matter, it may pay to listen to Ralph Hawtrey in his classic book The Art of Central Banking (1932, p. 288): "when the central bank elects to 'follow' the market, that means it acquiesces in these deviations [from the natural rate]. (…) So following the markets merely means delaying action".

The point is a more general one. If central banks are willing to work with estimates of most key parameters, why not also work with estimates of reasonable levels of asset prices? Not to do so may be good policy if there is no path dependence, but that is seldom the case. Consider, for instance, the case of a financial crisis. In a perfect textbook world bankruptcy is not costly – it is a mere reorganization of the liabilities of companies, where no value is destroyed. In reality, however, the costs can be very high, as the extensive literature on the subject attests.

If a given situation is on its way to becoming a bubble, and one where the extent and degree of leverage are such that a bursting will have significant social costs, then it may be the case that a policy intervention aiming at a soft landing, or even at an early and smaller crash, is the right way to go. Of course this requires that someone in government make a judgment (i.e., take a guess) as to whether a certain situation requires intervention. This in turn means taking a view on the level of some asset price, something most policy makers usually prefer not to do, thinking it would entail taking a 50/50 bet, an unattractive proposition. But there are instances where the odds may be better than 50/50. Or it may be the case that expected losses from a crisis exceed the gains from letting the party go on. For instance, it may well be the case that a bubble that involves the balance sheets of banks is more dangerous than one that materializes outside the banking system because of the well-know negative externalities associated with a collapse in the payments system. In this case, a preemptive strike makes sense, even if at first the action taken by the central bank takes the form of a partial step, perhaps followed by further steps, as more information becomes available and the original diagnosis is confirmed.

It seems to me that at this point in time we may be going through a subtle but relevant shift in the economics profession, towards a broader approach to the conduct of monetary policy. It is important to notice that this is happening as central banks strive to better achieve their proper goals, not as a cop out of their commitment to price stability. Examples include:
• The European Central Bank's pragmatic use of monetary aggregates to guide policy, now being reinterpreted in light of the need to incorporate asset-markets phenomena into the practice of central banking.
• The research led by the BIS on a macro-based prudential framework to deal with the disturbing degree of pro-cyclicality we observe in financial markets. This is useful because avoiding financial crises may reduce the danger of future inflation driven by the need to deal with extreme circumstances.
• Recent speeches by the president of the New York Federal Reserve Bank on asset prices and the US current account, including a careful but novel discussion of the role of foreign central bank purchases of Treasury bonds and their potential role in keeping long-term interest rates away from their fundamental level.

A FINAL WORD OF CAUTION

This discussion about the art of central banking applies to countries where the views of what central banks can and cannot do are consolidated. This means there is a general consensus concerning the role of central banking and, therefore, the

discussion is about how to achieve the achievable goals of monetary policy. First and foremost, a central bank can and should strive to keep inflation low and stable.

But in countries where there is no such understanding, a discussion about the art of central banking usually means a discussion about the need for looser monetary policy, typically based on a view that growth is not higher because the central bank does not want it to be so. This of course is pure hogwash, the province of charlatans, of nostrum pushers, and must be resisted by central bankers.

In an environment where a central bank may be exposed to these sorts of temptations, as well as to more legitimate ones, such as supply shocks, the risk of a loss in credibility becomes an issue, as repeatedly emphasized by deep thinkers like Otmar Issing. The art of central banking lies not in avoiding all temptations in extreme risk-averse fashion, so as to preserve credibility, but rather in striking a reasonable balance without losing the anchor of stable long-term inflation expectations.

LARS HEIKENSTEN[8]

Let me start by turning directly to the subject of these festivities, Otmar Issing. During these days, many will bear witness to your importance for the ECB and earlier – in pre-historic times – the Bundesbank. Let me therefore say that you have meant a great deal also for us in Sweden, in our work during the last 10 years to establish a trustworthy monetary policy regime. Sometimes we have agreed, sometimes not. But maybe it is precisely because we have not always had exactly the same view on things such as openness and inflation targets that discussions with you have been so constructive and fruitful. In a friendly and straight-forward manner throughout the years, we have held an ongoing conversation about pros and cons in different methods of working. And when times were rough, you have always had time for encouragement, support and a much-needed pat on the back. To get a friendly pat from Otmar is worth a lot, let me ensure you all. Thank you, Otmar.

"The art of central banking" is the heading for this panel discussion. The starting point, I suppose, is that central banking is something unique.[9] However, I shall commence from the opposite assumption; i.e. that "the art of central banking" is in important respects not so different. At least if we do not concentrate only on monetary policy but instead take a broader perspective on central banking. As governor of a central bank I spent at least two thirds of my time handling other matters than monetary policy.

---

[8] European Court of Auditors, former Governor of Sveriges Riksbank. I would like to thank Klas Eklund, Eva Srejber, Staffan Viotti and Anders Vredin for valuable comments.
[9] One of the most elegant descriptions that I have heard on this theme was delivered by Otmars earlier colleague Tommaso Padoa-Schioppa, in connection with him leaving the ECB Executive Board last year. He compared the central banks with mules, half bureaucrat, half market.

Let me set out some views on this based on three themes. They were used as guidelines for us in the Riksbank when we changed our operations during the last 10 years. In conclusion I will bring up an area where I believe that central banks truly distinguish themselves from other institutions.

1. The first theme is *efficiency*. Nothing is more important if you want to run an efficient operation than to concentrate on the really decisive and central activities. That applies to all organizations. Central banks are helped by the fact that in general it is not difficult to know what their goals are. They are often stated by a law. Even if this is not the case, they are normally quite clear and they don't change quickly. As a matter of fact, the Riksbank as the world's oldest central bank, did approximately the same thing in the 17th century as it does today, i.e. taking care of monetary and financial stability.[10]

Also, central banks are privileged in comparison with other institutions because they usually have a large degree of control over their own activities and budgets. This gives them greater scope to make their operations more effective, especially in comparison with other public institutions. One the one hand one can take initiatives and discontinue operations which are outmoded; on the other hand there is room to expand and develop other areas. Against this background, politicians, the financial community, citizens – everybody – have strong reasons to demand efficiency from central bankers. However, printing your own money, in combination with a high degree of independence, means that you can not blame budget restrictions set by others, or the market, or any other outside force when you want to change things. You have to be brave and take the fights that often go together with change yourself. Increased independence in monetary policy has been accompanied by much tougher scrutiny of what central banks have achieved in other areas. To have one's own house in good order is essential if one is to be able to act with self-confidence in the economic debate. I am surprised that we haven't seen finance ministers more frequently meeting demands for structural reforms from central bankers by simply biting back; "why don't you central bankers start by cleaning up in your own back yard?"

2. My second theme is *competence and analytical capacity*. This as well is something that many other organizations, private as well as public, are grappling with. It is important to be well in front within one's own area in order to stay in the competition. More and more often this implies having high analytical capacity.

Though the objectives of central banks, which I mentioned earlier, have held up well over time, the world around them changes rapidly. Increasing international integration and a continuous flow of innovations in the financial sector are among the factors changing the environment in which central banks operate. This means that it is essential to be able to switch from one problem or question to another. In practice, this requires not least a wide and deep analytical toolbox.

---

[10] In the law were among other things expressed that the Riksbank should store holdings of foreign currency and precious metal for the Kingdom.

The need for a strong analytical base has risen with increased central bank independence. When the responsibility for monetary policy, and thus to a very high extent also for macro-economic stability, lies in the hands of central banks, it is absolutely crucial that they can deliver. When central banks encounter problems, and policy outcomes differ significantly from expectations – something that has happened to all of us – we will naturally be exposed to criticism. However, according to my experience these sorts of situations can be handled if there is fundamental confidence in the competence of the organization, and if it is evident that the central banks are prepared to change the way they think and act in response to changes in the outside world and if there is trust that no one else could have done the job better in the long run. In this context an academically rigorous basis for analysis and policy as well as strong links with the academic world are great assets.

3. The third theme that I want to bring up – the need for *openness and clarity* – is connected to this. This need goes for society at large, and comes with better educated citizens, with tougher media, with the rapid spread of information technology etc. For central banks there are at least two more reasons. Transparency can help in guiding the markets. This is important primarily because disruptions in the markets result in costs for society as a whole and for the individuals involved. In turn this can undermine the credibility of the central banks. In addition to this comes something which I touched upon earlier. With significant independence and delegated powers, it is even more important to be able to justify one's own actions. For me a decisive argument for inflation targeting has been to facilitate evaluation and accountability.

Central banks face particular communication problems. I have already mentioned the need to reach out to financial markets in an efficient way. The challenge is enhanced by the fact that what is communicated is in general decisions concerning the future about which there can be no certainty. Since their cards are seldom or never scrutinized it is almost free of cost for anyone who so wishes – politicians, actors on the market, unions and media – to push their own agendas and interpretations in questions about interest rates. Add to this the political sensitivity and it is not strange that there are some very strong winds blowing at times.

I think it has been a great strength that in these winds – which have not always been the soft summer breezes one could have wished for – to have an analytical frame with targets and as clear decision rules as possible to stick to and to communicate. This has brought stability to the internal work at the Riksbank, helped structure the board discussions and facilitated the communication of monetary policy issues to the markets, to media etc. It has also made it easier to communicate the fundamental reasons for stability oriented policy and laid a good foundation for society at large better to understand monetary policy.

When we have increased the interest rate – as well as when we have decreased it, it has been of great importance that the arguments – within the framework that we have laid down – could be tied clearly and directly to new relevant information available. A good example was last June when we took rates down

to 1.5 percent. Given the political discussions during the spring it could easily have been claimed that we were "giving in" to pressures, if we could not have explained and justified the move so clearly with new incoming data and their expected effect on our inflation forecast.

Maybe I should also add that there in my view is a clear connection between openness and efficiency, which is often forgotten in these kinds of discussions. When we have opened up to the world around us, it has shown to be an effective way to stimulate changes and to improve our internal activities.

Let me round off. I have discussed three areas where I think the similarities between central banks and other institutions are greater than the differences. Within these areas I believe the "art of central banking" can be developed through learning from other institutions. In one of these areas central banks have been very successful i.e. in building up analytical capacity, which in many cases can stand as a model for others. Let me finish by mentioning a fourth area, one where I believe central banks are unique, and where I think others could learn a great deal from the world of central banks; namely international co-operation.

My experience has been that central banks within the frame of European central bank co-operation, within the Bank of International Settlements (BIS) and so on, can hold a fruitful and open dialogue about most things. It may be problems of principle of a highly analytical character, it may be very concrete matters or current problems which need to be resolved in a practical way. We central bank governors have talked freely and frankly about the difficulties we have faced on the national arena or about internal organizational matters. When something dramatic happened during recent years, like the crisis in Asia in 1998, later Russia and LTCM, we were able to make contact swiftly. The same applied to the aftermath of September 11. I believe this co-operation – sometimes of an almost club-like, informal character, has been extremely fruitful.

Why, one might ask , is central bank co-operation functioning so well? An obvious reason is that central banks in general do not compete in the same way as do actors in the private sector. Nor do the central banks tend to find themselves negotiating with each other to the same extent as government officials. This picture is complemented by the relatively large degree of personal continuity. Add to this, and this might be the most important factor, that central banks on the whole have the same goal – stability, and that this goal is not controversial. Independent of political views, most can agree that stability is something valuable. Besides stability in one country often contributes to a general stability in the surrounding world and vice versa.

Regrettably, the importance of a common goal in facilitating successful cooperation among central bankers implies that co-operation in the world of central banking is hard to copy. Still, I think it is worthwhile to reflect further on the question of whether or not other political arenas could learn something from co-operation between central banks. It would not hurt to have more "clubs" of this kind in the world.

HANS TIETMEYER[11]

For some time now, appropriate and – above all – lastingly successful central banking has more and more often been classified and designated as an art. The label "artist" for the active central banker is, however, not to be heard or read quite so frequently, apart perhaps from occasional references to Alan Greenspan as a great magician. In the case of Otmar Issing, too, I would not hesitate to speak of an artist of central banking. But his outstanding professional and academic qualifications and powers of persuasion are inadequately conveyed by the concept of "artist" alone. After all, Otmar Issing, through many years of masterly and persuasive work, has provided theoretical and practical economics with numerous findings and insights. And, as a major architect of central banking, in Germany and especially in Europe, he has set unmistakable standards. Personally, I was privileged to co-operate with him directly for almost a decade, and I learned a great deal from him, for which I remain grateful today.

I   GENERAL ASSESSMENT OF ECB MONETARY POLICY

In today's globalised, fast-moving and multidimensional financial world, successful central banking has indeed become an art making heavy demands. That was and is especially true of the supranational ECB. It was, after all, a newcomer without any experience of its own when, in autumn 1998, only a few months after the establishment of the ECB, the Governing Council first defined the future monetary policy strategy, at Otmar Issing's suggestion, and then announced it to the public. And the ECB has in principle abided by that strategy ever since. After a thorough review, at all events, the Governing Council reaffirmed its basic stance in May 2003. Although a number of clarifications and concretizations were also approved, there was no fundamental revision or change of stance.

The definition of such a common strategy was anything but easy, particularly in the preparatory stage of the monetary union. Not only were the traditions of the national monetary policies highly divergent in some cases; the structures of the financial markets and the political and media environments in member states likewise showed not inconsiderable differences, and to some extent still do so today. And yet, the strategy jointly agreed at that time and its application in the practical implementation of ECB policy over the past seven years has to my mind been successful. It has contributed materially to the fact that the euro is today a well established and universally recognized currency. In some respects, the ECB has been able to link up with the experience of the national member central banks, but in the meantime it has also acquired a distinct profile and standing of its own. At the same time, it has proved able to resist all overt and covert political assaults on its contractually-guaranteed independence. Also to that Otmar Issing has made a major contribution, together with his colleagues on the Board and the Governing Council.

---

2   JUDGEMENT VERSUS RULES IN MONETARY POLICY MAKING

2.1 THE CASE OF GERMANY 1993-94

The main object and purpose of this panel is to reflect on the significance of "judgement" in monetary policy practice. As a starting point, the organizers have asked the participants to report, in the light of their own experience, on monetary policy decision situations "in which there may have been little guidance from either history or theory, and where particular judgement was needed." The organizing committee was thinking of situations like "asset price collapses, financial crises, inflation scares, exchange rate crises, major political changes and big structural changes", such as for instance German reunion.

Needless to say, as Vice President and later as President of the Deutsche Bundesbank during the 1990s, I experienced quite a number of exceptional situations, and crises as well. Unlike other countries, Germany was largely spared "asset price collapses" and "financial crises" during those years. But we did have to cope with a number of "exchange rate crises" and a structural caesura of hitherto unprecedented scale, the reunion of western and eastern Germany, and the undesirable developments in German fiscal policy that were aggravated thereby. However, this was for the most part a singular historical event, the lessons of which for monetary policy in general and for the policy of the Eurosystem in particular – despite the challenges it posed to the ERM at the time – are fairly limited.

Hence I should like to draw your attention to a different critical period in German monetary policy in the 1990s which seems to me to be particularly suitable as an example of the importance of "judgement" or of "the art of central banking", and in mastering which Otmar Issing played a crucial role. I am thinking of the decision situation in the early months of 1994, when we at the Bundesbank decided to continue our policy of gradually lowering interest rates, even though the growth of the money stock at the time was much stronger than would have been consistent with our target corridor of 4 to 6%.

The situation around the turn of 1993-94 was marked by particular tension between easing inflationary pressures on the one hand and a sharp acceleration of monetary expansion on the other. A major reason for that was changes in national tax regulations at the end of 1993, which resulted in substantial return flows of financial resources from abroad and in a steep rise in the demand for housing loans. Under the impact of global interest rate increases at that time and of associated restraint in longer-term investments, this surge of liquidity developed into nothing less than a liquidity pile-up in early 1994.

After the monetary target had been already overshot in 1993 for the second year in succession, according to the money stock management orientation of monetary policy prevailing in the Bundesbank at the time, at first sight the obvious step would have been to restrain the strong monetary growth by means of interest rate policy curbs. But things were not all that straightforward. In view of investors' uncertainty, and of expectations of interest rate increases at the long end of the market, we had to assume that an interest rate increase on our part would, if

anything, tend to exacerbate the existing liquidity pile-up. Under those exceptional conditions, it was therefore essential to enhance interest in longer-term financial assets by increasing the interest rate gap between short and long-term investments, thus helping to dampen the growth of the money stock and the associated fears of inflation. After intensive internal debates, we decided, at Otmar Issing's suggestion, to resume (after a break of several months) the policy we had begun in the autumn of 1992 of a gradual interest rate reduction. Between February and May 1994 we lowered our key interest rates in three steps (from 5¾ and 6¾% to 4½ % and 6%). And after a comparatively short period, this policy led to a marked deceleration of monetary expansion.

The reason for this action by the Bundesbank at that time was not a new interest rate strategy and especially not a general setting-aside of potential-oriented monetary targeting. Instead, it was the appropriate answer to a specific situation in the financial markets, characterised by special factors. As a matter of fact, the interest rate stance of the Bundesbank (together with the rise in long-term yields) thereafter contributed significantly to the fact that the liquidity pile-up in the financial markets disappeared, and that the growth of the money stock returned to the target corridor by the end of 1994.

2.2 THE LESSONS OF THAT EXPERIENCE

What lessons may be derived from that phase of German monetary policy? In the first place, of course, the example shows that strict pursuit of a rule once set is not always appropriate in monetary policy practice. It was not for nothing that we at the Bundesbank described our prevailing strategy of money stock management as "subjection to rules, with the option of discretionary action in exceptional circumstances" or "rule-based behaviour". We wanted to keep the option of flexible moves open. And this behaviour was sometimes named as "pragmatic monetarism".

Even so, for us in the Bundesbank it was always important to abide by the concept of fundamentally "rule-based behaviour". The reasons for such a concept were accurately defined as follows by John Taylor, the "inventor" of the Taylor rule, in his Carnegie-Rochester paper of 1993:[12]

"If there is anything about which modern macroeconomics is clear however – and on which there is substantial consensus – it is that policy rules have major advantages over discretion in improving economic performance. Hence, it is important to preserve the concept of a policy rule even in an environment where it is practically impossible to follow mechanically the algebraic formulas economists write down to describe their preferred policy rules."

---

[12] See Taylor, J. (1993): Discretion versus policy rules in practice, Carnegie-Rochester Conference Series on Public Policy 39, 195-214, p. 197.

Interestingly, in this context John Taylor also emphasized the similarities between interest rate rules of the Taylor type and money stock rules in the manner of Milton Friedman.[13] But that is only by the way.

The crucial point for us at the Bundesbank was that rules – even if they cannot be abided by in certain situations – provide a major point of reference, which, in particular, serves to anchor medium to long-term inflation expectations. At the time, moreover, we always drew attention to the fact that the rate of monetary growth was only an intermediate target on the way to meeting the ultimate target, namely price stability. But the setting of a monetary target compelled the decision makers to provide convincing reasons for any failure to meet it, and thus created credibility with respect to the real mandate.

It may be argued, of course, that credibility depends less on words than primarily on deeds – that is to say, on visible successes in the matter of stability. In that respect, the Bundesbank was in a comfortable position in 1994 after many years of successful anti-inflation policy. And yet – and here, too, I know myself to be in agreement with Otmar Issing – a good "track record" alone is not enough to steer expectations in the desired direction. Rather must the "deeds" be bolstered by appropriate words – in the form of a clearly communicated definition of the ultimate objective and a consistent formulation of the monetary policy strategy.[14]

That brings us to another important aspect of the art of central banking, namely the role of communication. This is likewise a subject to which Otmar Issing has contributed a great deal. In his European function as well, he from the outset rightly emphasized the importance of transparency and communication for a newly-created institution like the ECB. At the same time, however, he always drew attention to the fact that there are distinct limits to any efforts at transparency. These limits result, firstly, from the substantial uncertainty about actual transmission mechanisms, especially in the international field, as well as from the low reliability of the available data base. Secondly, it must be borne in mind that enhancement of the data does not necessarily result in greater clarity. It is therefore imperative that the central bank should structure the mass of information bearing on any decision and release to the public not only the data but also its interpretation of such figures. This task is greatly facilitated in turn by the formulation of a consistent monetary policy strategy, which acts as a frame of reference for the interpretation of the varied data.

A special role is played by communication in the dealings of central banks with the financial markets. In this connection, all over the world there is an increasing tendency for the markets to be prepared for future interest rate changes by hints in speeches and publications. The object of this development is to steer market expectations in the direction desired by the central bank, although, needless to say, that can be accomplished only if the public statements are actually consistent.

[13] See Taylor (1996), Policy Rules as a means to a more effective monetary policy.
[14] See Issing (2004): Kommunikation, Transparenz, Rechenschaft – Geldpolitik im 21. Jahrhundert, Paper delivered at the annual meeting of the Verein für Socialpolitik, (Society for Social Policy), p. 5.

This cannot mean, however, that every monetary policy measure can be prepared well in advance, and can be completely foreseeable. Instead, situations are conceivable in which surprising monetary policy decisions are essential, for instance in order to prevent unwelcome developments in the financial markets. Hence, central banks must retain the freedom not necessarily to share the assessment of the markets, but rather to determine the basic orientation of market expectations themselves.

3   MONETARY POLICY AND ASSET PRICES

As already mentioned above, during the era of money stock management (1975-1998) Germany was largely spared sharp fluctuations in asset prices, and financial crises such as erupted in many other countries in that period. I am thinking, for instance, of the crash in the early 1990s, from which the Japanese economy has suffered for many years and of the asset price bubble of the late 1990s, which started in the USA and spread to many other countries. I have no wish to speculate here on how great the contribution of our monetary policy strategy was to the superior stability of asset prices and the financial system in Germany at that time, and on whether it was not other factors that fostered such stability. On the other hand, the fact should not be disregarded that both the crash in Japan and the bubble in the USA were preceded by a distinct acceleration of monetary growth, which – seen with hindsight – should perhaps have deserved more attention than it received at the time.

Fluctuations in asset prices which do not appear warranted by corresponding changes in the fundamentals give stability-oriented central banks cause for concern for several reasons. For one thing, they distort the price mechanism, and therefore impede the efficient deployment of resources. For another, the bursting of an asset price bubble may jeopardize the stability of the financial system, which may generate huge costs, in the form of a period of economic contraction – in the worst case, of a slide into deflation.

Against this background, central banks must grapple with the question of whether and, if so, when and how they should respond to expected undesirable developments in asset prices. Any answer to this question is complicated, firstly, by the fact that the identification of financial market bubbles – which often prepare the way for a crisis – is exceedingly difficult. Moreover, our knowledge of the real economic implications of financial disequilibria – notwithstanding all the empirical and theoretical research efforts of the past few years – is still very limited.

Both these facts suggest in general that central banks should respond to asset price fluctuations – if at all – only very cautiously. Alan Greenspan has expressed a very sceptical view about the possibility of stopping an emerging bubble by monetary policy means. For that reason, he argued in favour of first waiting for the bubble to burst, but then – if necessary – intervening quickly and resolutely to moderate any adverse consequences, such as an impending deflation ("mitigating the fallout when it occurs").

It is true and I agree – as I suppose most of you do as well – with Alan Greenspan that it is extremely difficult to diagnose unwelcome developments in asset prices in real time. But I assess the options available to prophylactic monetary policy not quite so sceptically as Alan – and in this I know myself also to be in agreement with Otmar Issing. And I would like to list some reasons for this. In the first place, central banks monitor developments in the financial and real-property markets very carefully, and clearly possess a number of indicators that point to potential unwelcome developments. Secondly, the general monetary and financial environment must also be included in any analysis of asset price movements. As past experience has shown, the emergence of price bubbles is very commonly accompanied by excessive credit and liquidity formation. Hence the monitoring of money stock and credit aggregates is in my view of paramount importance in identifying undesirable developments in asset prices.

And in this context it seems to me important that the twin-pillar strategy of the Eurosystem appears suitable in principle for detecting "unhealthy" developments in the financial markets in good time, and for forestalling them by means of monetary policy measures. For one thing, this is because the ECB, in the context of its economic analysis, analyses movements in asset prices and their impact on assets, capital costs and balance sheet items and – through these channels – on consumption and investment. For another, also because it assigns to the analysis of the money stock and lending an important role in the assessment of the medium to long-term prospects for price movements. By counter-checking the regular economic analysis by reference to the monetary analysis, the length of time over which the ECB assesses consumer price movements is extended. In this way, the ECB can also cover the significance of asset price movements, which are reflected in consumer prices only over the medium to long term.

Hence the ECB, with its twin-pillar strategy, not only serves price stability in the stricter sense but at the same time helps to safeguard financial stability.[15] In principle, to be sure, I am opposed to any extension of the explicit mandate of central banks – as is sometimes done – to objectives other than the safeguarding of price stability. And yet, with reference to financial stability (and also with reference to the target of output stabilization), it is true that a conflict between that target and the objective of price stability, which may exist in the short run, will disappear as long as the definition of price stability covers a sufficiently long horizon. Evidence that price stability and financial stability do not impede each other in the long run, but rather foster one another is incidentally provided by the high level of price and financial stability, by international standards, that was reached in Germany between 1975 and 1998 – during the era of money stock management.

However, as regards the important issue of monetary policy, asset prices and financial stability, many questions still remain unanswered. Otmar Issing has voiced a number of them as follows:

[15] See White, W. (2006): Procyclicality in the financial system: do we need a new macrofinancial stabilisation framework?, BIS Working Papers, No. 193, p. 15.

"What is the transmission mechanism of asset prices to the real economy and their information content for future inflation and output? How large are the risks for extreme outcomes following significant asset price corrections? What are the channels for possible systemic contagion effects of asset price busts? What is the role of banks in the asset price transmission mechanism? How do money and credit behave over an asset price cycle? Against this background, how should central banks act and communicate with regard to asset price developments?"[16]

Finding constructive answers to these open questions is of course primarily a task for academic economists. But it is often a part of the practical central banking to act and communicate before all the details have been clarified academically. To this extent, the art of central banking also occasionally includes progress through trial and error, although particular caution is called for in this case because of the potentially far-reaching consequences.

4 FINAL REMARKS

If you ask me to sum up the lessons I draw from my own experience as a central banker, I find myself in full agreement with Otmar Issing, who has very nicely summarized the core messages as follows:
• don't try tricks, don't try to be too clever;
• keep steady, keep committed to your mandate, even in exceptional circumstances;
• say as much as you can about what you are going to do: announce a strategy;
• don't be dogmatic, but follow a policy which is always in line with your strategy.[17]

The prospect, which will very shortly become reality, that Otmar Issing will be following the activities of the ECB only as an observer, from the outside, implies of course that he will no longer be participating as an active artist in the practical design and implementation of monetary policy. But I am utterly convinced that the subject will go on obsessing him in his future work and – in the interest of all of us – should continue to do so.

Already at this juncture, I should like to proffer him thanks for his sterling efforts at the ECB. Along with his staff, and under particularly difficult conditions, he significantly shaped and enriched the art of central banking, not just in theory but notably also in the difficult day-to-day practice of a new supra- and multi-national institution. The high quality of his analyses, his unequivocally stability-oriented stance, his clear diction and his cooperative style of work contributed materially to the fact that the ECB now enjoys a high reputation world-wide, and that the euro is today a stable and globally recognized currency.

---

[16] Issing, Otmar (2003): Introductory statement at the ECB Workshop on "Asset Prices and Monetary Policy", Frankfurt am Main, 11/12 December, 2003, p. 8f.
[17] Issing, Otmar (2003): Monetary policy in uncharted territory, Stone Lecture, London, 3 November 2003.

PAUL A. VOLCKER[18]

Why are we involved in central banking so insistent upon describing it as an "art?"

Does is have meaning and substance beyond a kind of subconscious longing not to be considered unimaginative mechanics unable to improvise like a true artist?

Is it an assertion that we will not be constrained by a pre-set rule book? Or is it that we wish to refute Keynes dictum that, as men of practical affairs, we are simply unconscious disciples of some academic scribbler?

The fact of the matter, as I see it, is that a central bank does need a direct and well understood rule book – or if not a rule book a certain lodestar for decision-making.

Over time, we've had a number of those:
• a century ago, it was the gold standard;
• the "real" bills doctrine, pretty much forgotten today, had for a time a widespread following;
• pure monetarism – the money supply "ueber Alles" – has had a broad following, and surely has influenced Otmar Issing;
• now we have the fashionable doctrine of "inflation targeting". (I confess that terminology strikes me as odd and disconcerting for a profession aiming at stability.)

All of these targets, guidelines – call them what you will – have a common ingredient. The basic idea is that confidence in the monetary unit – its stability – is a good thing, fundamental to the lasting success of any economy. It is, in fact, broadly recognized as the central responsibility of the central bank.

To make that point convincingly, to maintain the practice year in and year out amid the slings and arrows of uncertain events and inevitable political pressures, can itself, and in my mind should, be considered a true art, worthy of wide respect and of lasting significance.

But the story of central banking is more complicated than that simple proposition of defending the stability of currencies through thick and thin. For the most part, and I think correctly, central banks are typically assumed to have a still broader if less clearly defined responsibility – a responsibility for "financial stability". That responsibility is explicit in some laws such as the original Federal Reserve Act, implicit in other laws and certainly prominent in tradition. It has been amply reflected in much of the commentary in this colloquium.

These days, I understand, the responsibility is sometimes blurred, often shared with other agencies, and even occasionally denied. But whatever the theory, in

[18] Former chairman of the Federal Reserve Board.

times of crisis, actual or potential, the responsibility of central banks for financial stability is seldom escaped.

And, for sure, maintaining financial security is not a responsibility that can ever be replaced by a rule book.

Walter Bagehot 150 years or so ago tried valiantly. He set out the dictum that in time of crisis, lend freely at a high rate against good collateral – that is when the perceived crisis for a particular institution or group of institutions is one of liquidity pressure and not a matter of underlying solvency.[19] But who among us can make that distinction with any clarity in real life when the threat of systemic breakdown looms ahead?

To complicate matters much further, Bagehot had in mind commercial banks as the dominant financial institutions and the institutions of particular concern to the central banks. Today the central importance of something called a commercial bank – through which a central bank acts – is no longer so clear in either definition or function.

In other words, how far these days, does the central bank responsibility for financial stability go? To concern about Mexico in 1982 and 1994, or to Thailand or Indonesia or Korea in 1997, or to LTCM, a speculating hedge fund, in 1998? Do stock price and housing bubbles properly engage central bank action as well?

Inescapably, these are matters of judgment, requiring large areas of discretionary and, dare I say it, imagination – in other words, more art than science.

It's all further complicated – much complicated – by the fact that the two stabilities, price and financial, are intrinsically interrelated. To be sure, in the long term, they should be mutually reinforcing. But in particular cases, that may not be true. Then what to do?

Do we preemptively or otherwise, prick bubbles, or do we wait until they get bigger and self-destruct?

More common is the reverse situation. Should a central bank move aggressively to prevent or deal with crises in particular institutions, or particular countries, with systemic (or presumed potential systemic) implications? What are the implications of that approach for "moral hazard" and for the priority for price stability, or does that "priority concern", at least temporarily, give way?

There is no text book answer to those questions – questions that seem to me the essence of the art of central banking. They are questions that require a combination of analysis, of discretion, and indeed of some sense of what is possible and required by the broad political environment. It is the need for dispassionate analysis and

---

[19] Charles Goodhart has made it clear to me that Bagehot's dictum was "a high rate" not a "penalty rate" as I said in my oral remarks. It is an important distinction when market rates escalate and trading is effectively frozen in the midst of crises.

independent judgment in resolving those questions that is a large part of the justification for protecting a central bank from narrow questions of partisan and electoral politics.

Now maybe, just maybe, I'm all wrong.

Maybe, we ought to put it all on auto-pilot, as Milton Friedman advocated some years ago when he argued essentially to abolish the Federal Reserve and for adopting a fixed rate of increase for M1 (or was it for M2 or at times M3?).

Or, to be more up-to-date, we could simply adopt the "Taylor Rule", which, as I understand it, purports to summarize and generalize what central banks in practice do anyway.

Or, less radically, why not let Ben Bernanke stay at Princeton and lead a seminar of that distinguished economic faculty? After all, the discussion would be equipped with the best mathematical models, knowledgeable in stochastic processes, inflation heuristics and Bayesian inference.

Or instead, Congresses and Parliaments might decide central banking is not so arcane an art after all, and simply pass a law dictating agreed (and hopefully "scientific"?) rules.

Think then of the consequences for honoring or celebrating retiring central bankers. After all, ordinary mortals following a rule book do not ordinarily justify an international colloquium. There would be no rationale for the G-10, or the G-30, or even the BIS – just think, no real excuse for the collective practitioners to join together at Jackson Hole in high summer season.

Dare I say it out loud? Without art, without judgment and discretion, there would be no need for central bankers at all.

DINNER SPEECHES

JEAN-CLAUDE TRICHET[1]

Dear Otmar,

It is for me a great privilege to address this evening this extremely impressive audience gathered in your honour. I was looking for the most pertinent word to express and sum up what we all represent tonight. I deeply think it is the word "family". It is indeed a family meeting.

Firstly because your family is here, your wife Sieglinde and your children whom I want to welcome very very cheerfully.

Also because the family of the ECB and the Eurosystem is there and it seems to me that the word is appropriate when I think of the very nature of our day-to-day work, inspired by a team spirit which captures both professional dedication and affectionate friendship.

We in the Eurosystem and the European System of Central Bank are belonging to a larger family which is also there: the family of the central banks of the world. The values we are sharing and defending together, the intimate co-operation which characterises our relationship are indeed of a family nature. It is an extraordinary testimony in your honour, Otmar, that all our friends in global central banking are here with you.

And last but not least, we are immensely privileged to have with us also the even larger family of Academics in the field of monetary policy and of the European and global financial Institutions. I am not surprised that so many Academics have accepted the invitation of the ECB which permits to gather in your honour perhaps the most prestigious collection of brains in the domain of monetary policy one could dream of.

Let me also say how happy we are to welcome here Hans Eichel, the former Minister of Finance of Germany and so many of our friends in Frankfurt, in Germany, in Europe and in the world in the field of finance and banking.

* * *

Dear Otmar, you have participated in the European Economic and Monetary Union, very lucidly and very actively as a member of the Executive Board of the Bundesbank.

Very lucidly because, from the very beginning, you were the most fervent advocate of the absolute necessity of strictly meeting conditions for the Euro to be set up in a sustainable and successful fashion. I am quoting you:

[1] President of the European Central Bank.

"Lasting progress in the field of convergence will be absolutely essential. We cannot rest on our laurels. The presumably longer period of transition facing us must be used in particular,

– to eliminate inflation in all EC countries to the maximum extent possible and thereby to reduce existing discrepancies in prices and
– to reduce the budget deficits in all participating countries to a sustainable level which poses no problems in stabilisation policy terms."

And you added, in another part of the speech you delivered in November 1990 to the Monetary Commission of the European League for Economic Co-operation, not far from here, in Kronberg:

"(…) it was decisive from the outset that monetary policy integration proceeds in parallel to economic integration. This demands both the final implementation of the single market programme and the integration of fiscal policy into the overall process."

This central belief you expressed sixteen years ago that the concept of convergence which was the basis of the transition towards the single currency had to be a convergence towards the best performer and certainly not convergence towards the average performer was decisive. The same belief was, on the other side of the Rhine, in my own country, the very core of the strategy of "competitive disinflation" which had been pursued during fifteen years before the Euro.

As we all know, the Maastricht Treaty negotiation, which was about to start at the time of your speech in Kronberg, after the delivery of the so-called "DELORS report" of the governors of European central banks, incorporated in its "criteria" these concepts of fiscal soundness, monetary and price stability. I had myself the privilege to discuss, negotiate and elaborate the Treaty with a number of extraordinary colleagues that are all your friends Otmar and are very numerous around these tables.

But I have noted other remarks in your 1990 speech that are also extremely important. I am again quoting you:

"As soon as the markets are convinced of both the irreversibility of convergence and the commitment to stability, capital market interest rates will converge at the low level desired. A hasty fixing of exchange rates, by contrast, would also lead to a standardisation of interest rates patterns, but not at the low level of the formerly most stable currency."

It is probably the best summing up of one of the most important issue at stake at the beginning of the 90's when the single currency endeavour became not a theoretical but an operational project. How to ensure that the new currency would be at least as credible, as reliable and as stable as the best previous currencies? You note that I use the plural "best currencies" when you were using the singular "most stable currency". In the year 1990 you were absolutely right: there was only one best currency! In 1997 and 1998, before the inception of the Euro there were a few currencies that had attained the highest level of credibility and the

lowest level of market medium and long term market interest rates. Amongst several others you know Otmar how proud I was myself that after fifteen years of steady "competitive disinflation" strategy, my own currency was part of this grouping.

But before the setting up of the Euro we still had to convince the European and the global capital markets that – to retain your own words Otmar – "capital market interest rates will converge at the low level desired – namely the level of the formerly most stable currency" (currencies).

Today we have forgotten how bold this goal was at the time. How bold was the solemn promise made to the people of Europe, to all economic agents, to all enterprises: "The new currency will be at least as stable, as confidence inspiring, as credible as your national currency presently is". But still in the beginning of the year 1998, despite the fact that markets had considerably reduced the long term spreads between the currencies of the future euro area a large majority of investors, savers, market participants and, probably, a large proportion of the European public opinion itself, thought that the new currency could not have or would not have these essential features of the formerly most stable currencies. The challenge therefore was very demanding.

I believe that we had very carefully gathered all the necessary conditions from the legal and institutional standpoint, from the treaty standpoint, including the stability and growth pact, for this bold goal to be attained. I also trust that the Governing Council of the ECB, upon the proposal of the Executive Board, made the success possible in adding a number of other necessary conditions that proved altogether to be a set of sufficient conditions to reach the goal. I have explained myself how I analyse this interplay of necessary conditions that altogether became a sufficient condition[2].

That being said one should always remember three simple facts:

Amongst the most stable currencies the DM was at the first rank and was a very powerful symbol. Amongst the soundest national central banks the Bundesbank was again at the first rank and a very powerful symbol. And you have been personally, dear Otmar, both the operational instrument, as member of the Executive Board and of the Governing Council of the ECB, and the powerful living symbol of the continuity between the most credible currency and the Euro.

You gave successively and successfully, after 30 years in the Academic world as a professor, your talent, your professional dedication, your intellectual sagacity, your rigor and your immense personal credibility to the Bundesbank and to the ECB. I am impressed by the fact that you have divided your sixteen years of professional life as a central banker in two exactly equal parts: eight years as a member of the Executive Board of the Bundesbank from 1990 to 1998 and exactly eight years as member of the Executive Board of the Governing Council of the

[2] See my keynote speech at the Académie des Sciences Morales et Politiques – Paris, 24 May 2004

ECB. You have a sense of how to balance the management of your career, dear Otmar, that is remarkable!!

During all these sixteen years Karl-Otto Pöhl, Helmut Schlesinger, Hans Tietmeyer, our dear Wim Duisenberg and all our colleagues of the Bundesbank Council as well as of the Council of Governors of the ECB would all agree that you have been decisive in shipping to the Euro, all the credibility that had been gained over time by the DM and some other currencies. As I said, you were, in this respect, fully operational as a member of the team, as being responsible of the Economics and of the Research business areas. And you were also, simultaneously, lending your own personal credibility – which is so marvellously evidenced by the unique attendance of this dinner – to the Euro itself.

Dear friends, Otmar is much more than a brilliant professor and a remarkable central banker. He is a man of culture, with a particular dedication to literature and poetry. And this dinner is also a unique opportunity to understand better Otmar, his profound personality, the underlying cultural roots that contribute to explain his exceptional career in the academic world and in central banking. I recommend you to go to Würzburg with him and to experience the very profound link which is binding Otmar and his cherished city. The Executive Board of the ECB had that privilege at the invitation of our dear colleague. We could admire the city's sumptuous civil and religious monuments – so incredibly lavish as regards the Bishop's Palace that Napoleon said that Würzburg was the most magnificent "parish" he ever saw! We could measure the amplitude of your love for Würzburg and Franconia. I know your dedication for poetry Otmar… you could say for Würzburg what Friedrich Hölderlin said of Heidelberg:

"Lange lieb' ich dich schon, möchte dich, mir zur Lust,
Mutter nennen, und dir schenken ein kunstlos Lied,
Du, der Vaterlandstädte
Ländlichschönste, so viel ich sah".

Let me give you the „preferred" English translation of the Hölderlin Society:

„Long I have loved you, and now for my own delight
would call you Mother, offer an artless song
to you, of all, the homeland cities
which I have seen the most lapped in beauty".

There, in Würzburg and in Franconia we could see a unique blend of ancient and recent history, with its period of happiness and its terrible and dramatic events, of deep culture, of "joie de vivre" and aspiration to peace and prosperity, of beauty and dynamism. I would say Europe at his best. It is not by chance that a citizen of Würzburg became a major actor of the European construction and of European monetary union as a professor, as a member of the Bundesbank Executive Board and as our dear companion in the ECB Executive Board and in the Governing Council during eight years.

Speaking of values I have to say something which is in my mind extremely important. Otmar is a free man, an open mind, an individual without dogmatism. He has brought about in central banking the best of the academic values: capacity to listen; open dialogue based on a confrontation of arguments, respect for facts. Otmar est "un homme libre, un esprit libre". Otmar hat einen Geist der offen ist für Neues. It is the reason why he has accumulated such impressive personal credit. We all know in the ECB and in the Eurosystem what is our mandate: it is crystal clear: deliver price stability and be credible in delivering price stability over time. This is the treaty mandate, this is what 313 million fellows citizens of the Euro area are expecting from us. We have displayed our precise definition of price stability, we have displayed the two pillars strategy of our monetary policy and we candidly explain what we do and why we do it. All academics, in Europe and in the world, can analyse, compare, assess and judge whether we deliver what we are committed to and whether our analysis, arguments and actions are well founded. We consider that this constant dialogue is of the essence. And I am immensely grateful to Otmar for the very close link he has established with the Academic sphere. This link has decisively contributed to improve our own analysis and decision making. And this dinner is a living testimony of the uniqueness of our relationship with the best professors of the world.

* * *

Dear Otmar, I have mentioned your career, the Professor, the Executive Board member of the Bundesbank, the Executive Board and Governing Council Member of the European Central Bank, the living emblem of the continuity between the most credible currency – currencies and the Euro. I have mentioned the European, the poetry lover, the man of culture, the citizen of Würzburg, the dear friend. I would not be complete if I did not mention the sportsman, the former sprinter and Bavarian senior athletic champion who once considered training for the Olympics, the man who was still clocking 100 m in less than 12 seconds at the age of 50! It is certainly a key to understand your strength, your tenacity. Equally I would not pay justice to your multifaceted personality if I did not mention your marvellous sense of humour. I like very much one of your favourite jokes where I recognised so much of your irony and, perhaps, also so much of the present world situation: "The optimists think that we are living in the best of the world possible. The pessimists think that this might very well be true!".

I am proud to having had the privilege to work with you during all the last sixteen years and, more particularly in the last three years of companionship in the Executive Board. I know I express the sentiment of all your friends here present today in wishing you and Sieglinde all the best in your new enterprises. We know you. We know that you will remain very active. And the wide family who is gathered here as well as the international community at large needs your wisdom and counts on you.

MARTIN WOLF[1]

Why am I speaking here? There is a simple answer to this question: Otmar Issing asked me to do so.

Yet why did he ask me? That is less obvious: I have never been his colleague; I am neither a distinguished monetary economist nor a central banker; I am sceptical about the wisdom of the project on whose construction he has been engaged; I am dubious about aspects of the wider European project, of which the European Central Bank is so significant a part; and I have even been a not infrequent critic of the decisions of the ECB itself, of which he has been the guiding spirit.

Nothing, in short, made it at all likely that I would delight this distinguished audience with a panegyric worthy either of the occasion or of the man. But the very fact that I have been invited is a sign of why Otmar is worthy of praise. I am here because, as he told me, he desired not the eulogy customary on these occasions, but rather an outsider's view of central banks, in general, and his central bank, in particular. Otmar is, indeed, a brave man.

How then do I view central banks, this particular central bank and Otmar Issing, in that order?

In trying to answer these questions, I found guidance in five quotes: one profound, one sceptical; one pragmatic; one classic; and one humorous.

First, there is the profound, from Ludwig von Mises in 1912: "it is impossible to grasp the meaning of the idea of sound money if one does not realize that it was devised as an instrument for the protection of civil liberties against despotic inroads on the part of governments. Ideologically it belongs in the same class with political constitutions and bills of right."[2]

Second, there is the sceptical, from the great American economist, Irving Fisher, this time in 1911: "irredeemable paper money has almost invariably proved a curse to the country employing it."[3]

Third, there is the pragmatic from that most pragmatic of Englishmen, Eddie George, former governor of the Bank of England, this time in 1995: "central banks don't have divine wisdom. They try to do the best analysis they can and must be prepared to stand or fall by the quality of that analysis."[4]

---

[1] Associate Editor & Chief Economics Commentator, *Financial Times*, London. The speech was delivered on March 16th 2006 at a colloquium in Frankfurt on "Monetary Policy: a Journey from Theory to Practice", in honour of Otmar Issing's retirement from the board of the European Central Bank.
[2] Ludwig von Mises, *The Theory of Money and Credit*, 1912, p. 454.
[3] Irving Fisher, *The Purchasing Power of Money*, New York, Macmillan, 1911, 2nd ed., New York, Macmillan, 1913, New ed., New York: Macmillan 1929, p. 131.
[4] *The Guardian*, London, May 22nd 1995.

Fourth, there is the classic, from William McChesney Martin Jr, chairman of the Federal Reserve from 1951 to 1970: "The job of the Federal Reserve is to take away the punch bowl just when the party starts getting interesting."[5]

Finally, there is the humorous, from Will Rogers, a well-known American wit, cited by Paul Samuelson: "there have been three great inventions since the beginning of time: fire, the wheel, and central banking".[6]

So how do I see contemporary central banks? I see them as institutions that: understand what von Mises said, try to prove Fisher wrong, fall prey to the ignorance of which Eddie George spoke, try to cut back when everything is still going fine, as McChesney Martin recommended, and recognise that, important though they may be, they are not in charge of the world's third most important invention. Humanity's third most important invention is writing. This is why I, a professional writer, believe I am entitled to assess the contribution of those who are responsible for only the fourth – not central banks, of course, but money. Without money there can be no complex division of labour; but without writing there is no civilisation.

Why did I start with these quotations? The answer is that Otmar, a German liberal in the tradition of Walter Eucken and Ludwig Erhard, believes in the constitutional role of sound money, fears the social calamities visited by monetary mismanagement and is ideally suited to the role of conservative central banker outlined by McChesney Martin. For these reasons, he has also been precisely the right person to provide intellectual guidance to a new central bank for a continent struggling to heal the scars of past disorder, including, not least, monetary disorder.

These have been serious tasks for a serious man. And such a man deserves a serious speech.

With brief and partial interruptions, we have lived in the era of fiat money since Europe embarked on collective suicide, in the First World War. But only over the past two and a half decades have monetary authorities done a passable job of proving that Fisher might be wrong. Prior to this, we witnessed one monetary calamity after another: the hyperinflations of the early 1920s; the great depression; and then a worldwide inflation in the 1970s. For all of these central bankers bear at least part of the blame.

So my most fundamental response to the question Otmar set me is this: central banks are trying to prove that we can manage money wisely in a world that has discarded the constraints of what J. M. Keynes called the "barbarous relic" of metallic money. Keynes' fault was his belief that people like him could – and would be allowed to – manage our world, instead. For about 25 years central bankers have indeed operated like Platonic philosopher kings. Will they be allowed – or be able – to continue to do so? I wonder.

---

[5] No precise source has been found for this frequently attributed quotation.
[6] Paul Samuelson, Economics, cited in *A Dictionary of Economic Quotations*, 2nd edition, compiled by Simon James, (London: Croom Helm; 1984) p. 4.

Now let me turn to a second response. In a world of pervasive uncertainty, institutional evolution and so trial and error have great value. That was Hayek's greatest insight. While we have a reasonable understanding of what central banks should be doing, there is much we do not know: we do not know how far central banks should attempt short-term macroeconomic stabilisation; we do not know how much risk they should take in judging the natural rate of unemployment; we do not know what attention they should pay to asset prices in forming monetary policy; we do not know whether data on the money stock give useful information; we do not know the ideal time horizon for monetary policy decisions; we do not know whether it makes sense to indicate the future course of a central bank's monetary decisions; and we do not know whether central bank should be responsible for the systemic stability of the financial system.

Since there remains so much we do not know, it is immensely valuable to have a set of competent central banks implementing somewhat different answers to these questions. Let a thousand – or at least three of four – flowers bloom and our experience be the judge.

This then is my second response to Otmar's question: let the best central bank – or rather the practices of the best central bank – win. That is what the Bundesbank achieved not just inside Europe, but in the wider world. We are now in a second such competition, one in which the ECB has a distinctive position. It is a position with which I am not altogether in sympathy. But it is immensely valuable for our collective future that this experiment exists.

My third response is that central banks remain highly political institutions. The ECB, in particular, is an expression of specifically European politics, both in its independence from politicians and in its political isolation. This is a blessing and a curse: it is a blessing because the ECB can do what it wants; and it is a curse, because it is a whipping boy for populist politicians.

In their wisdom, or rather lack of it, European politicians decided to create a monetary union without a labour market capable of adapting to its rigours. They agreed to fiscal disciplines, but discarded these when the rules started to bite. They agreed to a project requiring the highest political commitment and then indulged in a flood of anti-European rhetoric, thereby laying the ground for the rejection of the constitution that manifested such a commitment. They still make the fiscal decisions on which the stability of fiat money ultimately depends. Not least, they are able to blame the ECB for what is going in inside their country, thereby undermining the population's commitment to European integration itself. All central banking is politically tricky. The ECB's is surely trickiest of all.

My fourth response is that the UK would have been a particularly badly behaved eurosceptic cuckoo in the nest. It is a huge blessing that the UK has stayed outside. It is good for the UK that it is responsible for its own monetary fate. It is good for Europe that it does not have British disruption to add to those more than adequately supplied by the other big member states.

I said at the beginning that I would discuss central banks, the ECB and Otmar, in that order. Having said what I can about the fragile achievements of – and perils confronting – the first two, let me turn to the contribution of the last. The challenge confronting the ECB during the first six years of its existence has been to take up the mantle of the Bundesbank, the most complete embodiment of von Mises' constitutional perspective and Europe's most successful central bank. If that mantle could not be worthily worn by the ECB, this project would have foundered. Otmar's job was to ensure it was. It is why he was here. It is also exactly what he has achieved.

As an outsider whose job was defined by a pre-war British politician – Stanley Baldwin, to be precise – as "power without responsibility – the privilege of the harlot throughout the ages", I recognise and respect a man who has carried out such a task. I admire Otmar's ability to bear his historic responsibility lightly. I do not know whether the achievements of modern central banks will prove lasting. I do not know whether the euro will be deemed a success in the distant future. But I do know that Otmar Issing has done his best to bring the legacy of the Bundesbank to the ECB. The economist as commentator salutes the economist as practitioner for a job well done.

Dear guests, colleagues, friends,
What can, what should one say on such an occasion? Abraham Lincoln, attending a funeral, once remarked: "If General so-and-so had known what a great funeral he would get, he would have died years before". If I … I must not continue. And to be quite frank, I prefer to be able to hear what is said at such an exceptional moment.

Let me thank you all for joining us this evening. I will have the opportunity tomorrow to extend my special gratitude to all who contribute to the unique colloquium.

Therefore let me just thank you, Jean-Claude, and you, Martin

In his "Theory of Moral Sentiments", Adam Smith wrote: "As ignorant and groundless praise can give no solid joy … it often gives real comfort to reflect, that though no praise should actually be bestowed upon us, our conduct, however, has been such as to deserve it …".

It is not for me to judge my conduct. Whatever I may have achieved is the result of life-long learning and close cooperation with so many people throughout my professional life. In economics, this process has never stopped. Having become a central banker, it was my privilege to build the bridge between economic research and monetary policy-making. The title of the colloquium captures it nicely: A Journey from Theory to Practice.

From the beginning of my new life as a central banker I was able to benefit from close contacts with colleagues from all over the world who were ready to share their rich experience with me. I always felt it an invaluable advantage of my position, to be in permanent contact with so many leading researchers from all over the world – quite a few of whom are participating in this conference, so I should not start mentioning names.

Our discussions covered a broad spectrum. It helped me to be informed on a first-hand basis on important new developments in the field of economics and especially monetary theory. For me as a central banker, the challenge was to understand progress in research and combine this with hopefully sound judgement of what is relevant and applicable in the practice of central banking.

Let me give just one example. Like all of us, as an academic I was deeply impressed by the convincing logic of the famous Lucas Critique. As a central banker, it influenced my reflections on the potential implications of structural breaks in the context of German unification, and even more so at the start of European Monetary Union. The monetary policy strategy of the ECB – among many other results of research – reflects this important contribution to assessing the high degree of uncertainty under which policy has to be conducted.

At the ECB I have been fortunate to cooperate with outstanding colleagues on the Executive Board and the Governing Council. It has been a constant pleasure to work as a team with my staff of excellent economists, with bright minds and high motivation. Hardly a day has gone by on which I could not learn from reading their contributions and discussing the reasoning behind them. It has been my privilege to present the results of this cooperation to the decision-making bodies, thereby connecting economic analysis and research with policy. This process goes in two directions: input into the decision-making process and impulses from that process for further studies.

We were all privileged to participate in an historically unique experiment: the creation of a new currency for Europe. We had to manoeuvre through uncharted waters and we may not yet have arrived in the Promised Land.

The ECB is in many respects a very special institution. It is not only still a very young central bank, but also a place where people from now 25 European countries work together.

For our young staff, working for a European mission is a fact of daily life. The older generation is still aware of a different time. I vividly remember the day when Christian Noyer, then Vice-President, and I were reflecting over lunch on our national backgrounds. At the same time as his father was a prisoner of war in Germany, my father was a member of the German occupation army in France. Half a century later the sons of the two men were working together in Frankfurt for a common, European project.

To the last days of my professional life I feel that I have had the most interesting job I could think of for an economist. Confucius once said: "Find a job you love and you will never have to work a day in your life". I hope that this remark will not inspire my employer to think that I should not be paid anymore.

I will still be around here for a few more weeks. Nevertheless, this is a moment of farewell. Should I claim, like Achilles when he – temporarily – withdrew from the Trojan war, "All will yearn for me, all"? Be assured, I am well aware that this is a moment in which you hear only nice words, from those who regret that you are leaving as well as from those who are looking forward to your departure.

I would like to conclude with a famous example of the influence of changes in distance on the judgement of a person.

In March 1815 the French newspaper Moniteur reported on Napoleon's journey from Elba to Paris:

March 10: The Corsican ogre has landed at Cape Juan.

March 11: The tiger is in Gap. Troops are on their way and will stop him. He will end his miserable adventure as a homeless refugee in the mountains.

March 12: The monster succeeded in proceeding to Grenoble.

March 13: The tyrant is now in Lyon. Horror has caught the people.

March 18: The usurper is some days' march distant from Paris.

March 19: Bonaparte approaches in a hurry, but he will not succeed in advancing to Paris.

March 20: Napoleon will be in Paris tomorrow.

March 21: Emperor Napoleon is in Fontainebleau.

March 22: Yesterday evening His Majesty celebrated his arrival in Paris. The jubilation cannot be described.

I can only hope that in my modest case the reversal of the sequence does not end where the news on Napoleon started.

SESSION 2

STABILITY FIRST: REFLECTIONS INSPIRED BY OTMAR ISSING'S SUCCESS AS THE ECB'S CHIEF ECONOMIST

VÍTOR GASPAR[1], ANIL K. KASHYAP[2]

"It is in the nature of beginning that something new is started which cannot be expected from what may have happened before. This character of startling unexpectedness is inherent in all beginnings."   Hannah Arendt[3]

"Excellence, then is a state concerned with choice (…) being determined by the right rule and in the way in which the man of practical wisdom would determine it."   Aristotle[4]

We review Otmar Issing's service as the inaugural chief economist of the European Central Bank (ECB). During his 8 years in the post he faced many unique challenges. Many of the hurdles associated with creating a new central bank and launching a new currency could have been anticipated, but some such as the terrorist attacks in September 2001 and the Asian Financial crisis in the Fall of 1998 (as the final preparations for the ECB were underway) could not have been foreseen. We study the choices that Issing and his colleagues made in confronting these challenges, the performance of monetary policy over the period and ask if there are any lessons that can be drawn from this episode.

Early in his tenure Issing revealed his thinking on many of these matters. Specifically in 1999 he wrote:[5]

"As a central banker directly involved in monetary policy making, I have been dealing with uncertainty and its consequences for a large part of my professional life. (…) But never have I felt the impact of uncertainty as acutely as in the weeks

that preceded the introduction of the euro and the birth of the single monetary policy. (…) when the Governing Council made its final announcement on the monetary policy strategy and was getting ready for the Changeover Weekend, the uncertainty was at its peak. Nothing could be taken for granted, no matter how careful the preparatory work had been."

Perhaps because of this awareness Issing designed a monetary policy framework that accounted for the uncertainties confronting the newly formed central bank. In doing so, he faced at least six specific challenges. The first has to do with data uncertainty. Here we may distinguish two different aspects. The creation of the euro area, a new economic entity, introduced a discontinuity in existing statistical time series. Historical time series for the euro area exist only since 1999. In order to perform econometric analysis it is necessary to use synthetic aggregates, based on national data, before 1999. The other aspect to bear in mind relates to the fact that, at the start, the timeliness and scope of information was below the standard, normally available to the central bank of an industrialized country.

Secondly, the creation of the ECB and the start of the single monetary policy could be expected to induce a structural break à la Lucas (1976). Interestingly the available evidence suggests that, probably because of the gradual convergence process prior to monetary unification, no discontinuity took place.

Thirdly, the introduction of the euro is a catalyst for structural change leading to deeper trade and financial integration. Changing patterns of integration, in turn, affect the linkages across euro area economies. Already in 1999, Wim Duisenberg, the first President of the ECB, underlined the importance of obtaining better knowledge about the structure and functioning of the euro area economy and, in particular, of the transmission mechanism of monetary policy. For policymakers this meant that they needed to account for both parameter uncertainty and model uncertainty.

Fourth, the ECB as a new institution, had to start operating without the benefit from a track record. Blinder (1999), portrays central bankers as obsessed with credibility. There are excellent reasons for such obsession. When inflation expectations become unhinged, inflation dynamics become unstable with inflation literally feeding on itself. The experience of the Great Inflation testifies how economic performance is affected and how long it takes to re-establish price stability.

Fifth, as stressed above, the creation of a new central bank, responsible for the conduct of monetary policy in a new economic entity the euro area is an event of historical magnitude, in the context of European integration. It is a major defining moment of constitutional relevance. Nevertheless, many issues of governance, political legitimacy and political accountability remain open, potentially affecting the position of central bank in the political realm.

Finally, a source of immediate concern, in the early days of the ECB, related to some specific difficulties associated with the transition process. Obstfeld (1998) refers to both the fixing of the conversion rates of national currencies to euro and the start of operations of the European large value payment system (TARGET), an essential ingredient for a smooth transition to the new Eurosystem's operational framework for the implementation of monetary policy.

Against this backdrop, and the ECB's mandate to deliver price stability, over the medium term, we evaluate the policy strategy that the ECB adopted. We argue that it has worked surprisingly smoothly and surprisingly well. Issing is at the root of this outstanding performance. This explains the quote from Aristotle in epigraph to this paper. According to Aristotle, practical deliberation, meaning, for our purposes policy-making, can never be fully scientific. There must always be an element of art, associated with the ability to grasp the relevant particulars. Decisions are always made in concrete, individual, historical context. However, this is not the aspect we will want to highlight. Instead, we want to recall that also, according to Aristotle, the standard of excellence in decision-making is the man of practical wisdom. In other words, it is the successful policy-maker.

Thus, according with Aristotle's viewpoint, we ask, in this paper, whether the ECB's success under Issing happened as predicted by a variant of the New Keynesian model (clearly derived and systematically explored in Woodford 2003). We offer this model not because it necessarily characterizes Issing's views of the structure of the economy or the monetary transmission mechanism, but rather because it has become the workhorse model used in the academic literature studying monetary policy design.

We find that ECB practice and the predictions of the benchmark model depart most sharply regarding the importance of the financial system in the conduct of monetary policy. Most renditions of the traditional model abstract from any structural representation of the monetary and financial system and of the role of the financial system in the transmission mechanism of monetary policy. We believe that this may prove a very important omission for our ability to understand the actual conduct of policy. In the spirit of Wicksell we distinguish between the policy rate and the loan rate (which is the relevant rate for determining spending decisions). We extend the standard model in a very simple way to take into account this additional complication. We argue that by doing so we can better understand actual ECB conduct.

The rest of the paper is organized as follows. In section 1 we present an overview of the single monetary policy after seven years. We stress the unique, historical changes, associated with the creation of the euro area and the starting up of the ECB. We go on to ask

Has the stability-oriented monetary policy strategy worked?
How did it work?

Given the perspective taken in the paper it is clear that the answer to the first question will be yes.

In section 2 we will discuss a model that includes some minimum conditions, which are necessary in order for monetary policy to be effective. The conditions we will be focusing on derive from the role of money as a unit of account. Specifically, we use a fundamental equation that appears in most models using a new Keynesian or New Neoclassical Synthesis approach to monetary policy making. In this class of models the fundamental friction comes from imperfect price adjustment associated with the mechanism of nominal price setting by monopolistic competitive firms. We focus on optimal policy as implied by the Woodford (2003) variant of the model, and relate the model's policy prescriptions to those annunciated by Issing.

In section 3 we will look at the transmission mechanism of monetary policy through the financial system, in general, and the banking system, in particular. Woodford's model also spells out the connection between policy rates and expenditure precisely. In his basic set-up, there is a direct link between the policy rate and expenditure. However, going back to Wicksell there have been debates as to how to model the relevance of the financial system in the transmission of monetary policy. Inspired by Wicksell we will minimally depart from the standard set-up and introduce a second interest rate that matters for spending. In deference to Wicksell we will call this rate the "loan" rate.[6] Such extension allows us to consider important issues such as liquidity, financial stability and asset prices and their relevance for the conduct of monetary policy.

In section 4 we will conclude and list a number of open questions that men of practical wisdom (in particular Otmar Issing) may want to reflect upon.

I   BRIEF OVERVIEW OF THE SINGLE MONETARY POLICY 1999-2005

The questions we will examine in this section are:
    Has the stability-oriented monetary policy strategy worked?
    How did it work?

The answer to the first question is clearly yes. The European Union Treaty and the statute of the ECB and the European System of Central Banks (EUT and the Statute) state that maintaining price stability is the primary goal of monetary policy. On October 13, 1998, the Governing Council adopted a precise, quantitative definition of price stability based on a specific statistical indicator: "Price stability shall be defined as year-on-year increase in the Harmonized Index of Consumer Prices (HICP), for the euro area of below 2 percent. (ECB (1998))." The ECB's aim was to maintain price stability over the medium term. On May 8, 2003, the Governing Council further clarified that it aimed at maintaining inflation below (but close to) 2 percent, over the medium term.[7] Table 1 and Chart 1 show that ECB has essentially attained this goal: the average annual increase,

---

[6] See Brainard (1964), Brunner and Meltzer (1972, 1993), Friedman (1970), Tobin (1969), Bernanke and Blinder (1988) and very recently Cecchetti and Li (2005)).

[7] See ECB (2003a, 2003b) and Issing et al. (2003) for more details.

in the HICP, during the first seven years of the single monetary policy has been very close, but not below 2 per cent.

The announcement of a precise, quantitative definition of price stability, based on a specific indicator fulfills three functions: by making the primary objective more visible and easier to understand it makes monetary policy more transparent and predictable. The definition also provides an objective yardstick against which the performance of the monetary authority may be measured. Thus, it helps accountability. Lastly, the definition, together with the medium term orientation, helps anchoring inflation expectations enhancing the credibility of policy.

One fundamental characteristic of the ECB's approach to maintaining price stability is its medium-term orientation (ECB (1999)). Apart from providing a long term anchor to expectations a medium-term orientation also allows, after a shock, for a gradual approach in returning to price stability. Such a gradual approach may be called for in order to avoid unnecessary volatility in economic activity and interest rates. An important qualification follows from the fact that the ECB has always emphasized that the relevant time horizon is not constant. It depends on the current state, the nature and characteristics of the shocks and on the structure of the economy. Moreover, a medium term orientation also acknowledges the importance of long and variable lags of monetary transmission, avoiding the dangers of short-sighted activism. In other words the uncertainties associated with the timing and magnitude of monetary policy actions is too great to allow for fine-tuning of short term developments in the price level.

The remark that inflation in the period 1999-2005 was close (but not below) 2 percent is an example of an ex-post evaluation of the performance of policy. The small deviation is easily accounted for given the accumulation of a long list of miscellaneous shocks to the price level (e.g. oil prices and other commodity prices, food prices, administered prices and indirect taxes). Examining Chart 1 it becomes clear that the ECB has also been successful in price stability, in the more imprecise sense of maintaining low and stable inflation. Moreover, given the medium term orientation the differences between the various indicators included in the Chart are immaterial.

As already noted the Governing Council definition of price stability is not only a benchmark for ex post accountability but also an anchor for inflation expectations. The latter aspect is closely linked to credibility. Thus, we also must examine the ECB's performance in terms of credibility. Chart 2 plots two such measures: the five-year ahead inflation forecast, from the ECB's Survey of Professional Forecasters and the 10-year break-even inflation rate recovered from the 10-year index linked bond.[8] From the Chart it is clear that expectations have been stable and consistently close to the ECB's definition of price stability (please notice the scale on the vertical axis). Castelnuovo and others (2003) and Gaspar

---

[8] Computed on the basis of bonds, issued by the French treasury, indexed to the euro area HICP, maturing in 2012. The break even inflation rate is computed by equating the yield to maturity on the real bond to the nominal bond with the same maturity.

Chart I Inflation in the euro area

Chart I Inflation in the euro area

- HICP
- HICP ex food and energy
- HICP 10% trimmed mean
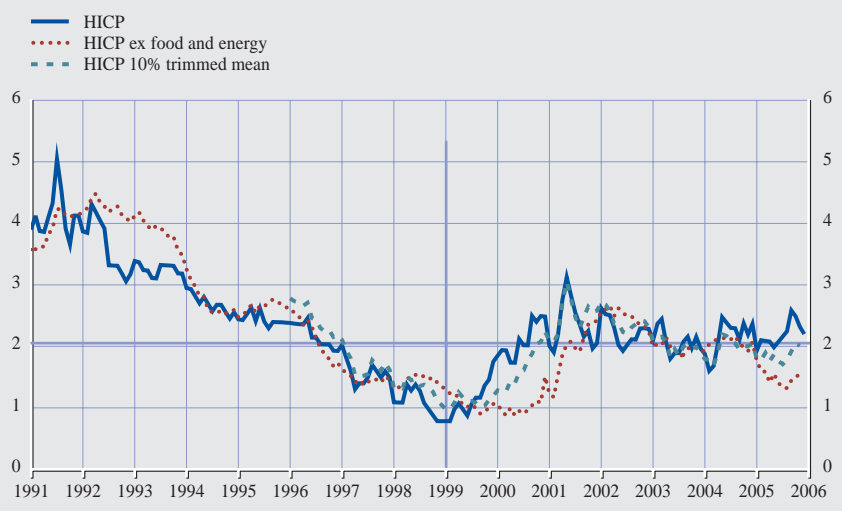
(2003) have shown that there is a very low correlation between short run forecasts (or changes in short run forecasts), which are much more volatile, and long run forecasts (or changes thereof).

At the same time it is clear from Table 1 (which is taken from Masuch, 2005) that the stability of inflation and inflation expectations has coincided with low volatility of important real variables like GDP and employment. Low volatility compared with the recent past (but also longer time periods, see Masuch, 2005) and also with the US – where volatility has also fallen recently. The drop in

Table I Price Stability and overall Macroeconomic Stability

	Euro Area				US			
	1990-1998		1999-2005		1990-1998		1999-2005	
	Average	StDev	Average	StDev	Average	StDev	Average	StDev
HICP/CPI 12th month % change	2.81	1.07	2.01	0.46	3.10	1.14	2.53	0.71
Real GDP quarterly % change	0.48	0.52	0.46	0.36	0.76	0.53	0.71	0.53
Real Consumption quarterly % change	0.48	0.58	0.43	0.40	0.78	0.51	0.87	0.41
Employment quarterly % change	0.12	0.34	0.28	0.24	0.32	0.35	0.26	0.44
Unemployment rate	9.80	0.99	8.55	0.47	5.93	0.97	5.05	0.79
Long-term interest rates	8.23	1.98	4.60	0.64	6.78	1.04	4.86	0.82
Short-term interest rates	7.62	2.80	3.13	0.96	4.88	1.29	2.95	1.79

Source: Masuch (2005).

Chart 2 Long run inflation expectations in the euro area

SPF 5 years ahead
10-year break-even inflation rate
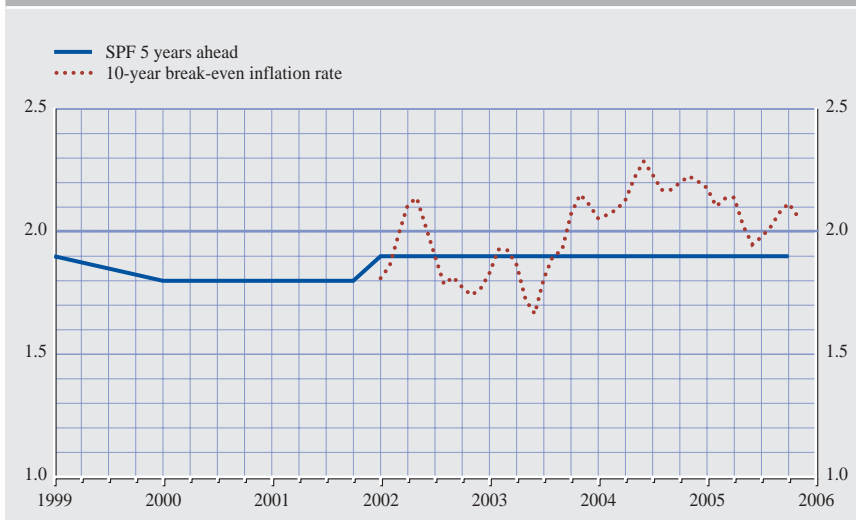
volatility is particularly marked for financial variables like long term interest rates.

It is worthwhile to pause to consider the facts. Clearly it is not possible to conclude from comparing volatilities that monetary policy has caused such improvement.[9] However, in the literature following Rogoff's (1985) contribution, it was expected that delegation of monetary policy to an independent (conservative) central bank would lead to lower inflation on average and to higher volatility of output. Alesina and Summers (1993) looked at this proposition using a sample of OECD countries. They found that central bank independence was, as expected associated with lower average inflation, but also that the variance of growth or employment were not related to central bank independence. In such perspective the experience of the ECB adds to the evidence pointing to the compatibility between price stability and overall macroeconomic stability. We will comment on this further below.

How has it worked?

In the Eurosystem, as in all modern central banks, monetary policy operates first through a short term interest rate. The central bank offers two standing facilities: a lending and a deposit facility. The two standing facilities define a corridor limiting the fluctuation in the overnight rate. Moreover, the ECB steers market interest rates though its regular main refinancing operations. If we look at Chart 3 the first few weeks of 1999 – the start of the single monetary policy – do not stand out. It shows that banks adapted quickly and easily to the new environment. The evidence suggests that the precautions taken by the Governing Council, on 22 December 1998, in particular the narrow corridor (of just 50 basis points)

[9] However, see Cecchetti, Flores-Lagunes and Krause (2006) for some evidence that monetary policy might be responsible.

defined by the marginal lending facility and the deposit facility, effectively contained money market volatility. After a few teething problems in the first few days the situation rapidly stabilized so that already on 21 January 1999 the ECB was able to announce the normalization of the corridor width effective from the following day onwards. The start of the Eurosystem's operational framework and of the TARGET system occurred in a seamless way (calming the concerns referred to in the Introduction).[10]

To sum up: after seven years the experience under the single monetary policy is impressive:
• The transition to the single monetary policy has been seamless.
• Price stability over the medium term has been maintained.
• Inflation expectations have been low, stable and (by and large) compatible with the ECB's definition of price stability.
• Volatility of macroeconomic variables has declined.
• Volatility of long term bond yields has declined as well.

In our view much of this success is attributable to the monetary policy strategy that Issing helped design. Issing (Issing et al. 2005, pp 75-76) summarizes the policy and strategy that emerged as follows:

"As in the Bundesbank's case, the ECB's approach involves both Rule-like features, consistent with the results of monetary theory, and an attention to central banking experience in the implementation phase. The key messages from monetary policy theory which emerge through the lens of my professional experience can be stated as follows:
• don't try tricks, don't try to be too clever;
• keep steady, keep committed to your mandate even in exceptional circumstances;
• say as much as you can of what you are going to do: announce a strategy;
• don't be dogmatic, but follow a policy which is always in line with your strategy."

He concludes by announcing three principles for successful conduct of monetary policy.

1) Institutions matter. Central bank independence and a mandate for price stability are crucial pre-requisites for successful central banking: "Sound institutional arrangements play a central role. Historical evidence and theory agree in pointing out that central bank independence and a clear mandate for price stability are the basic elements of a sound institutional set-up."

2) Credibility is paramount: "They provide the premises to establish credibility, to anchor inflationary expectations and ultimately deliver price stability and foster a stable macroeconomic environment."

---

[10] See Gaspar, Perez-Quirós and Sicilia (2001) for more detailed documentation on the operational transition to the single monetary policy.

Chart 3 **Money market and policy interest rates**

- marginal lending rate
- deposit rate
- main refinancing rate
- EONIA overnight
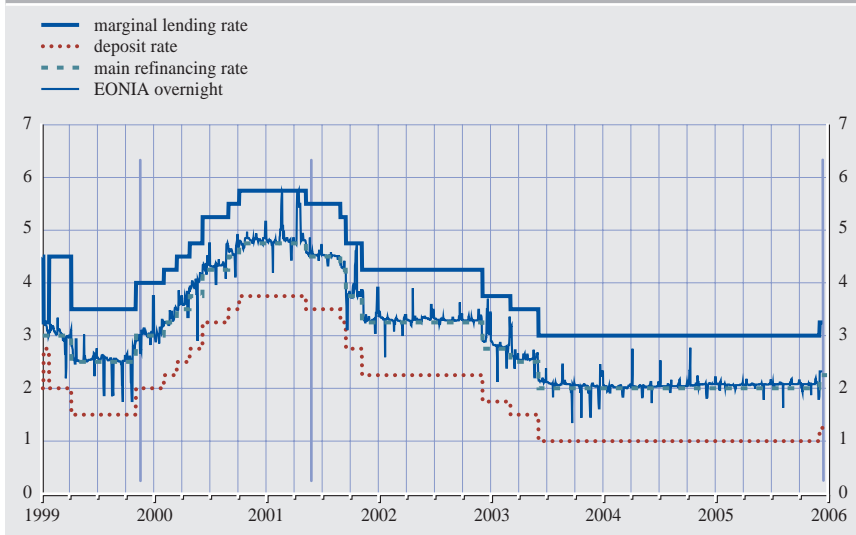
3) Temptation must be resisted. Moral responsibility and fortitude are fundamental in the face of economic complexity and change: "We must never forget this message, nor ever take credibility for granted, even at times when price stability is established and there seem to be minor challenges ahead. Credibility is hard to gain, but it is easily lost. To be maintained, it requires continuous vigilance. If lost, it can be regained only at high costs to society."

The ECB's monetary policy embodies these three principles. The ECB's mandate and independence are enshrined in the European Union Treaty and in its Statute. Thus, they have a constitutional character in Europe. Moreover, the strategy is medium term oriented, forward-looking and based on a full information approach. Its assessment of the current economic situation and risks to price stability is based on two complementary viewpoints: economic analysis and monetary analysis. Furthermore, the communication strategy of the ECB is organized around explaining interest rate decisions in terms of how they relate to the price stability mandate.[11]

In this section we will not comment further on specific decisions and their circumstances. We will look at some examples in the following sections.

However, before moving on, it is important to note that during this period many important events took place at the European level. A partial list includes the disappointing pace of structural reforms in many Member States and in the EU as a whole, as is clear from the European Commission own review of the Lisbon

---

[11] An important part of the communication strategy has also to provide regular updates on the ECB's experience and what the experience implied for the monetary policy strategy. See Issing (1999b, 2000, 2001c, and 2005).

strategy, the debate over budgetary discipline and the Stability and Growth Pact (culminating with the ruling of the European Court of Justice and the revision of some secondary legislation), the enlargement of the European Union to include ten new Member States and the rejection of the European Constitution in referenda by French and Dutch voters.

Issing (1995) wrote:

"In view of European integration, the role and responsibilities of the central bank are assuming international and supranational dimensions to an unprecedented extent. Since nothing less than the future constitution of the Community is at stake in this integration process, the position of the future European central bank within the overall pattern of the "political union" is not the least of issues that have to be considered and decided."

And in (2001a) he wrote a paper where he started, as an economist by posing the question: Can One Size Fit All? And ended with his passionate answer that as an European citizen "At this juncture monetary union simply cannot fail. It must succeed: One size must fit all."

The first question we address to Otmar Issing is:

Monetary union is a major institutional change that will necessarily lead to important behavioral changes, which cannot be accurately foreseen. At the same time, proper functioning of the monetary union also calls for institutions to change, for structural reform.

Given the fact the monetary, economic and political trends are co-determined and co-evolutionary what is the ground for optimism about the future of the European Union? How will political forces affect the operation of the European Central Bank and the Eurosystem?

2 ECONOMIC ANALYSIS: MAINTAINING PRICE STABILITY AND ANCHORING INFLATION EXPECTATIONS

"If it were in our power to regulate completely the price system of the future, the ideal position … would undoubtedly be one in which, without interfering with the inevitable variations in the relative prices of commodities, the general level of prices … would be perfectly invariant and stable. And why should not such regulation lie within the scope of practical politics? … Absolute prices … are a matter in the last analysis of pure convention, depending on the choice of a standard of price which lies within our power to make."

Knut Wicksell, Interest and Prices, page 4.[12]

---

[12] Quoted in Woodford (2003), page 1.

In this section, we follow the approach proposed by Aristotle and ask whether the successes that have just been documented accord with the predictions of the kind of model that has become the standard in the academic literature that studies optimal monetary policy decision-making. We focus specifically on the fundamental equation that appears in most models using a new Keynesian or New Neoclassical Synthesis approach to monetary policy making (these include, among others, Goodfriend and King, 1997, 2001, Walsh, 1998, Clarida, Gali and Gertler, 1999, Goodfriend, 2002, Woodford, 2003, and Svensson and Woodford, 2005). Our analysis draws most heavily on the variant of this model studied by Clarida, Gali and Gertler (1999) and by Woodford (2003).

This model rests on several critical assumptions. First, it presumes that the goods market is populated with a set of monopolistically competitive firms as in Dixit and Stiglitz (1977). Second, this imperfect competition means that firms must set prices. As in Calvo (1983), firms commit to a fixed nominal price in advance of knowing the demand for that period. At the end of each period a fraction of the firms are allowed to adjust their price freely, while the remaining firms increase theirs' based on the inflation rate observed in the period. This so-called partial indexation assumption is made so that the model's predicted persistence in inflation will match that found in the data. We also will explore the implications of dropping the indexation. Third, firms produce using labor under a marginal diminishing returns technology. Fourth, output is demand determined at the set price.

Finally, the model allows for shocks that create a tension between price stability and output gap stabilization. For example, in the case of a positive "cost-push" shock inflation rises and output falls relative to its natural level.

Inflation in this framework is inefficient because firms have promised to meet demand at their fixed nominal price. Consequently aggregate inflation moves real, relative prices (which is inefficient). We consider model's presumption of nominal price rigidity as appropriate since absent some sort of price stickiness monetary policy will be neutral; if prices can all adjust proportionally following a change in the quantity of money then no real quantities (including most importantly the real interest rate) will be affected by monetary policy.[13]

One of Issing's contributions to this debate was to promote basic research on these issues and in this case the Eurosystem Inflation Persistence Network produced a wealth of information on price setting and inflation dynamics. A very short summary of findings from micro data sets is that prices do change infrequently (only about 15 percent of consumer prices change each month). Thus, price stickiness is clearly documented. When prices do change, they can either increase or decrease. In euro area data, 60 percent of the prices changing are increases, while 40 percent are declines. Price changes are sizeable (on average 8 per cent for price increases and 10 per cent for price decreases). There is no evidence of mechanical indexation to past inflation, undermining the micro-

---

[13] We are less convinced that the Calvo formulation of the rigidity is necessarily appropriate and are intrigued by the recent papers such as Klenow and Kyvstov (2005), Golosov and Lucas (2005) and Gertler and Leahy (2006) that explore competing formulations.

foundations, for the inclusion of lagged inflation, in the New Keynesian Phillips curve. Price reviews are more frequent than price changes, which calls into question the rational inattention version of the sticky information story (for additional elaboration and complete references see Angeloni et al. 2004, Issing (2004), Fabiani et al., 2005 and Alvarez et al., 2005). In any case, for the remainder of this paper we will follow the dominant trend in the literature to stick to the Calvo price-setting assumption.

Woodford (2003) shows that under rational expectations, these standard assumptions lead to a Phillips curve of the form

(1) $\quad \pi_t - \gamma\pi_{t-1} = \beta\left(\mathrm{E}_t\pi_{t+1} - \gamma\pi_t\right) + \kappa x_t + u_t,$

where π is inflation, x is the output gap, β is the discount rate, κ is a convolution of the structural parameters, γ is the degree of indexation of prices, not optimally set each period, and u is a cost-push shock (assumed i.i.d.). Thus, in equation (1) inflation is determined by lagged inflation, inflation expectations, the output gap and the shock. In this section, we will simply assume that the central bank directly controls the output gap, thereby abstracting from the complexities of the monetary transmission mechanism.[14] The assumption does not affect the main results we will present. We postpone the discussion of the importance of the monetary transmission mechanism to section 3.

Furthermore, up to a second order approximation, the (negative of the) period social welfare function (as also shown in Woodford, 2003) takes the form

(2) $\quad L_t = (\pi_t - \gamma\pi_{t-1})^2 + \lambda x_t^2,$

where λ is another function of the underlying structural parameters.

The problem of minimizing the loss function in equation (2) subject to the linear constraint (1), given by the New Keynesian Phillips curve resembles the classic linear quadratic framework explored in the 1950s by Simon (1956) and Theil (1954, 1957). Simon and Theil extended the deterministic framework of Tinbergen (1952) to a stochastic set-up and showed that, in the linear-quadratic framework, both certainty equivalence and the separation of estimation and control held true. The main difference of our problem relative to the classical policy instrument choice framework is that expectations about the future are endogenous and influence the current state of the economy. Recently, Svensson and Woodford (2003) have identified conditions for these results to hold in models with forward-looking behavior.

---

[14] Clarida, Gali and Gertler (1999) explain the approach we follow, by appealing to a division of the optimal policy problem in two stages. In the first stage, the one we will focus on, the optimal path of inflation and the output gap are determined. In the second stage, the policy rate path, compatible with the optimal solution, determined in stage one, is worked out using a forward-looking IS curve.

The first order conditions for the central banker's problem may be shown to imply:

(3) $x_t = -\dfrac{\kappa}{\kappa^2 + \lambda} u_t$.

Under the optimal discretionary policy, the output gap only responds to the current cost-push shock. In particular, following a positive cost-push shock to inflation, monetary policy is tightened and the output gap falls. The strength of the response depends on the slope of the New Keynesian Phillips curve, κ, and the weight on output gap stabilization in the loss function, λ. The reaction function in (3) contrasts with the one derived in Clarida, Gali and Gertler (1999). They assume that the loss function is quadratic in inflation (instead of the quasi-difference of inflation) and they find that, in such a case, the output gap is also a function of lagged inflation.

The corresponding equation for inflation as a function of the shock is:

(4) $\pi_t = \gamma\pi_{t-1} + \dfrac{\lambda}{\kappa^2 + \lambda} u_t$.

Equation (4) makes it clear that under partial indexation inflation will respond gradually and persistently to a temporary cost push shock. Inflation persistence contrasts here with a non-persistent response of the output gap to cost-push shocks (assumed to be i.i.d.).

Expressing inflation directly as a function of the output gap:

(5) $\pi_t - \gamma\pi_{t-1} = -\dfrac{\lambda}{\kappa} x_t$ or $x_t = -\dfrac{\kappa}{\lambda}\left(\pi_t - \gamma\pi_{t-1}\right)$.

The solution under commitment is considerably different. Specifically, the expression relating the output gap and inflation becomes[15]:

(6) $x_t - x_{t-1} = -\dfrac{\kappa}{\lambda}\left(\pi_t - \gamma\pi_{t-1}\right)$

What general principles for the conduct of monetary can we extract from this set-up? What questions remain for a wise policy-maker?

First, all models incorporating the type of nominal rigidity that we have discussed imply a strong case for price stability. The idea, which does not seem to depend on the details of the modeling strategy, is that the allocative inefficiency, associated with relative price dispersion will, in general, be eliminated by the stability of the aggregate price level (assuming $\gamma < 1$). The way to achieve such an outcome is to follow a monetary policy regime where firms, when setting prices, will have no desire to change them. Such decisions, in turn, will validate the firms' initial expectations. In the absence of cost-push shocks the intuition behind this principle

---

[15] The first order condition relative to the first period would be different. We disregard such peculiarity assuming that the optimization was performed a long time in the past. This is the idea of Woodford's timeless perspective.

is clear. As Goodfriend and King (1997, 2001) stress, nominal price stickiness is the only distortion preventing the identity between the rational expectations equilibrium and the first best allocation of resources. Thus, optimal monetary policy aims at reproducing the allocation of resources which would occur under flexible price equilibrium. Therefore, the model clearly accords with Issing's first principle that emphasizes the primacy of a price-stability mandate and the wisdom of delegating such mandate to an independent central bank.

Second, it is apparent directly from equation (1) that policy credibility will also be important. In particular, given a positive cost push shock, the central bank is faced with a dilemma because the output gap will drop and inflation will rise. However, the tension depends importantly on what happens to expected inflation. If the public believes that the expected inflation will be lower following the temporary increase in inflation, the policymaker's problem is made less acute. Conversely, if the public foresees higher expected inflation it magnifies the shock making the policy dilemma worse. This observation rationalizes Issing's second principle that stresses the importance of credibility.

Issing's third principle focuses on the risks associated with caving in to the temptation to accommodate a shock and associated problems once inflation expectations become unhinged. The preceding discussion suggests that this is clearly possible. The importance of this consideration appears to center on the nature of the shocks that the policymaker must confront. The discussion in Clarida, Gali and Gertler (1999) is particularly illuminating on this point. They show that optimal policy calls for offsetting demand shocks and for accommodating shocks to potential output. In all such circumstances stabilizing prices ensures stability of the output gap (or alternatively the mark up). In such circumstances, Goodfriend and King (2001), explain that policy aiming at price stability is neutral policy precisely because it maintains output close to its potential.[16] In all such circumstances there are no trade-offs. So in these specifications only cost-push shocks create a dilemma for the central bank. Offsetting all other shocks is optimal so that only an incompetent central bank would fail to do so.

So what exactly are these cost push shocks? Woodford (2003) shows that, in the context of the current class of models, it is possible to ground cost-push disturbances on time-varying tax wedges or mark-ups.[17] Alternatively, Benigno and Woodford (2004) show that in an extended model with other distortions, output will normally be below its efficient level so that other factors, such as exogenous government spending shocks, also change the gap between the flexible

---

[16] The model of Goodfriend and King is within the tradition of optimal taxation in general equilibrium, in the spirit of Ramsey (1927) and Lucas and Stokey (1983). The basic intuition follows from looking at the wedge between price and the marginal cost – the mark-up – as analogous to a tax rate. Constant mark-ups are optimal (or approximately optimal) in a way which is analogous to tax smoothing over the business cycle or uniform taxation in the optimal taxation literature. As in the optimal taxation literature there may be departures from optimality of constant mark-ups and price stability but they argue departures are likely to be minor and temporary. In their setting preserving price stability keeps output at potential.

[17] The approach in Woodford (2003) is very common in the literature. See, for example, Clarida, Gali and Gertler (2001), Smets and Wouters (2003) and Steinsson (2003).

price level of output and the efficient level of output. Thus, these disturbances introduce a trade-off between inflation volatility and output gap volatility.

Finally, in a recent paper Blanchard and Gali (2005) argue that the introduction of real frictions, in the model, creates an environment where the gap between the natural level of output and the efficient level of output fluctuates endogenously in response to economic shocks. Blanchard and Gali argue that real wage rigidity is more than an example of a real friction. It is their belief that real wage rigidities rank high in their ability to contribute to the empirical explanation of the business cycle. The model is also able to account for some empirical facts about inflation, namely its strong dependence on lagged inflation.

Taken together it seems that either using the baseline model sketched above, or more complicated variants involving more frictions, there will be a wide range of shocks that may create a temptation for the central bank. The possibility of yielding to temptation directly threatens credibility. As equation (3) shows optimal discretionary policy involves just a linear response to the cost-push shock. This implies that the output gap is not persistent (under the assumption of i.i.d. shocks) and inflation is persistent. Such policy is not globally optimal. Indeed, as Woodford (2003) shows, commitment to a history-dependent policy allows for the simultaneous reduction in the volatility of inflation and of the output gap. The ability to commit – that is credibility – is associated with welfare gains.

What explains this result? The key aspect is forward-looking behavior on the part of price setters. As Clarida, Gali and Gertler (1999) and Woodford (2003) show, a central bank will want to commit to pursue a policy of sustaining its response to cost-push shocks so that the policy persists well after the shock has vanished from the economy. Specifically, a positive cost-push shock should be followed by a persistently negative output gap (and vice-versa). Such response is optimal because it generates expectations of a reduction in the price level that reduce the immediate impact of the shock, spreading it over time. With optimal policy, under commitment, inflation expectations operate as automatic stabilizers in the face of cost-push shocks. This stabilizing effect explains why it is possible to improve the inflation volatility, output gap volatility trade-off and why caving in to the temptation to combat these shocks would be misguided. Thus, it seems that simple extensions of the benchmark model account well for Issing's three key principles.

We are not sure Issing would agree. In Issing et al. (2005), Issing recommends "skepticism in the application of theoretical results on how to optimally balance short term trade-offs and the belief that, once the benefits of medium and long-run price stability have been attained, the additional gains produced by such "optimized" policies are "small", and often model-dependent." Our second question to Otmar Issing, is thus: as a practical matter what are the most likely threats to the credibility of the European Central Bank? Which temptations are hardest to resist, what mistakes easiest to make? How important is communication with the European people as prevention against such possibilities?

We close this section by noting one further implication of the role of expectations as potential automatic stabilizers. Clarida, Gali and Gertler (1999) and Woodford

(2003), show that the price level is stationary for the case of optimal policy under commitment (taking the timeless perspective). Under commitment and without partial indexation the policy rule may be written simply as:

$$(7) \quad x_t = -\frac{\kappa}{\lambda} \cdot \left(p_t - p^* \right) .$$

Woodford (2003) shows that the price level is also stationary even allowing for partial indexation (provided $\gamma < 1$). In addition, Vestin (2006) shows that, for the case $\gamma = 0$, it is possible to implement fully optimal policy through the delegation of a target for the path of the price level to the central bank. Clearly, in such a case, it is possible to improve on the discretionary inflation targeting case by entrusting a price path target to the central bank. Inflation volatility and output gap volatility can be reduced. Therefore, even in the case of a society that cares only about inflation and output gap stability, it might still be beneficial to entrust the central bank with a price level mandate. This is just one example of a modified loss function (as in Rogoff (1985) or Walsh (1995)).

The main alternative to sticky price is sticky information models, which, recently have been formulated on the basis of behavioral models.[18] Interestingly the conclusions for policy are very similar to those summarized above. Ball, Mankiw and Reis (2003) show that optimal policy stabilizes the path for the price level in response to productivity and demand shocks. In case shocks to mark-up levels are added the optimal response becomes, as before, flexible targeting of the price level.

Before putting forward our third question to Issing it is necessary to take a step back and look at the role of money as a unit of account. Robert Shiller (1997) illustrates the important role of money as a unit of account in long-dated financial contracts. The absence of indexation clauses in most contracts is a puzzle given the magnitude of long term inflation risk in historical time series. The relevance is clear when thinking about buying real estate or planning for retirement. From such a viewpoint price level stability appears important in its own right. These important aspects of the role of money as a unit of account are not present in the theoretical frameworks we have presented in this Section. Moreover, as Coulombe (1997) was among the first to point out, price level targets help to alleviate the zero lower bound on interest rates constraint on monetary policy. The reason is that they are consistent with increasing inflation expectations in the face of deflation shocks.[19] Lastly, it seems from the implications of the current vintage of sticky prices and sticky information models, that we have considered here, that a focus on price level stability would lead to even better outcomes in terms of inflation and output gap variability. In such context, focusing on price level stability can be interpreted as a commitment device.[20] In "Why Price Stability?"[21] Issing states "that the question of whether to focus on the price level or the inflation rate remains an open issue".

[18] See Blanchard (1990).
[19] Gaspar and Smets (2000) present some simulations illustrating the relevance of this argument.
[20] See Vestin (2006).
[21] Issing (2001b).

After more than five years and given the results reviewed above, our third question to Otmar Issing is[22]: Is time now ripe to consider again the costs and benefits of stabilizing the path for the level of prices (rather than the inflation rate)? Why not price level stability?

3   MONETARY AND FINANCIAL ANALYSIS

While the baseline model succeeds, albeit under duress, in delivering Issing's three principles, we argue in the remainder of the paper that it ignores monetary and financial analysis that plays an important role in ECB's decision-making. The easiest way to see the omission is to study Chart 4, which shows the ECB's description of the monetary transmission mechanism.[23] The logic of the New Keynesian model can be traced through the left hand side of the Chart, which shows the link between the official interest rate, expectations and prices. The Chart, however, also shows that policy is believed to operate by affecting bank and market rates, which independently are thought to influence prices.

Modeling the transmission mechanism using a single interest rate has a long tradition in macroeconomics (e.g. in the IS/LM model). Bernanke and Blinder (1988) argued that the IS/LM model could be usefully extended by allowing for a second interest rate. The argument that follows makes the same point in the context of the New Keynesian model. More specifically, we argue that a second interest rate is also necessary to capture Wicksell's view of the economy. We start the discussion by reviewing a few key episodes that are odds with the baseline model and then discuss extensions necessary to understand the observed ECB practice.

We find it useful to consider three episodes where monetary and financial conditions drove monetary policy decisions and actions. To be concrete, we briefly review the ECB's actions related to the asset market turbulence in the Fall of 1998 and September 2001, as well as the words used to discuss possible asset market bubbles.

In the second half of 1998, just at the ECB was preparing for the launch of the common monetary policy, the international financial system was hit with a series of shocks. First, on August 17th the Russian Government devalued the ruble, defaulted on its domestic debt and declared a moratorium on its payment to foreign creditors (see Chiodo and Owyang (2002) for a summary of the events).

The losses on the bonds destroyed the capital of the Long-Term Capital Management (LTCM) hedge fund. LTCM was a hugely levered entity and it began looking for additional financing. By mid-September it became clear that LTCM was at risk for failing. Alan Greenspan, Chairman of the Federal Reserve, described the situation as follows:[24]

---

[22] See Dugay (1994) for an early survey of the issues raised by price level targeting as an alternative to inflation targeting.

[23] See ECB, 2004, Chart 3.1. The ECB's account of the monetary transmission mechanism and its empirical features in the euro area are presented in section 3.2., pages 45-49.

[24] Greenspan (1998).

| OFFICIAL INTEREST RATES | | Examples of shocks outside the control of the central bank |

| Expectations | Bank and market interest rates |

| Money, credit | Asset prices | Exchange rate | Changes in global economy |

| Wage and price-setting | Supply and demand in goods and labour markets | Changes in fiscal policy |

| Domestic prices | Import prices | Changes in commodity prices |

| PRICE DEVELOPMENTS |
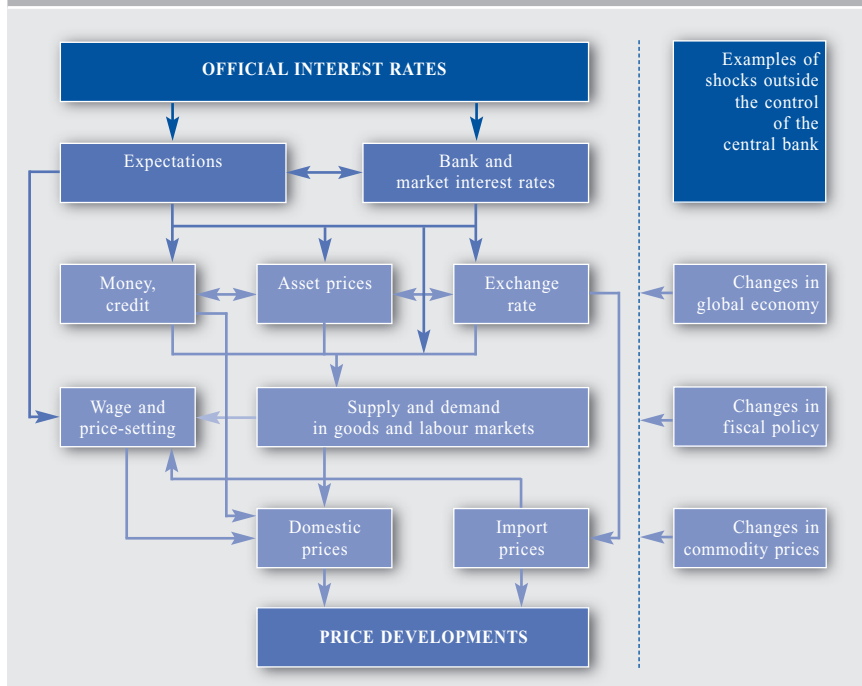
"It was the judgment of officials at the Federal Reserve Bank of New York, who were monitoring the situation on an ongoing basis, that the act of unwinding LTCM's portfolio in a forced liquidation would not only have a significant distorting impact on market prices but also in the process could produce large losses, or worse, for a number of creditors and counterparties, and for other market participants who were not directly involved with LTCM. …

Financial market participants were already unsettled by recent global events. Had the failure of LTCM triggered the seizing up of markets, substantial damage could have been inflicted on many market participants, including some not directly involved with the firm, and could have potentially impaired the economies of many nations, including our own."

On this logic the Federal Reserve Bank of New York helped organize a rescue of LTCM. Nonetheless, spreads on corporate securities relative to government securities widened and many firms were unable to roll-over their commercial paper when it came due.

At the September 29th FOMC meeting, the Federal Reserve cut the Federal Funds rate 25 basis points, from to 5.5 to 5.25. Donald Kohn (who was then a staff member) summarized the case for the cut as follows: [25]

---

[25] FOMC transcripts for the September 29, 1998 meeting, page 77.

"The case for easing does not rest on incoming data about the economy. As many of you have noted, the information that has come available since your last meeting indicates that the economy continues to expand at a pace around the growth rate of potential. That has kept the unemployment rate flat at a very low level and inflation has edged higher on a twelve month basis, at least as measured by the core CPI. Thus, a standard, backward-looking Taylor rule that called for a 5.5 percent funds rate in August would continue to do so today.

Rather, the case for easing relies on projections that have been marked down by developments overseas and in U.S. financial markets."

The Federal Reserve went on to cut interest rates two more times. In each case the FOMC pointed to conditions in financial markets (and not any direct evidence of weakness in spending) as the rationale for the moves.

The ECB's Governing Council also decided in November that a coordinated interest rate cut by the National Central Banks was in order. Thus, on December 3 1998, there was a concerted reduction of official interest rates to 3 per cent. The move represented the final convergence of interest rates in preparation to the start of the single monetary policy. Remarkably, the average three month interbank rate declined, in the countries participating in the euro area, by about 70 basis points between August 1998 and the end of the year. Half of the adjustment took place following the decision of 3 December. Issing et al. (2001) explain the rationale for these moves on two grounds: First, weakness as recorded by leading indicators. Second, turmoil in international markets and negative wealth effects associated with stock market losses. These together with low inflation and inflation prospects implied that risks to price stability were moving to the downside.

The decisions taken by the ECB in the wake of the terrorist attacks against the United States on September 11, 2001 provide unambiguous evidence that the ECB acts as if shocks to the financial system can be important for monetary policy. In this case the ECB announced on that day that "the Eurosystem stands ready to support the normal functioning of markets. In particular, the Eurosystem will provide liquidity to the markets, if need be." It re-iterated this pledge the next day and conducted a "liquidity providing fine-tuning operation." On September 13, it reconfirmed the commitment to support the functioning of markets and repeated the liquidity providing fine-tuning operation. It also announced that it had opened a $50 billion swap line with the Federal Reserve to "facilitate the functioning of financial markets and provide liquidity in dollars." On September 17, the bank cut the policy rate by 50 basis points. Thus, this is a case where the ECB perceived the disorder in financial markets to be critically important and was willing to act promptly to restore order. In any case it is important to point out that the decision was made easier because, at the same time, economic prospects for the euro area were also weakening.

Finally, throughout Issing's tenure at the ECB, one of the most hotly debated issues for both policymakers and academics has been the linkages between asset prices and monetary policy. There seems to be little dispute that a sharp decline in asset prices can be disruptive. For instance, there is broad consensus that the

decade-long slump in Japan was triggered by a collapse in asset prices and then prolonged by spillover effects of the collapse into the banking system (IMF (2002)). There is also broad agreement that failure to deal decisively with financial system weakness was a major policy mistake (Bernanke (2000), Kohn (2006)). But, the question of what to do when faced with a large increase in either equity prices or house prices remains contentious.[26]

Issing (2003a) offers a nuanced view on how to deal with this. On the one hand he notes, "it is worth stressing that according to the previous arguments considering financial imbalances – from time to time – may lead to a different monetary policy stance than fixed-horizon inflation targeting, despite the fact that the only objective of the central bank is price stability (defined over the appropriate medium term horizon)." Yet on the other hand, if one does not adhere rigidly to the fixed-horizon then provided that "the central bank employs a medium term horizon for the definition of price stability and implies a strategy encompassing a stability-oriented, forward-looking approach, financial imbalances will implicitly obtain the attention they deserve."

Our fourth question to Issing is thus: some proponents of inflation targeting recommend focusing on an inflation forecast at a fixed time-horizon (say two years). Many times you have suggested that a flexible time frame, and sometimes a long time frame, maybe be necessary to cope with some shocks and risks. What are the most important considerations determining the length of the relevant time horizon? How can such considerations be most effectively communicated? Does the unwillingness to commit to a fixed time horizon create temptation that can undermine credibility?

Can the baseline new Keynesian model account for the right-hand side of Chart 4?

Up to this point we intentionally abstracted from the mechanism by which monetary policy affects the output gap. To determine whether we can reconcile the baseline model with the aforementioned concerns regarding the financial system we must explore these connections more thoroughly. In Woodford (2003, chapter 4) this connection is precisely derived. In particular, he shows that

$$(8) \quad x_t = \eta E_t x_{t+1} + \alpha\left(\rho_t - E_t \pi_{t+1}\right) + v_t$$

where ρ is the interest rate that is relevant for spending decisions and v is the aggregate demand shock.

One of the points of Woodford (2003) is that equation (8) is consistent with Wicksell's view of the economy. We agree with this, although Wicksell himself presumed that a "loan" rate was the relevant one for spending and so in deference to Wicksell we will refer to ρ as a loan rate. As we explain below, ρ could also be interpreted as the required return on equity or the corporate bond rate.

[26] Issing's view on this (Issing (20003b) and Issing (2002)), which we agree with, is that pre-emptive policy moves based purely elevated asset values would be dangerous.

In contrast to the Wicksellian approach, the convention in the recent literature is to equate ρ with the policy rate. We believe the distinction between treating ρ as being perfectly and imperfectly linked to the policy rate is critical and that an extended model that presumes an imperfect connection generates several interesting insights.

One reason for considering an imperfect connection is that no users of this model believe that the short-term interest rate is the critical interest rate for spending. Instead one presumably equates ρ with the policy rate because the appropriate longer term interest rate that belongs in (8) is itself a stable function of the policy rate; the expectations hypothesis of term-structure determination might justify this simplification if there were no time-variation in any term-premia. Cochrane and Piazzesi (2005), and many others document the considerable time-variation in term-premia. More importantly, the Fall 1998 and September 2001 episodes specifically suggest that policymakers are sometimes quite concerned about such variation. Indeed, Chart 4 shows that the ECB believes that it is crucial to monitor developments regarding the connections between the policy rate and market rates (and asset prices).[27]

Accordingly, in the remainder of the paper we explore the consequences of introducing a distinction between the policy rate and the loan rate.[28] Specifically, we assume

$$(9) \quad \rho_t = \varsigma_t x_t + \delta_t\left(i_t, \varepsilon_t\right) i_t + z_t,$$

where i denotes the policy rate and ε a stochastic disturbance affecting the monetary transmission mechanism.

This formulation is admittedly ad-hoc and we make no attempt to provide micro foundations that deliver this precise equation. Instead, we view it as a relatively general specification that allows us to nest various hypotheses that have been put forward about the workings of financial markets. For instance, one way to think of (9) is as of a description of the equilibrium in loan market. Naturally, loan rates would rise when output is abnormally high – more generally we allow ρ to depend on x to capture the effects of the demand for credit on the price of credit. Likewise, when the policy rate increases, loan rates tend to rise; in general arbitrage considerations would require expected rates of returns on other securities to rise when the rate of return on the safe asset increases.

---

[27] See ECB (2004) pages 44-49.

[28] The alternative approach would be allow financial factors to matter, but to assume that this reflects un-modeled factors that affect desired spending; this amounts to assuming in (8) that v and not ρ is the relevant channel through which financial factors matter. It is possible that some cases, such as a decline in asset prices that reduce wealth, might naturally correspond to this interpretation. But, in other cases this assignment is less clear. For instance, the widening spreads on corporate bonds and commercial paper in the Fall of 1998 most naturally would be interpreted as raising the cost of capital for firms. Depending on whether there is any credit-rationing this type of shock might or might not belong in the residual in (8). Undoubtedly, the change in the spreads should appear in ρ.

We allow for time variation in δ, the function governing the link between the policy rate and the loan rate, because of the evolving nature of intermediation (that we discuss further below). Under this interpretation, ε would be a vector of factors that also affect the loan rate, such as the amount of capital in the banking system or the net-worth of borrowers. Finally, we allow for a disturbance z in the loan market that we also discuss shortly.

Substituting this back into the output gap equation yields the following:

$$(10) \quad (1 - \alpha\varsigma_t)x_t = \eta E_t x_{t+1} + \alpha\left(\delta_t(i_t, \varepsilon_t)i_t + z_t - E_t \pi_{t+1}\right) + v_t$$

The usual special case considered by Woodford and most others in the literature presumes that δ and ς are known multipliers and z is zero. We see three reasons for generalizing in this way. First, we believe it allows us to formalize the concerns raised by Wicksell and others. Using Wicksell's framework it is natural to think about two wedges: first the wedge between the loan rate and the Wicksellian natural rate (the difference putting the "cumulative process" in motion) and second, the wedge between the loan rate and the policy rate. Second, it provides a convenient way to formalize a great deal of empirical evidence, including the large project on the monetary transmission that Issing initiated. Finally, it helps explain some aspects of the monetary policy strategy that has been practiced by the ECB. From this viewpoint, the loan rate is a summary of all the variables determining the financing conditions in the economy (as in ECB (2004)).

Taking (10) together with the Phillip's curve and a monetary policy rule allows us derive several propositions about the role of monetary and financial analysis in the conduct of monetary policy.

First, in the usual special case considered in the literature, the fact that spending depends on a loan rate and only indirectly on the policy rate would be inconsequential for the monetary authority. The policymakers would have to recognize that the coefficients on output and the policy rate in the aggregate demand equations are reduced form coefficients, but they would be stable reduced form coefficients.

Second, if z_t is random and α is known certainty equivalence results apply. So this particular type of the uncertainty would have little practical impact on the central bank's conduct.

Alternatively, if relevant parameters are both unknown and time-varying then the central bank's job becomes much harder. The literature does not seem to provide any general insights. In cases where uncertainty is primarily about the static effect of the policy instrument on spending, then the problem looks much like the one studied by Brainard (1967) and the associated reasoning suggests that the policy-maker will behave cautiously (meaning he should move less than implied by certainty equivalence). On the other hand, if the uncertainty relates to the dynamic effects of policy, and the dynamics of the system threaten to become unhinged, then the central bank should be extra aggressive in responding to shocks, thereby stabilizing inflation.

As signaled by the quote from Issing at the start of this paper, he struggled with how to handle uncertainty throughout his career as a central banker. One further indication of the importance he placed on this problem is that he sponsored two major international conferences (in 1999 and 2004) on this theme of how to operate given uncertainty and imperfect knowledge.

He also supported a cooperative venture between the ECB and the National Central Banks of the Eurosystem to study the monetary transmission from a variety of angles. The Monetary Transmission Network (MTN) research offers the most complete assessment to date of how monetary policy appears to operate in the euro area.

It is particularly relevant, in the context of Chart 4, that much of the MTN research was aimed at studying the importance of shifts in bank loan supply in the transmission of monetary policy. Operationally this amounted to comparing changes in loan volumes for different types of banks (small versus large, liquid versus illiquid, members of groups versus independent, etc) following changes in policy rates. In terms of (9) these different bank characteristics would be candidates for ε. There was no single indicator that revealed systematic differences in all countries, although in nearly all cases it appears that banks with fewer liquid assets on their balance sheets seem to cut lending relatively more when policy rates rise. Thus, at an aggregate level the amount (and distribution of) liquidity in the banking system is one candidate proxy for ε that deserves more scrutiny. Interestingly, neither the level of bank capital, nor the size of a bank seemed to be closely related to the degree to which bank lending changes.

The MTN and a number of follow up studies at the ECB and elsewhere in the Eurosystem have also explored the role of the "financial accelerator" in influencing investment (Bernanke, Gertler and Gilchrist (1999)). Broadly these studies tend to find clear evidence that financial factors tend to amplify changes triggered by changes in policy rates. The MTN evidence suggests that firm size typically does not govern the importance of these effects, but there are many predictable differences as to which types of firms respond more or less strongly to changes in interest rates.

There has been less research to date on the role of non-bank financing (and more precisely disturbances to this type of financing) in affecting spending. But, there is a great deal of indirect evidence suggesting that these disturbances could be important. For instance, there is a large literature that studies the predictive power of yield spreads for many macroeconomic variables. Moneta (2005) shows that in the euro area the spread between the ten-year government bond rate and the three month interbank rate is a good predictor of recessions. Importantly, his regressions show that this spread has out of sample forecasting ability, that the spread adds information over and above the information of past data on recessions, and that the spread is a more informative forecasting variable than GDP, stock prices and a composite index of leading indicators. This could be accounted for in our framework assuming that ρ should be a long-term interest rate and by associating z with the term premia.

Christiano, Motto and Rostagno (2005) estimate a small dynamic, stochastic general equilibrium model of the euro area economy that allows for 14 different disturbances. They find that when they suppress financial shocks the model predicts that output volatility would drop substantially (by more than half using their baseline estimates).[29] Thus they conclude that further modeling of the financial system is critically important for understanding euro area business cycle dynamics.

In the current version of their model, shocks to the net worth of entrepreneurs are the critical financial disturbances. This could be captured in (9) by posting that household net worth belongs in ε or that the residual, z, might be related to net worth. The conjecture that these shocks could be important is also consistent with the findings by Adalid and Detken (2006) that loose money, associated with excessive growth in monetary aggregates, is related to asset price increases and that these increases lead to spending increases (and ultimately recessions).

Thus, a third general proposition about (10) is that there are many routes by which a change in the policy rate might be amplified or dampened due to financial factors. The ECB's monitoring and cross-checking seeks to identify these cases.

Such considerations lead to our fifth question to Issing: how best to characterize the various channels of the monetary transmission mechanism in a theory of monetary policy? Specifically, what monetary and financial shocks are likely to be most relevant? What remain as the least certain features of the transmission mechanism?

One last issue concerns the role of monetary aggregates. Patinkin (1965, 1968) and Humphrey (1997) convincingly show that Wicksell was a main upholder of the quantity theory of money. For example, in Wicksell's cumulative process monetary expansion (contraction) is crucial to accommodate the increase (decline) in prices occurring when the loan rate is below (above) the natural rate. In his "Lectures on Political Economy" he devotes 50 pages refuting the critics of the classical quantity theory of money. Wicksell (like Fisher) uses the quantity theory to argue that monetary policy can only bear responsibility for the determination of the value of some nominal variable (e.g. the price level). Nevertheless, in our simplified account of the Wicksellian loan rate and our discussion on the implications for the conduct of monetary policy, the explicit role of monetary aggregates has been very limited.

Others have argued for a more central role for monetary aggregates. For example Christiano and Rostagno (2001) argue that monitoring money allows for improvements on the outcomes implied by a Taylor rule, while Nelson (2003) (following a tradition that prominently includes Brunner and Meltzer) states that monetary aggregates may serve as proxy for the substitution effects of monetary policy in an environment where the multiplicity of financial assets matters.

---

[29] Dynan, Elmendorf and Sichel (2006) assemble a variety of evidence that suggests that changes in the structure of financial markets have contributed to the decline in volatility of real activity in the United States.

This leads us to our last question to Issing: Is our reading of Wicksell in error? If so, is there a modification of the model in section 3 (or a completely different model) that would make the role of money explicit? Put differently, can we move past the quantity theory to use monetary aggregates more productively in the policy process?

4   CONCLUSION

In this paper, we review Otmar Issing's career as the ECB's inaugural chief economist. We began by documenting many notable successes including: 1) the seamless transition to the single monetary policy; 2) the maintenance of price stability over the medium term; 3) low and stable inflation expectations; 4) reduced volatility of key economic variables.

We argue that the standard New Keynesian model, which is widely used in the theory of monetary policy, is able to account for many features that characterize Otmar Issing's approach to the conduct of monetary policy. In particular, it seems to account for Issing's three guiding principles for the successful conduct of monetary policy, namely: 1) Institutions matter. Theoretical reasoning and historical experience show that price stability and central banking independence are the two defining features of sound institutional arrangements. 2) Credibility is fundamental. It is necessary to ensure price stability in a way that is compatible with an overall environment of macroeconomic stability. 3) Temptation must be resisted. In particular, never take credibility for granted, be constantly vigilant and beware of the lasting costs of policy mistakes.

Thirty years ago, Charles Goodhart (1981, page 116) formulated his famous law "that any observed statistical regularity will tend to collapse once pressure is put upon it for control purposes." Issing examined Goodhart's law (in Issing, 1997) and interpreted it as a particular case of the Lucas (1976) critique. Goodhart's law was inspired by the historical example of change and instability of monetary policy in the UK. Thus, Issing decided, inspired by the experience of the Bundesbank, to spin the Lucas critique in the opposite direction. Our favorite formulation of Issing's law[30] is: "a policy (…) geared to steadiness and medium-term objectives reinforces … stability … and hence the foundation of the policy itself." Goodhart's law stresses a vicious circle of instability generating instability. Issing's law, instead, stresses the virtuous circle of stability begetting stability. Thus one of our major conclusions is that the success of the ECB illustrates the practical relevance of Issing's law.

Our second major conclusion is that the link between theory and the practice of monetary policy, at the ECB, under Issing, is the least clear concerning the role of monetary and financial analysis. Our assessment is that this mostly reflects the limited attention that financial factors have received in the theoretical models. We proposed one extension that moves towards filling this gap. While we find

---

[30] In Issing (1997) the reference is clearly to the monetary targeting strategy of the Bundesbank. We have omitted these references in order to highlight the general relevance of Issing's law.

the extended model helpful for organizing many observations about practice, we recognize that the lack of foundations to our model is a serious short-coming. We hope that by calling attention to this disconnect between the theory and practice we can trigger more research to close this gap.

Finally, we see the comparison of the theory and practice as raising many questions. We hope, as a parting gift, Issing, in due course, will share his thoughts on these specific questions.

First, given the fact the monetary, economic and political trends are co-determined and co-evolutionary what is the ground for optimism about the future of the European Union? How will political forces affect the operation of the European Central Bank and the Eurosystem?

Second, as a practical matter, what are the most likely threats to the credibility of the European Central Bank? Which temptations are hardest to resist, what mistakes are easiest to make? How important is communication with the European people as prevention against such possibilities?

Third, is time now ripe to consider again the costs and benefits of stabilizing the path for the level of prices (rather than the inflation rate)? Why not price level stability?

Fourth, what are the most important considerations determining the length of the relevant time horizon? How can such considerations be most effectively communicated? Does the unwillingness to commit to a fixed time horizon create temptation that can undermine credibility?

Fifth, how best to characterize the various channels of the monetary transmission mechanism in a theory of monetary policy? Specifically, what monetary and financial shocks are likely to be most relevant? What remain as the least certain features of the transmission mechanism?

Sixth, is our reading of Wicksell in error? If so, is there a modification of the model in section 3 (or a completely different model) that would make the role of money explicit? Put differently, can we move past the quantity theory to use monetary aggregates more productively in the policy process?

Issing's awareness of the key importance of uncertainty, imperfect knowledge and communication has been, in our view, crucial to his success. As in the concluding quote from Machiavelli, Issing benefited from good fortune:

"(…) anybody wise enough to understand the times and the types of affairs and to adapt himself to them would have always good fortune (…) and it would come to be true that the wise man would rule the stars and the Fates."

Niccolò Machiavelli, Letter to Piero Soderini in Ragusa, January 1513, in Gilbert (1988).

REFERENCES

Adalid, A. and Detken, C. (2006), Asset Price Booms and Excess Liquidity, mimeo, ECB.

Alesina, A. and Summers, L. (1993), Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence, *Journal of Money, Credit and Banking*, 25, pp. 151-62.

Alvarez, L., Dyhne, E., Hoeberichts, M., Kwapil, C., Le Bihan, H., Lünnemann, P., Martins, F., Sabbatini, R., Stahl, H., Vermeulen, P. and Vilmunen, J. (2005), Sticky Prices in the Euro Area: a Summary of New Micro Evidence, *ECB Working Paper* 563, December.

Angeloni, I. et al., (2004), Inflation Persistence in the Euro Area: Preliminary Summary of Findings, available at http://www.ecb.int/events/pdf/conferences/ inflationpersistence/ IPN_interim_report_decb.pdf

Arendt, H. (1958), The Human Condition, 2nd edition, Chicago: University of Chicago Press.

Ball, L., Mankiw, N. G. and Reis, R. (2003), Monetary Policy for Inattentive Economies, *NBER Working Paper* 9491, February.

Benigno, P. and Woodford, M. (2004), Inflation Stabilization and Welfare: the Case of a Distorted Steady State, *NBER Working Paper*, 10838, October.

Bernanke, B. (2000), Japanese Monetary Policy: A Case of Self-Induced Paralysis? in Mikitani, R. and Posen, A. S. eds., *Japan's Financial Crisis and Its Parallels to U.S. Experience*, Washington: Institute for International Economics.

Bernanke, B. and Blinder, A. (1988), Credit, Money and Aggregate Demand, *American Economic Review Papers and Proceedings* 78, pp. 435-38.

Bernanke, B., Gertler, M. and Gilchrist, S. (1999), The Financial Accelerator in a Quantitative Business Cycle Framework, in Taylor, J. and Woodford, M. (eds.) *Handbook of Macroeconomics*, Amsterdam: North-Holland.

Blanchard, O. (1990), Why Does Money Affect Output? A Survey, in Friedman, B. and Hahn, F. (eds.), *Handbook of Monetary Economics*, Amsterdam: North-Holland.

Blanchard, O. and Gali, J. (2005), Real Wage Rigidities and the New Keynesian Model, *NBER Working Paper* 11806, November.

Blinder, A. (1999), *Central Banking in Theory and Practice*, MIT Press.

Brainard, W. (1964), Financial Intermediaries and a theory of Monetary Control, *Yale Economic Essays*, 4, (fall).

Brainard, W. (1967), Uncertainty and the Effectiveness of Policy, *American Economic Review*, 57, pp. 411-425.

Brunner, K. and Meltzer, A. (1972), Money, Debt and Economic Activity, *Journal of Political Economy*, 80, pp. 951-77.

Brunner, K. and Meltzer, A. (1993), *Money and the Economy: Issues in Monetary Analysis*, The Raffaelle Matioli Lectures, Cambridge: Cambridge University Press.

Calvo, G. (1983), Staggered prices in a Utility-Maximizing Framework, *Journal of Monetary Economics*, 12, pp. 983-98.

Castelnuovo, E., Nicoletti-Altimari, S. and Rodriguez-Paluenzuela, D. (2003), Definition of Price Stability, Range and Point Inflation Targets: the Anchoring of Long Term Inflation Expectations, in Issing, O. (ed) *Background studies for the ECB's evaluation of its monetary policy strategy*, Frankfurt: European Central Bank.

Cecchetti, S. and Li, L. (2005), Do Capital Adequacy Requirements Matter for Monetary Policy, *NBER Working Paper* 11830, December.

Cecchetti, S., Flores-Lagunes A., and Krause, S. (2006), Has Monetary Policy Become More Efficient? A Cross-Country Analysis, *Economic Journal*, forthcoming.

Chiodo, A. and Owyang, M. (2002), A Case Study of a Currency Crisis: The Russian Default of 1998, *Federal Reserve Bank of Saint Louis Review*, pp. 7-17, November/December.

Christiano, L. J., Eichenbaum, E., and Evans, C. (2005), Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy. *Journal of Political Economy*.

Christiano, L. J. and Rostagno, M. (2001), Money Growth Monitoring and the Taylor Rule, *NBER* Working Paper, 8539.

Christiano, L. J., Motto, R. and Rostagno, M. (2005), Financial Factors in Business Cycles, mimeo, ECB.

Clarida, R., Gali, J. and Gertler, M. (1999), The Science of Monetary Policy: A New Keynsian Perspective, *Journal of Economic Literature*, 37(4), pp. 1661-707.

Clarida, R., Gali, J. and Gertler, M. (2001), Optimal Monetary Policy in Open vs. Closed Economies: An Integrated Approach, *American Economic Review*, 91, 2, pp. 248-52.

Cochrane, J. and Piazzesi, M. (2005), Bond Risk Premia, *American Economic Review*, 95:1, pp. 138-60.

Coulombe, S. (1997), The Intertemporal Nature of Information Conveyed by the Price System in *Price Stability, Inflation Targets and Monetary Policy*, Proceedings of a Conference held by the Bank of Canada.

Dixit, A. and Stiglitz, J. (1977), Monopolistic Competition and Optimum Product Diversity, *American Economic Review*, 67, 3, pp. 297-308.

Dugay, P. (1994), Some thoughts on Price Stability vs. Zero Inflation, paper presented at a conference on Central Bank Independence and Accountability, Bocconi.

Duisenberg, W. (1999), Economic and Monetary Union in Europe: the Challenges Ahead, in *New Challenges for Monetary Policy*, a Symposium sponsored by the Federal Reserve of Kansas City.

Dynan, K., Elmendorf, D. and Sichel, D. (2006), Can Financial Innovation Help to Explain the Reduced Volatility of Economic Activity?, *Journal of Monetary Economics* (forthcoming).

ECB (1998), A Stability Oriented Monetary Policy Strategy for the ESCB, ECB Press Release, 13 October, http://www.ecb.int/

ECB (1999), The Stability-Oriented Monetary Policy of the Eurosystem, *Monthly Bulletin*, January, pp. 39-50.

ECB (2003a), The ECB's Monetary Policy Strategy, Press release, 8 May.

ECB (2003b), The Outcome of the ECB's Evaluation of Its Monetary Policy Strategy, *Monthly Bulletin*, June.

ECB (2004), *The Monetary Policy of the ECB*, Frankfurt: European Central Bank.

Fabiani, S., Druant, M., Hernando, I., Kwapil, C., Landau, B., Loupias, C., Martins, F., Mathä, T.Y., Sabbatini, R., Stahl, H. and Stockman, C.J. (2005), The Pricing Behaviour of Firms in the Euro Area: New Survey Evidence, *ECB Working Paper* 535, October.

Federal Open Market Committee Meeting Transcripts, September 29 (1998), available at http://www.federalreserve.gov/fomc/transcripts/1998/980929 meeting.pdf

Friedman, M. (1970), A Theoretical Framework for Monetary Analysis, *Journal of Political Economy*, 78, pp. 193-238.

Gaspar, V. (2003), The Conduct of Monetary Policy under Uncertainty, in *Monetary policy and Uncertainty: Adapting to a Changing Economy*, a Symposium sponsored by the Federal Reserve of Kansas City.

Gaspar, V., Pérez Quirós, G. and Sicilia, J. (2001), The ECB monetary policy strategy and the money market, by Gaspar, V., *International Journal of Finance and Economics*, 6 (4), pp. 325-42.

Gaspar, V. and Smets, F. (2000), Price Stability: Some Issues, *National Institute Economic Review*, 174, pp. 68-79.

Gertler, M. and Leahy, J. (2006), A Phillips Curve with an Ss Foundation, NBER Working Paper 11971.

Gilbert, A. (1988), *The Letters of Machiavelli*, Chicago: University of Chicago Press.

Golosov, M. and Lucas, R. (2005), Menu Costs and Phillips Curves, NBER Working paper 10187, revised.

Goodfriend, M. (2002), Monetary Policy in the New Neoclassical Synthesis: a Primer, *International Finance*, 5 (2), pp. 193-212.

Goodfriend, M. and King, R. (1997), The New Neoclassical Synthesis and the role of Monetary Policy, NBER *Macroeconomics Annual*, 12, pp. 231-83.

Goodfriend, M. and King, R. (2001), The Case for Price Stability, in Garcia-Herrero, A., Gaspar, V., Hoogduin, L., Morgan J. and Winkler B. (eds), *Why Price Stability?*, Frankfurt: European Central Bank, pp. 53-94.

Goodhart, C. (1981), Problems with Monetary Management: the UK experience, in A. Courakis (ed.), *Inflation, Depression and Economic Policy in the West*, London: Mansell.

Greenspan, A., Testimony of Chairman Alan Greenspan, *Private-sector financing of the large hedge fund, long-term capital management* before the Committee on Banking and Financial Services, U.S. House of Representatives October 1, 1998.

Humphrey, T. (1997), Fisher and Wicksell on the Quantity Theory, *Federal Reserve of Richmond Economic Quarterly*, 83/4, Fall, pp. 71-89.

International Monetary Fund (2002), Japan: Staff Report for the 2002 Article IV Consultation, Washington, DC.

Issing, O. (1995), The Role of the Central Bank and its Responsibility, in Frowen, F. and Mc Hugh, F. (eds.), *Financial Decision-Making and Moral Responsibility*, Basingstoke.

Issing, O. (1997), Monetary targeting in Germany: The stability of monetary policy and of the monetary system, *Journal of Monetary Economics*, 39, pp. 67-79.

Issing, O. (1999a), The monetary policy of the ECB in a world of uncertainty, contribution to the policy panel at the conference on Monetary policy-making

under uncertainty, organised jointly by the European Central Bank and the Center for Financial Studies of the University of Frankfurt, Frankfurt am Main, 3 December.

Issing, O. (1999b), The Eurosystem: Transparent and Accountable or Willem in Euroland, *Journal of Common Market Studies*, 37, pp. 503-19.

Issing, O. (2000), The ECB's Monetary Policy: Experience After the First Year, *Journal of Policy Modeling*, 22 (3), pp. 325-43.

Issing, O. (2001a), The single monetary policy of the European Central Bank: one size fits all, *International Finance*, 4, pp. 441-62.

Issing, O. (2001b), Why Price Stability? In A. Garcia-Herrero et al. (eds), *Why Price Stability?*, First ECB Central Banking Conference.

Issing, O. (2001c), The euro – the experience of the past 2 years, *Journal of Asian Economics*, 12, pp. 1-20.

Issing, O. (2002), Monetary Policy in a Changing Economic Environment, in *Rethinking Stabilization Policy* a Symposium sponsored by the Federal Reserve of Kansas City.

Issing, O. (2003a), Monetary and Financial Stability: Is there a Trade-off?, Remarks at Conference on Monetary Stability, Financial Stability and the Business Cycle, Bank for International Settlements, Basle, March 28-29, 2003.

Issing, O. (2003b), Introductory statement at the ECB Workshop on Asset prices and monetary policy, European Central Bank, Frankfurt, December 11-12, 2003.

Issing, O. (2004), Inflation persistence in the euro area, contribution to the ECB conference 'Inflation persistence in the euro area'; Frankfurt am Main, 10 December 2004.

Issing, O. (2005), The ECB and the euro – the first 6 years: A view from the ECB, *Journal of Policy Modeling*, 27, pp. 405-20.

Issing, O., Gaspar, V., Angeloni I. and Tristani, O. (2001), *Monetary Policy in the Euro Area: Strategy and Decision-Making at the European Central Bank*, Cambridge, Cambridge University Press.

Issing, O. et al., (2003), eds., *Background studies for the ECB's evaluation of its monetary policy strategy*, Frankfurt: European Central Bank.

Issing, O., Gaspar, V., Vestin, D. and Tristani, O. (2005), *Imperfect Knowledge and Monetary Policy*, Cambridge: Cambridge University Press.

Klenow, P. and Kryvtsov, O. (2005), State-Dependent or Time-Dependent Pricing: Does it Matter for Recent US Inflation, *NBER Working Paper* 11043.

Kohn, D. (2006), Monetary policy and asset prices, at Monetary Policy: A Journey from Theory to Practice, a European Central Bank Colloquium held in honor of Otmar Issing, Frankfurt, Germany.

Lucas, R. (1976), Econometric Policy Evaluation: a Critique, *Carnegie-Rochester Conference Series on Public Policy*, 29, pp. 173-204.

Lucas, R. and Stokey, N. (1983), Optimal Fiscal and Monetary Policy in an Economy without Capital, *Journal of Monetary Economics*, 12, pp. 55-93.

Masuch, K. (2005), Price Stability and Macroeconomic Volatility in the euro area – the Positive Supply-Side Effects of Credible and Predictable Monetary Policy, in Heise, M., and Wieland, V., (eds.), *Capital Markets in the Long Term: Demography, Economic Developments and Funded Pension Systems*, Center for Financial Studies.

Moneta, F. (2005), Does the Yield Spread Predict Recessions in the Euro Area?, *International Finance*, 8:2, pp. 263-301.

Nelson, E. (2003), The future of monetary aggregates in monetary policy analysis, *Journal of Monetary Economics*, 50, pp. 1029-59.

Nussbaum, M. (1986), *The Fragility of Goodness*, Cambridge: Cambridge University Press.

Obstfeld, M. (1998), *EMU: Ready, or Not?*, Princeton Essays in International Economics, 209, also available as http://elsa.berkeley.edu/~obstfeld/graham.pdf

Patinkin, D. (1965), *Money, Interest and Prices*, 2nd Edition, New York: Harper & Row.

Patinkin, D. (1968), Wicksell's Cumulative Process in Theory and Practice, *Banca Nationale del Lavoro Quarterly Review*, 85, June, pp. 120-31.

Ramsey, F. (1927), A Contribution to the Theory of Taxation, *Economic Journal*, 37, pp. 47-61.

Rogoff, K. (1985), The optimal degree of commitment to an intermediate monetary target, *Quarterly Journal of Economics*, 100, pp. 1169-90.

Shiller, R. (1997), Public Resistance to Indexation: a Puzzle, *Brookings Papers on Economic Activity*, 1, pp. 159-211.

Simon, H. (1956), Dynamic Programming under Uncertainty with a Quadratic Criterion, *Econometrica*, 24, pp. 74-81.

Smets, F. and Wouters, R. (2003), An Estimated Stochastic General Equilibrium Model for the Euro Area, *Journal of the European Economic Association*, 1, 5, pp. 1123-75.

Steinsson, J. (2003), Optimal Monetary Policy in an Economy with Inflation Persistence, *Journal of Monetary Economics*, 50, 7.

Svensson, L. and Woodford, M. (2003), Indicator Variables for Optimal Policy, *Journal of Monetary Economics*, 50, pp. 621-50.

Svensson, L. and Woodford, M. (2005), Implementing Optimal Policy Through Inflation-Forecast Targeting, in Bernanke, B. and Woodford, M. (eds.), *The Inflation Targeting Debate*, Chicago: University of Chicago Press.

Theil, H. (1954), Econometric Models and Welfare Maximization, *Weltwirtschaftliches Archiv*, 72, pp. 60-83.

Theil, H. (1957), A Note on Certainty Equivalence in Dynamic Planning, *Econometrica*, 25, pp. 346-49.

Tinbergen, J. (1952), *On the Theory of Economic Policy*, Amsterdam: North-Holland.

Tobin, J. (1969), A General equilibrium Approach to Monetary Theory, *Journal of Money, Credit and Banking*, 1, pp. 15-29.

Vestin, D. (2006), Price Level Targeting vs Inflation Targeting in a Forward-Looking Model, *Journal of Monetary Economics*, forthcoming.

Walsh, C. (1995), Optimal Contracts for Central Bankers, *American Economic Review*, 85, 1, pp. 150-67.

Walsh, C. (1998), *Monetary Theory and Policy*, Cambridge, MIT Press.

Wicksell, K. (1935), *Lectures on Political Economy: volume two – Money*, London: Routledge & Keegan Paul.

Woodford, M. (2003), *Interest & Prices: Foundations of a Theory of Monetary Policy*, Princeton: Princeton University Press.

PANEL DISCUSSION:
ECB MONETARY POLICY: THE FIRST SEVEN YEARS

LESZEK BALCEROWICZ[1]

Ladies and gentlemen, I was planning to read, well actually re-read the vast literature on the monetary policy of the ECB, but I was a bit distracted by some constitutional developments in Poland. However, I think, there is a certain merit to this. First, because it focuses attention on what is really relevant and second, it is a great coincidence that today's hero, Otmar Issing, shows that to be an excellent monetary economist it is not enough to be only a monetary economist. He is the perfect example of a person who combines technical expertise with wisdom (these two traits do not always go together) and with insight into constitutional theory. This is reflected, I think, in at least three things: 1) his approach to uncertainty of a Knightian type 2) his long-term view that is appropriate for the independent central bank, and 3) in the importance he puts on 'Ordnungspolitik' or – in other words – the institutional framework.

In the debate on the ECB these three issues are sometimes confused: the whole euro project including the Stability & Growth Pact, the ECB's strategy, the ECB's actual policies as conducted during the last seven years and especially since 2001. I will try to be a disciplined central banker, and I will only make a few points. On the third issue, there is no need to repeat the list of genuinely great accomplishments of the ECB with respect to its main goal. I can only agree – and here I come to the issue of the whole euro project – that if there were any threats to the future stability of the euro, they would come from outside the monetary sphere and in particular from the fiscal sphere which is always related to politics. I have in mind the issues of fiscal dominance, etc.; we know that there are strong incentives to meet fiscal criteria before a country enters the eurozone, yet much weaker ones after its entry. This appears to be the main issue and I don't have any miraculous formula on how to solve it. One remark I would like to make is that to strengthen fiscal frameworks in respective countries is important regardless of the euro, but it also gains in importance because of the euro. This is important as one of the pre-conditions for long-term economic growth and I have in mind not only fiscal imbalances but also an overextended fiscal position of the state. Most of the European countries including some of the new Member States have such a fiscal burden that I don't think they can grow fast in the longer run. Furthermore, I believe that some macroeconomists' objections to the alleged deficit of accountability of the ECB as derived from what some perceive to be democratic theory is a bit naive, because they have in mind, I think, a rather naive concept of democracy implicitly derived from Athens. However, there are some modern developments in constitutional theory that macroeconomists who speak on constitutional issues should consider. Also constitutional theory should perhaps address the issue of a constitutional nature regarding both goals, target independence and keeping in mind a modern concept of the division of powers

[1] Governor, Narodowy Bank Polski.

within the state which would go beyond Montesquieu and include the independence of monetary authority.

On the second issue of the ECB's Framework I would like to point out that there is a lot of confusion. First, having two pillars does not mean having two separate goals as is sometimes perceived, price stability remains the overriding goal. Second, two pillars refer to the way of arranging information in the pursuit of this overriding goal. Third, having two pillars does not imply an equal weight to two sets of information: economic and monetary. Fourth, having the two pillars does not rule out using the standard framework which includes the output gap etc. I think much more attention should be paid to the weaknesses of the standard framework because, I think, it is not very appropriate from a methodological point of view to grant great credibility to a framework whose crucial variables are subject to extreme uncertainty – and we know how uncertain the measurement of potential output and the output gap can be. Finally, having two pillars as a way of organizing information analysis has important advantages as it forces you to see the variables which are important for the longer term; after all central bankers are paid not to be short-sighted but to look more to the future. Furthermore, a longer term outlook matters for the analysis of asset prices, an issue which was discussed yesterday. This is a vast territory and I would like to make only one remark: it is not an issue of having two goals as some people would think, what is at stake is not to have two goals, price stability and financial stability. The real issue is a decision-making rule in a rather rare situation which creates a dilemma. This situation is characterized by low interest rates, low inflation and by a potential (or actual) asset price bubble. Whatever you do in such a situation is risky, or at least may be perceived as risky. If you reduce interest rates because of the fear of deflation you stimulate the growth of the asset price bubble, if you don't reduce interest rates you may perceive the risk of deflation. Let me add, however, that in my opinion, the discussed risks of deflation are exaggerated not only from today's perspective but also when they were discussed.

CHARLES GOODHART[2]

OTMAR ISSING AND THE MONETARY PILLAR

About a fortnight ago, Otmar himself sent me a (signed) copy of his joint book, based on the Stone lectures in Economics, entitled 'Imperfect Knowledge and Monetary Policy'. In this, the first of the two lectures was presented by Otmar, with the assistance of Oreste Tristani. In this lecture, once again, Otmar sets out his reasons for paying close attention to the path of the monetary aggregates.

His position on this has certainly not been without challenge or contention. Not only economics in general, but even more so macro-economics and Central Banking in particular, are subject to fashion. Monetarism, in any of its guises, has become somewhat unfashionable; and the neo-Keynesian three equation

synthesis, based on a forward-looking I/S curve, Phillips curve and reaction function, rides high. The econometric models are based on so-called micro-founded, rational expectations DSGE models. Deviate from this, and you are not a member of the In Crowd.

And yet we know far less about the working of our economies than we may like to think, especially when our priors get supported by computer assisted data-mining. In this context of fundamental uncertainty, it is necessary in Otmar's view, and I quote, to maintain "a firm reliance on the fundamental and robust results of monetary economics", which in turn requires "a clearly defined price stability objective and a strong focus on medium- and long-term outcomes, rather than the optimization of short-term trade-offs", (p. 22). That obviously gives a potentially starring role to the monetary pillar, since to quote "the long-run link between inflation and money growth is a virtually undisputed result in monetary theory", (pp 68-69).

But, beyond the dictates of fashion, there is another more practical problem facing those, like me and Otmar, wishing to preserve a major informational role for the monetary aggregates. This is that it has been, in my view correctly, decided that the main function of a central bank is to set short-term interest rates; and this latter is inherently a relatively short-term decision, not only because a new decision will supersede the latest within a month, or so, but also because the attempt to peer forward into the uncertain future beyond a year, or two, is so fraught with uncertainty as to be hardly worth the effort. But in this relatively near-term context the short-run vagaries of velocity have meant that monetary developments have had comparatively much less predictive value than the so-called real forecasts. As Otmar admits (p. 69), "short-term developments of money can be subject to a number of large and persistent (velocity) shocks which blur the long-run link."

Indeed, and despite an embarrassingly large number of econometric studies which had suggested that the demand for money function of the euro would be even more stable than that of its previous constituents, (I quote), "Money growth has had a bumpy ride over the first years of EMU", (p. 69). See Figure 1, which I have taken from Manfred Neumann's EMU Monitor Outlook of November 2005. As is apparent from that chart, broad money growth began to surge in 2000/1, just at the same time as real output growth declined sharply (Figure 2). There were a whole slew of 'special factors', notably related to an enhanced desire for liquidity in the context of asset market volatility, which Otmar amongst others has recorded, and this first monetary overshoot played, as far as an outsider can tell, little, or no, role in the Governing Council's overall interest rate decisions. Even so, as Otmar reports, "these results confirm that it is difficult to extract information on future price developments from short-run movements in monetary growth", (p. 71).

Of course, Otmar goes on "to reaffirm … the existence of a trend relationship between money and prices", but quite how does one incorporate such essentially long-run considerations into what is, I would contend, a comparatively quite short-run-focussed decision process?

Figure I **Money supply**

per cent

——— EMU Monitor's reference band
······· adjusted for cash outflow
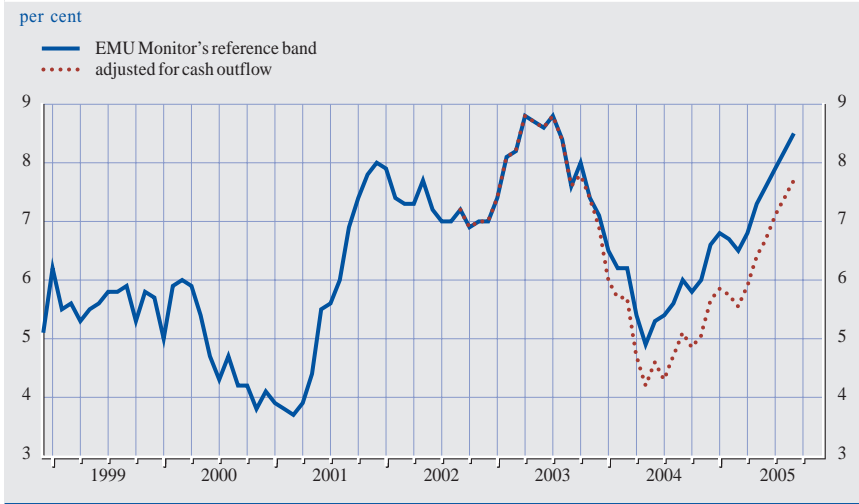
And yet, let me review more recent conjunctural developments. A few months ago most of the received wisdom in forecasting circles was that 2006 would see a period of slowing growth and declining inflation. The consumer of last resort in the USA was borrowing to do so against his housing equity, and that would slow down, as it would also in the UK, Spain, and elsewhere. China's excess supply of both saving and tradeable goods would keep the lid on prices and costs world-wide. Against that there was evidence of strongly expansionary monetary developments in the eurozone, and more widely across the world. One key feature was that, in the previous monetary upsurge in the eurozone, broad money and bank lending to the private sector had been moving in opposite directions. Now they are moving in concert, and strongly upwards, (Figure 3).

Figure 2 **Real growth rates**

per cent

——— Euro area
······· USA
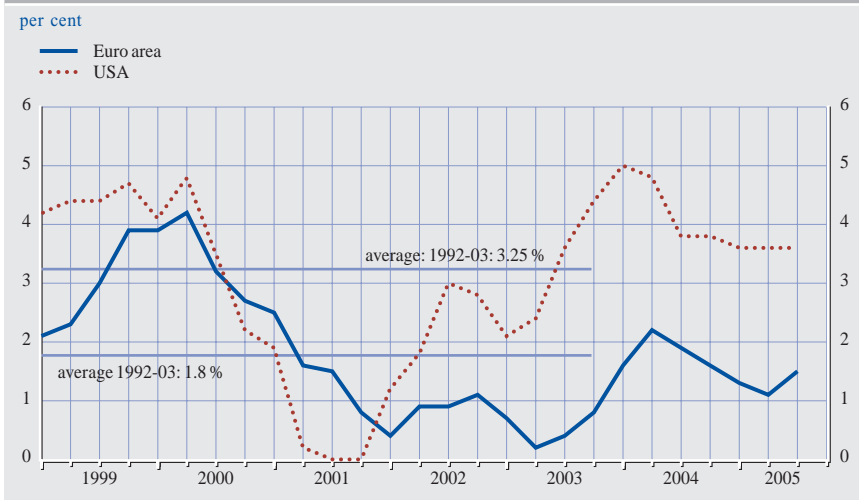
Figure 3 **M3 and bank lending in the Eurozone**

per cent

Bank credit to private borrowers
...... M3
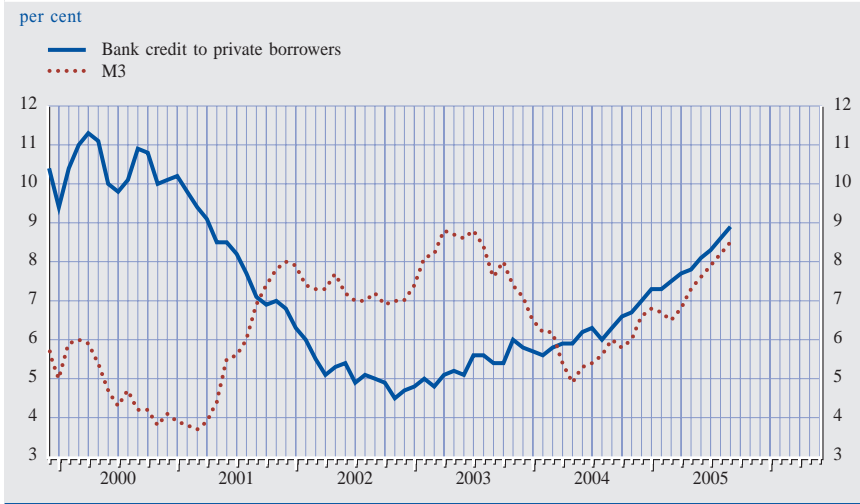
My reading of the tea-leaves is that in this latest battle between negative, so-called real factors, and the positive, expansionary effects of the monetary aggregates, the latter have been winning, on points at least, and that economic expansion in 2006, throughout most of the world, is looking stronger, as the days go by.

One conclusion that I draw is that, whereas monetary developments do have informational value, trying to interpret what that may be is often complex and requires attention to detail, notably sectoral detail. Moreover the links between purely monetary and real developments depend on frictions and imperfections on the real side. Such imperfections are, in my view, likely to be more prominent in respect to bank borrowing than to bank deposits, so my own preference would be to give relatively more weight to bank credit, and less to M3 on its own, in assessing the height of the monetary pillar.

It would, however, be deeply ironic if the timing of Otmar Issing's departure from the ECB Board was to coincide closely with a demonstration of the underlying value of the monetary pillar, but that may be just what is happening.

MALCOLM KNIGHT[3]

MONEY, CREDIT AND ASSET PRICES: (RE-)LEARNING TO READ THEIR MESSAGE

It is a great pleasure and honour for me to have been invited to participate in this Colloquium for Otmar Issing's Festschrift. Over the years, Otmar has made an indelible contribution to monetary policymaking, first at the Deutsche Bundesbank and later at the ECB. He has helped to ensure that, in the face of unprecedented challenges, this new institution has quickly gained much of the credibility and prestige that the Bundesbank had earned through its impressive track record in securing low inflation, but over a much longer period.

In making this contribution, Otmar has displayed a number of salient qualities. First, an unflagging belief in the virtues of monetary stability as an essential building block of a well-functioning society, with its benefits extending well beyond the economic sphere (e.g. Issing (2004a)). Second, a balanced blend between theory and pragmatism, combining a healthy scepticism for the latest fashion of the day with an open mind, ready to assimilate new conceptual insights (e.g. Issing (2001)). And last but not least, a "thick skin", which has allowed him to support the institution in the steadfast pursuit of its goals against sometimes heavy political and academic criticism.

In what follows, I would like to reflect on one aspect of Otmar's thinking that has deeply influenced the ECB's strategic framework and in which all of these personal qualities have been very much in evidence, viz. the role of quantitative – monetary and credit – aggregates in monetary policy. I would like to trace the trajectory of this role in the light of the evolving economic and policy environment and the waxing and waning of conceptual insights. In this evolution, I will highlight in particular the role of asset prices, in many respects a novel aspect compared with the traditional monetarist perspective that was typical of the era of the Great Inflation.

So as not to keep you guessing, let me say straight away that I broadly share Otmar's view that it is desirable to assign a salient role to quantitative monetary and credit aggregates in policy. And, as he has recently acknowledged, I believe that unusual developments in asset prices can help economists better to understand their information content. Personally, I feel that the prevailing orthodoxy, which tends to downplay the role of quantitative aggregates and asset prices, will not be sustainable in the longer run. Hard as it may be, I think it is important to find ways of firmly accommodating these economic variables in monetary policy frameworks. Indeed, I sense that a number of central banks, alongside the ECB, have been moving in this direction. This is all the more important at the current juncture, as the world is emerging from an unprecedented period of low interest rates, very rapid monetary and credit expansion, and booms in certain key asset prices, all against the backdrop of subdued inflation.

---

[3] General Manager, Bank for International Settlements.

In what follows, I shall first trace the evolving role of quantitative aggregates in Otmar's thinking and in the policy frameworks of the institutions he has worked for, stressing the new role more recently played by asset prices. I shall then provide a few personal observations on this issue, before concluding with some more forward-looking thoughts.

I   THE POLAR STAR: QUANTITIES MATTER BEYOND INTEREST RATES

A number of deeply-held convictions concerning how to achieve monetary stability have been the enduring cornerstone of Otmar Issing's thinking. These convictions have been strongly influenced by his experience at the Bundesbank and have later been at the core of the ECB's philosophy since its establishment.

First, Otmar has always stressed the importance of a sound institutional framework, characterised by a clear objective, a strong degree of operational autonomy ("independence") and, as a quid pro quo, a corresponding degree of accountability. His belief has predated theoretical formalisations of these issues in the academic literature, whose merits Otmar has always been ready to acknowledge.[4] He has seen the framework as providing the right balance between strategic discipline and tactical discretion, thereby avoiding the pitfalls of rigid operational rules. Otmar has seen this as the basis for having faith in central banks, as opposed to central bankers.[5]

Second, Otmar has always stressed the importance of pursuing price stability over the medium term. This has reflected a concern with the consequences of excessively ambitious fine tuning and with the risk of following too closely the vagaries of the markets. Above all, it has stemmed from his deep belief in the guiding maxim, emphasised by Milton Friedman: "avoid major mistakes" – a belief in turn rooted in the acute recognition of the limits of our knowledge.[6]

Finally, against the backdrop of this general philosophy, Otmar has always assigned a key role to quantitative aggregates in policymaking – a kind of "polar star" helping the traveller find his way in the journey through lands old and new. Regardless of their specific characteristics, the main function of these aggregates has been that of buttressing, operationally, the need to avoid the risk of excessive short-termism in monetary policymaking – a mechanism, if you will, to avoid succumbing to the alluring song of the sirens.

---

[4] In paying tribute to the contributions of theory in the fields of dynamic inconsistency, credibility and precommitment, Otmar says "… I regard this development as the most important contribution made by monetary theory for a long time to a sustained stability-oriented monetary policy" (Issing (2001, p 19)).

[5] "So, should we – should you – have faith in central banks? The answer is yes and no. *No*, it would not be wise always and everywhere to trust *central bankers* with our money, but, *yes*, there are good reasons for trusting *central banks*, if they are designed as solid and independent institutions with a clearly defined mandate. Institutions limit the faith we need to place on the omniscience and benevolence of individual decision-makers and provide a more lasting and reliable basis for trust and credibility" (emphasis in the original) (Issing (2002, p 34)).

[6] See, for instance, Issing (2002), where he quotes Friedman (1968).

In contrast to Ulysses, however, Otmar has, wisely, never quite gone as far as tying himself to the mast. True, the belief in a key role for quantitative aggregates has never waned. But it has never given rise to a dogmatic policy implementation and has evolved over time in the light of changing circumstances.

At the time of the Bundesbank, although inspired by the monetarist thinking of the period, the approach was essentially pragmatic, hence the term "pragmatic monetarism" to denote the Bundesbank's policy. Within a well-designed and transparent framework, the announcement of monetary targets was fundamentally aimed at providing a stable anchor for the expectations of the private sector, not least at disciplining wage formation, while minimising the risk of relying excessively on interest rates as a gauge for the stance of monetary policy. In other words, it was a way of combining discipline with discretion. Hence the considerable element of flexibility, in the form of tolerance ranges and feedback adjustment mechanisms (Issing (1997)).

At the ECB, the evolution of the role of monetary and credit aggregates has been even more marked. Not least, it has reflected the incorporation of a new element, rather peripheral in the preceding monetarist tradition, viz. the role of asset prices.[7]

In contrast to the experience at the Bundesbank, from the beginning the "monetary" pillar coexisted with the "economic" pillar. The former was primarily seen as guarding against medium-term inflation risks; the latter was regarded as a better gauge of short-term inflation risks (e.g. Issing et al (2001)). The monetary pillar seemed all the more justifiable given limited data and the equally limited experience with the transmission mechanism in the new area – although limited experience also clouded the properties of monetary aggregates.

In more recent years, the monetary analysis component of policy was gradually broadened. In particular, a new and complementary role was assigned to it, viz. that of also safeguarding against the risk of inadvertently accommodating misalignments in asset prices. Over the medium term, and coupled with excessive indebtedness, the misalignments could disrupt the macroeconomy and derail the inflation objective, possibly even in the form of undesired excessive disinflation (e.g. Issing (2004b,c), ECB (2004)).[8] Correspondingly, credit aggregates seem to have gained significance alongside the more traditional focus on monetary aggregates.

All along, Otmar's "thick skin" has stood him in good stead. In his Bundesbank days, he defended the role of monetary aggregates against those who saw them as at best unnecessary, and at worst self-defeating. Hence, for instance, his spirited defence against the implications of "Goodhart's law" (Issing (1997)). In his ECB days, Otmar displayed equal skills and determination in defending the two-pillar approach against those who criticised the uneasy coexistence of the two

---

[7] To be sure, Friedman did consider the connection between excessive monetary expansion and asset prices, most explicitly in Friedman (1988), but this always remained, at best, a peripheral element in his thinking.

[8] To see the evolution of Otmar's thinking it is useful to compare Issing (1998) and e.g. Issing (2004b).

components, with the monetary pillar seen as redundant, if not confusing and misleading.[9]

2   OWN REFLECTIONS

I broadly share Otmar's belief in the importance of retaining a salient role for quantitative aggregates in monetary policymaking. I see risks in evaluating the appropriateness of policy by simply considering the link between policy interest rates and inflation over horizons of, say, one to two years ahead. Moreover, I think that in the current environment their importance is best appreciated when their information content is considered alongside that of signs of unsustainable booms in asset prices. Let me elaborate.

I would highlight three reasons why failing to pay close attention to the message contained in quantitative aggregates is inappropriate. First, this disregards important long-standing lessons from both theory and experience. Second, there is a growing body of evidence suggesting that, properly filtered, quantitative aggregates do contain useful information for policy. Finally, current mainstream theoretical frameworks, if taken literally, are based on excessively simplistic assumptions about monetary and macroeconomic relationships. Consider each argument in turn.

First, money and credit have left a profound imprint in both the theory of monetary economics and policymaking. In the history of economic thought, even if their relative salience has varied greatly over time, they have been at the core of monetary economics. They have occupied this place alongside the more nebulous but even more fundamental notion of "liquidity" – the defining characteristic of a monetary economy. Thus, they have been seen as key causal variables in the transmission mechanism of monetary impulses. And they have typically been regarded as complementary information variables, recognising the difficulties of assessing the appropriate level of real interest rates. Importantly, they can help better to evaluate the cumulative (stock) implications of keeping interest rates away from their unobservable equilibrium levels for protracted periods.

In practical policymaking, with hindsight at least, some of the most serious mistakes have arguably been made when these key lessons were not heeded. I would include here the lead-up to the Great Depression, the lead-up and initial response to the Great Inflation, and, more recently, the lead-up to the Japanese and East Asian crises. In all of these cases, the rapid expansion of quantitative aggregates in relation to income, often in clear association with asset prices, failed to elicit a sufficiently prompt and graduated response. In the case of the Great

---

[9] For instance, Begg et al (2002) argue that "The first pillar of the monetary strategy is now flawed beyond repair – both as a matter of theory and empirically" (p xiv). Similarly, in Galí et al (2004) one can read that "With the ECB now able to walk by itself, it no longer needs the Bundesbank monetary crutch. We have carefully examined in this chapter whether there can be some special role for monitoring the growth rate of a monetary aggregate … and we did not find any" (p 33).

Depression, the mistake was greatly compounded by the overly cautious response to the monetary contraction that followed the unwinding of the imbalances.

Second, while the shift to an environment of low and stable inflation in conjunction with financial liberalisation and innovation have tended to cloud the information content of quantitative aggregates, more recent empirical research, including some carried out at the BIS, has begun to rediscover it.

Two different strands are relevant here. Beyond their differences, they share an attempt to look beyond the horizon of one to two years employed in many monetary frameworks. One strand, closer to the original monetarist tradition, has focused on the low-frequency link between money and prices (e.g. Neumann and Greiber (2004), Assenmacher-Wesche and Gerlach (2006)). A second strand, closer to the Kindleberger-Minsky tradition, has focused on the non-linear relationship between credit and asset prices, on the one hand, and output, prices and financial stress, on the other (e.g. Borio and Lowe (2002, 2004), Detken and Smets (2004)). This strand has stressed the coexistence of protracted, cumulative expansion in credit and asset prices beyond historical norms as a potentially valuable signal of the build-up of financial imbalances. It has emphasised that their subsequent unwinding can raise material costs for the macroeconomy and price stability, not least in the form of unwelcome disinflation.[10]

Despite their differences, these two strands are actually complementary. The former stresses average relationships between economic variables that normally evolve within historical ranges; the latter stresses non-linear relationships that become evident only once the variables evolve outside normal ranges.

Finally, the prevailing mainstream theoretical paradigms, enshrined in current textbooks and research, find it difficult to accommodate a significant role for quantitative aggregates over and above that played by interest rates. In particular, the simplifying assumptions on which these paradigms rely militate against an independent informational function. They typically have limited – or no – room for an active role for liquidity in the transmission mechanism. They see the economy as being quickly self-equilibrating, which can hardly allow for the cumulative build-up of financial imbalances and the corresponding distortions in real expenditures and capital accumulation. And they typically assume a degree of knowledge of the structure of the economy which permits the proper identification of the equilibrium level of interest rates. This does away with the potential cross-checking role of quantitative aggregates.

CONCLUSION

As Otmar Issing has always stressed, successful monetary policy requires a delicate balance between theory and pragmatism, nurtured by careful observation. Given the inevitable limits of our knowledge, the biggest mistakes made in the past

---

[10] In addition, for the usefulness of monitoring monetary aggregates in exceptional deflationary circumstances, see e.g. Bordo and Filardo (2005) and Christiano et al (2003).

have often arisen from hubris. They have arisen, that is, from the belief that we had finally come to understand the secret workings of the economy and had learnt to master it. This is the belief that helped to blind us to the signs of the build-up of risks contained in quantitative aggregates, not least in conjunction with frothy asset prices. All too often their behaviour was discounted as benign despite protracted deviations from historical patterns. To borrow Alan Greenspan's felicitous phrase, such one-sidedness is hardly consistent with monetary policy seen as an extension of risk management.

Despite the "Great Moderation" of the last decade in many industrial countries, certain puzzles counsel caution. One such puzzle has been the extraordinarily long period of unusually low, if not negative, inflation-adjusted interest rates. This has gone hand in hand with an equally unprecedented expansion of monetary and credit aggregates in relation to GDP and with asset price booms without igniting strong inflationary pressures.

While allegedly benign, this configuration of developments is far from comfortable. Have we, despite our past successes, unwittingly been allowing imbalances to build up that one day might come back to haunt us? Could it be that central bank anti-inflation credibility, together with the relaxation of supply constraints associated with globalisation, have been preventing the imbalances from showing up, as in the past, in goods and services inflation? And could it be that these imbalances have been emerging first in the form of unsustainable increases in asset prices, most recently in those of residential real estate around the globe?[11]

Given past experience, this possibility deserves further exploration. And as Otmar would no doubt say, understanding it necessarily calls for a better reading of the message contained in monetary and credit aggregates, to my mind properly filtered through the behaviour of asset prices.

The major achievements of the central banking community in its fight against inflation through the anomalous Great Inflation era should not be underestimated. We have learnt a lot from that historical phase. But we should not forget that the toughest challenges to policymaking can arise precisely when final success appears at hand. Just as in the late 1960s, but in a different guise, it is the interaction between policies and the broader economic environment that can result in new and unexpected challenges. Might we not be living through such a phase just now?

---

[11] On various aspects of these issues, see Borio and Lowe (2002), Borio and White (2003), BIS (2005) and White (2006).

REFERENCES

Assenmacher-Wesche, A. and Gerlach, S. (2006): "Interpreting euro area inflation at high and low frequencies", *BIS Working Papers*, no 195, February.

Bank for International Settlements (2005): *75th Annual Report*, June.

Begg, D., Canova, F., De Grauwe, P., Fatás, A. and Lane, P. R. (2002): *Surviving the slowdown: monitoring the European Central Bank 4*, Centre for Economic Policy Research.

Bordo, M. and Filardo, A. (2005): Deflation in a historical perspective, *BIS Working Papers*, no 186, November.

Borio, C. and Lowe, P. (2002): Asset prices, financial and monetary stability: exploring the nexus, *BIS Working Papers*, no 114, July.

Borio, C. and Lowe, P. (2004): Securing sustainable price stability: should credit come back from the wilderness? *BIS Working Papers*, no 157, July.

Borio, C. and White, W. (2003): Whither monetary and financial stability? The implication of evolving policy regimes, in *Monetary policy and uncertainty: adapting to a changing economy*, proceedings of Jackson Hole Symposium on 28-30 August, Federal Reserve Bank of Kansas City. Also available as *BIS Working Papers*, no 147, February 2004.

Christiano, L., Motto, R. and Rostagno, M. (2003): The Great Depression and the Friedman-Schwartz hypothesis, *Journal of Money, Credit and Banking*, 35(6), pp. 119-97.

Detken, C. and Smets, F. (2004): Asset price booms and monetary policy, *ECB Working Paper*, no 364, May.

European Central Bank (2004): Asset price bubbles and monetary policy, *ECB Monthly Bulletin*, April.

Friedman, M. (1968): The role of monetary policy, *American Economic Review*, 58, p. 12.

Friedman, M. (1988): Money and the stock market, *Journal of Political Economy*, 96(2), pp. 221-45.

Galí, J., Gerlach, S., Rotemberg, J., Uhlig, H. and Woodford, M. (2004); *The monetary policy strategy of the ECB reconsidered*: *monitoring the European Central Bank 5*. Centre for Economic Policy Research.

Issing, O. (1997): Monetary targeting in Germany: the stability of monetary policy and of the monetary system, *Journal of Monetary Economics*, 39, pp. 67-79.

Issing, O. (1998): panel remarks, *Asset prices and monetary policy: four views*, BIS/CEPR, pp. 20-22.

Issing, O. (2001): Monetary theory as a basis for monetary policy: reflections of a central banker, *Monetary theory and policy experience*, Axel Leijonhufvud (ed), University of Trento, Palgrave, pp. 13-35.

Issing, O. (2002): Should we have faith in central banks?, The Institute of International Affairs, London.

Issing, O. (2004a): On the primacy of price stability, European Central Bank, *Speeches & Interviews*, 10 June.

Issing, O. (2004b): Financial integration, asset prices and monetary policy, European Central Bank, *Speeches & Interviews*, 10 May.

Issing, O. (2004c): The ECB and the euro – the first five years, Mais lecture, European Central Bank, *Speeches and Interviews*, 12 May.

Issing, O., Gaspar, V., Angeloni, I. and Tristani, O. (2001): *Monetary policy in the euro area: strategy and decision-making in the European Central Bank*, European Central Bank.

Neumann, M. J. M. and Greiber, C. (2004): Inflation and core money growth in the euro area, *Discussion Paper*, no 36, Economic Research Centre of the Deutsche Bundesbank.

White, W. (2006): Is price stability enough?, *BIS Working Papers*, no 205, April.

WILLIAM McDONOUGH[12]

Good morning everyone. You may notice I am wearing a green tie this morning. I am a citizen of two countries: USA and Ireland, and this is St Patrick's Day. I am also going to do something different and that is I am going to talk about Otmar Issing at the end of my remarks, rather than at the beginning.

In 1995 at a G10 meeting in Basel, at a time when I was getting rather perplexed and concerned about the current account deficit of my favourite country, the USA, hovering around 3% of GDP, I made the remark that it would be very important for world stability if there would be a common central bank and a common currency in Europe. It would not only be very good for Europe, but it would also be very good for providing a bit of discipline to the USA. The subject of this panel is supposed to be: ECB monetary policy in the first seven years, and so since I was such a strong believer in the creation of the ECB, how do I see the performance of the ECB in the first seven years? In my opinion there is one word which describes it: excellent.

The thing that I particularly like about performance of the ECB in the first seven years is the constant refrain at every press conference given by Wim Duisenberg, by Jean Claude Trichet, by Otmar Issing in many speeches, that structural reform is required in the European economies and monetary policy is no substitute for structural reform. Rather, by insisting on price stability it actually makes it easier for structural reform, but also more necessary. So your central banker is benevolent, but rather demanding at the same time.

I'm going to make a bit of a lyric leap to thinking of 'where do we need structural reform in the broader world economy now'? I suggest that it is most evident if we look at world capital flows.

Last year the USA had a deficit on current account of over 800 billion dollars or six and a half percent of gross domestic product. These massive requirements of capital in the US are being supplied from many places, but particularly from: the oil producers; Japan; China; and from China's neighbours (who also have rather nice current account surpluses at the moment) and from The Federal Republic of Germany, as the Germany economy has adjusted rather well to be able to manufacture in a highly competitive world economy highly sophisticated manufactured goods.

Why is it working? How can we have a six and a half percent current account deficit in the US and most of us would still say it worked fine last year, it will probably work fine this year, and it sure looks good at the moment. Can this go on?

The reason I think it is taking place is that the US is a wonderful consumer of last resort for other people's exports. In a world in which there is a search of a lot of savings for really interesting investments, the USA is a particularly attractive

---

[12] Former President of the Federal Reserve Bank of New York.

place in which to put your money. Why? It's a geopolitical power; it has a strong economy; and it has extraordinarily good monetary policy (thank you to Don Kohn for continuing that after my departure in 2003). The USA also has an excellent rule of law and at the moment higher interest rates than most of the other possibilities. It's a very attractive place to put your savings.

Is this likely to last? As I mentioned a moment ago, I think the prospects are, for the next several years, probably yes. It's in everybody's interests, or appears to be in everybody's interests, to have this go on. There is also another question: Is it desirable?

As an American citizen, I say for my country that the answer to that is: no. We have the need to import other people's savings of 6 and a half percent of GDP, maybe higher this year, because we have a very serious structural problem in our economy of a lack of savings. Let's look at the public sector more broadly, not just the current annual deficit.

Each year the controller general of the USA puts out a report on the state of the American economy. He looks at our government health care system, Medicare, and he comes to the conclusion that on an actuarial basis it is completely incapable of delivering on the obligations under present law and policy. He comes to the same conclusion about our Government old age programme, the social security programme.

In the private sector the problem is if anything more severe, because in a globalised economy even the finest American companies in traditional business lines are not capable of carrying the cost burdens of their obligations for health benefits and pensions to past and present employees. This is one of the reasons why we've had such a shake out in industries such as steel, such as airlines and at the present time the concerns in credit markets about several automobile companies.

Is it likely that the American people will balance this problem? Not very likely because the American household savings rate is approximately zero, after having taken advantage in recent years of the ability to re-mortgage their homes in order to pull savings out of the equity value in the homes. The only place where we have a strong savings performance is in private sector companies where the cash positions are very strong indeed. I believe that American history would tell you that when we have a serious problem, we are usually a little late in figuring out how to solve it, but when we do, we do it very well.

I think that there will be a move, that is not yet noticeable, towards looking at this whole government fiscal area in a way that will demand a good deal of political courage. I think it could well be a major issue in the 2008 presidential election, as to which candidate will offer a more sensible or at least a more attractive 'to the people' solution. In the meantime, and one of the reasons that will make it politically possible for politicians to come to a proposal, the American people are starting to run scared. If you had thought that your old age was in good shape because of a pension and healthcare system, but now you know that it may just

not be there, the likelihood is first that you get angry, and secondly you figure you'd better do something about it, like saving more.

It's beginning to show up in financial markets because individuals are having ever greater demand for very long time products offered by insurance companies and other financial services firms. They have to balance that obligation, that liability, in their future balance sheet by increasing the duration of their assets, and that has created a very significant part of the demand for 30 year and even longer maturities.

I am confident that over time the United States will improve its performance on its savings. That could of course imply, if we have higher domestic savings, that you would have a weak economy or even a recession. It need not demand that, however, if we can have enough adjustment going on in the rest of the world economy that domestic demand can be replaced by a greater level of exports. In the sake of time and simplicity let me look at the rest of the world and use China as an example.

The rest of the world's net exporters of savings, have to adjust, if the big importer of the US is going to have a lesser demand. What's going to happen? I think if we assume that the world economy behaves reasonably well, we have to assume energy prices will stay high, at 50/60 dollars per barrel.

That would mean that oil exporters as a group will be significant net exporters of capital for a very long period of time. I think that has to be handled and will be handled by financial markets. But there's a different issue with the countries that are very big net exporters of savings, so let's use China as an example. Their net reserves this year are very likely to reach one trillion dollars, and this is in a country in which Wen Jiabao, their premier, a week ago Sunday noted there are 800 million people living in the rural economy who have not benefited much at all from the great growth of China, and there are 400 million Chinese living below the poverty line. So it would appear that it doesn't make a whole lot of sense for a country with a lot of poor people to have an economic model which pushes exports like there's no tomorrow, and builds up these massive international reserves.

Will China Change? I have a view of politics which is a very simple one: Governments govern with the consent of the governed.

In a democratic system, if the people don't like it, they throw out the party in power and bring in the opposition. In a single party system they have open manifestations of unhappiness and at the recent people's party congress in China the leadership evidenced extraordinary concern about that issue. So I believe that China and its neighbours will change their economic policy to one involving much more demand for the local economy and therefore their need to export savings will become less. All of this will take a very long period of time and perhaps the grace of God on top of it. What do central bankers do in the meantime?

I think central bankers do two things. First of all they stick to their guns on price stability and reminding the political leaders that reform of the basic economy is

what is needed and it cannot be substituted by monetary policy, which could only make things worse if we had another inflationary bout. There is the issue of what kind of leadership these central bankers should give, and I think that varies a bit from country to country. I admire the outspoken quality of the ECB leadership and I admire the fact that many ECB governors in their respective countries are quite outspoken on the need for structural reform.

There is a balancing act, however, in a democracy. Globalisation is very tough on individuals. Globalisation benefits everybody, but if you lose your job because the factory in your town is closed or the call centre has been exported to Bangalore, the pain that you have is very real and the pain that the politicians feel for you and therefore represent is very real. We have to be careful as central bankers, I think, not to get too involved in prescribing exactly the painful adjustments that are necessary.

If we do, the politicians can say if you can decide to run everything else, maybe we should run monetary policy. I think there has to be that balancing act.

In this very interesting demanding period for central bankers, I refer you to two wonderful great people. One was born 450 years ago, and is Otmar Issing's and my favourite composer: Wolfgang Amadeus Mozart. In the remote chance that there is somebody in this room who isn't a music lover, I once asked the great Hungarian conductor Georg Solti, to tell me about the world's great composers. He said it's very simple, they fall into two schools: Mozart and everybody else.

I have always found it very useful to put on a Mozart piano concerto as a central banker or anything else I've ever done and have that in the background when I think. But then there's the question of while you have that wonderful brilliance in the background as you're thinking, who should guide you in what to do as a central banker? I think that's easy: Otmar Issing. Mozart and Issing, that's your answer. Thank you very much.

AXEL A. WEBER[13]

THE ROLE OF MONEY IN THE MONETARY POLICY OF THE EUROSYSTEM

The title of this colloquium "Monetary policy: A journey from theory to practice" is the perfect choice to describe Otmar's academic and personal life.

I met Otmar first in 1988, just having completed my PhD. My first impression of him was: mild mannered, modest and with inquisitive mind. He has not changed since then. This, of course, is just evidence of another defining element of his character: consistency.

He has been a highly respected academic, one of the "five wise men" advising the German government, and became chief economist of the Bundesbank in 1990. In this function he has been the mastermind behind the pragmatic (not orthodox) monetary targeting of the German central bank.

As an academic he turned into a policymaker and shortly after he took office as a policymaker he turned into an explorer. Germany's unification meant his first experience with the terra incognita of a newly founded monetary union.

Becoming ECB chief economist in 1998 he was once again confronted with the unchartered territory of a new currency area. With his methodological approach and hard working attitude he systematically filled the map and leaves us with a pretty good understanding of the economic working mechanisms of the euro area. On numerous occasions I had the privilege to get to know his explorative and stimulating approach – as a colleague in the Governing Council and before that as director of the CFS in Frankfurt in organising the first rounds of ECB Watcher conferences and the first transatlantic conference on uncertainty and monetary policy.

How did he do it? One key answer is: Challenge! Otmar needs challenges, complacency is no characteristic of him. His magnetic needle, his northern star is monetary analysis. He has strong convictions and always exposed them to the rigor of data. In that he has been wise enough to focus in detail on the unchartered landscape around him.

And in systematically exploring the landscape he asked questions. As he wanted to convince, he needed to understand. In his dinner speech yesterday Martin Wolf asked why he, not being a central banker or monetary expert, was chosen to speak on this occasion. The reason is as simple as that: Otmar always enjoyed exchanging views with intelligent sceptics. Critics are as important to him as supporters.

On one specific occasion, however, his approach of "analyse-understand-explain" seems to have not been crowned with success: He could not convince both his wife and his mother not to doubt the benign official price statistics after the

---

[13] President of the Deutsche Bundesbank

introduction of euro notes and coins. Both seem to have inherited a certain degree of Otmar's scepticism in blindly trusting established statistics.

But these instances of failure are the exception. Thus, as President of the Deutsche Bundesbank I would like to take this unique opportunity to pay my tribute to Otmar – both in a personal capacity and on behalf of the institution. It is a great pleasure for me to participate in this colloquium to honour the work of Otmar.

My brief remarks will focus on the role of money in the monetary policy framework of the Eurosystem.

The role of money in the design of monetary policy in the euro area has been one of the more criticised aspects in our monetary policy strategy.

From a theoretical point of view, the New-Keynesian approach, which forms the current paradigm in monetary economics, by and large doubts the relevance of money to monetary policy making in an environment in which central banks predominantly use a short-term interest rate to achieve their goals.

In addition, though from a theoretical less radical point of view, market participants often criticise that the contribution of the monetary analysis to the decision-making process of the Governing Council is not as obvious as it should be.

I will argue in my following remarks that both criticisms are unjustified in view of the challenging task of conducting monetary policy in real time in an uncertain environment.

First of all, there is a general consensus that "inflation is a monetary phenomenon" – as Milton Friedman put it; a central bank that aims at price stability therefore simply cannot afford to completely discard monetary indicators; and what I learn from more recent deliberations of central banks that traditionally have a more critical attitude towards the use of monetary indicators – such as e.g. the Bank of England – confirms my assessment.

However, how exactly monetary analysis is implemented and how it is used for monetary policy decisions depends crucially on the empirical relationship between monetary aggregates, inflation and other macroeconomic variables of interest.

The question can be put in simple terms: How monetarist should one be? And my simple and agnostic answer is: as monetarist as the empirical evidence supports.

There is a well-established long-run relationship between money growth and inflation in the euro area: monetary aggregates in the euro area prove to have explanatory power for longer-term inflationary developments. This is documented, not least, by current research carried out in the Bundesbank.

As long as these relationships hold, there are convincing empirical reasons for paying close attention to monetary developments in the policy making process.

Beyond this issue, there are further conceptual reasons why money should matter: It offers a suitable longer term perspective for internal decision-making and external communication, and thus enhances credibility. Of course, this latter point is of general importance for central banks but it has been especially important for the Eurosystem and its monetary policy at the beginning of the third stage of EMU. In 1999 the Eurosystem did not possess its own established track record. Thus, a strategy making use of the empirically established long-term relationship between money growth and inflation was especially important to gain and secure credibility right from the outset of EMU.

And all this is irrespective of questions as to whether there is an active role for money to play in the transmission mechanism, i.e. whether money is exogenous or endogenous.

This brings me back to the more academic criticism that stems from the New-Keynesian school of thought. Despite all the undoubted merits of such an approach – sound theoretical principles, microfoundations, general equilibrium character – it also has its shortcomings.

Firstly, the transmission mechanism is specified too leanly and mechanistically.

For example, one prominent channel for the role of money in this class of models is a real-balance effect – something that is empirically difficult to verify and arguably too simplistic in the present-day world of financial markets.

Some years ago, in the controversy between monetarists and Keynesians Allan Meltzer argued that: "The difference between the Keynesians and us is less in the nature of the process than in the range of assets considered". Applied to the current environment, those words have not lost much relevance.

Furthermore, the New-Keynesian approach is a natural extension of the real business cycle framework to a world with nominal rigidities. As such, it focuses on short-term deviations of the relevant variables from trend. The empirical evidence for the correlation between money and inflation, however, is of a low-frequency nature. In other words, it is more relevant to the trend behaviour of inflation.

In a nutshell, given the empirical evidence, it seems that the New-Keynesian framework is missing something important in the working-mechanisms of the economy and the inflation generating processes that govern it. Something that is – at least – empirically captured by the information content of monetary aggregates.

Moreover, the merits of analysing monetary developments in a broad framework encompassing credit dynamics allows to extract valuable information with regard to possible financial market tensions caused by the build-up of asset price bubbles.

In the light of these considerations it is not so much a question of whether monetary policy in the Eurosystem should pay close attention to monetary

aggregates. The more relevant issue is how this should best be done, that is, how monetary aggregates should feature in the monetary policy design.

Here, the challenging task for monetary analysis is how to separate in real time the noise in the short-run development of monetary aggregates from the part of monetary dynamics that signals risks to future price stability.

Monetary analysis, properly understood and implemented, can not be a mechanical forecasting exercise. It has to take into account the possibilities of money demand shocks injecting noise into the liquidity-inflation nexus or possible structural shifts in money demand relations.

Up-to-date monetary analysis should be a broadly-based approach and an ongoing intellectual endeavour. And this is precisely how monetary analysis has developed over the past few years in the Eurosystem. In an environment of high financial uncertainty it has identified large liquidity shocks which led to significant portfolio shifts in liquid and secure bank deposits. And it has derived a toolbox of liquidity measures signalling possible excess liquidity.

Applying this toolbox has allowed to separate liquidity developments rooted predominantly in financial uncertainties from developments signalling more imminent inflation risks. For example the actual strong increase in the money stock M3 which is accompanied by very low level of interest rates and a strong rise in loans to the private sector.

All in all, an elaborate analysis of monetary aggregates as well as their components and counterparts is a useful tool for monetary policymakers. It has clearly the potential to enhance the robustness of our judgments about future economic developments. In the past few years, academic research has emphasised the advantages of robust analytical tools for appropriate policy responses in an environment of prevailing uncertainty – something that has always been known by practitioners of central banking.

However, besides this longer-term nature of the relationship between monetary developments and inflation, there is the need to take into account also other and more short-term risks to price stability. This is the core of the economic analysis in the strategy of the Eurosystem.

Given the different time horizons of the economic and monetary analysis I think that the demands that are sometimes brought-up in the public debate to merge the two pillars are not convincing. Moreover, there is no existing model that would allow to integrate the multitude of economic information that is relevant for monetary policy in one coherent theoretical structure. This is especially relevant for the integration of monetary aggregates into traditional macroeconomic and macroeconometric models. Insofar, proposals to merge the two pillars are ill-founded. The ultimate goal of the two-pillar structure is the efficient utilisation of available information for monetary policy decisions and communication. However, one possible approach with regard to the information gained through the lens of the economic and monetary analysis might be found in a stronger formalised combined assessment of the information included in both pillars for

future inflation developments. This is in a sense what the cross-checking is all about. Of course, the merits of a more formalised forecasting combination would have to be weighted against any possible loss of information that might be associated with it.

This brings me to another criticism that is sometimes voiced, namely that monetary developments are not regarded as being informative about the Eurosystem's monetary policy decisions. In my view, this criticism is unjustified:

Firstly, the very nature of the information content of the monetary analysis has to take into account its role as a cross-checking device and its focus on longer-term risks to price stability.

Secondly, in an environment of heightened financial market uncertainty actual monetary dynamics may to a large part be driven by noise which does not necessitate a monetary policy reaction. The portfolio-shift adjustment of money growth in the post 2001 period can be seen as an example.

By the way: The role of money in our policy decisions has been analysed in recent empirical research; on that issue we found a kind of non-linear relationship between monetary developments and policy reaction. Such threshold effects in my view deserve further empirical investigation.

Let me conclude by saying that the experience of the first seven years of EMU has shown:
• that the monetary analysis plays an important role in our policy strategy and our policy decisions
• that the monetary analysis is a challenging and evolving exercise given today's financial market dynamics
• but that, even in such an environment, money has an empirically justified informative role.

SESSION 3

THE CONTRIBUTION OF THEORY TO PRACTICE IN MONETARY POLICY: RECENT DEVELOPMENTS

CARL E. WALSH[1]

… monetary policy, just like other fields of human activity, always involves (in part) a mismatch between accumulated learning and the need to take specific policy actions. (Issing 2001)

I INTRODUCTION

Monetary theory and the practice of monetary policy have long informed one another – this two way interaction is in perhaps its healthiest state in the last forty years. It is an interaction that has greatly interested Otmar Issing (e.g., Issing 2001) and one to which he has been an insightful contributor. In this paper, I focus on recent additions to accumulated learning, in Issing's words, that have provided insights to those who are faced with the need to take specific policy actions. Today's productive exchanges between academic and policy economists derive in large part from the use of a common class of models. New insights from these models are shaping policy discussions and practices. In contrast to the models used by academic economists in the 1970s and 1980s, with their underlying skepticism about the ability of systematic policy to have beneficial real economic effects, a major task in monetary theory today is that of contributing to the design and analysis of systematic rules to reduce the costs of inflation and business cycle fluctuations.

The work on policy rules and systematic policy behavior represents a sweeping change from the vision for monetary economics set out by Lucas and Sargent in 1978. They made the point, now universally accepted, that "… [equilibrium methods] will focus attention on the need to think of policy as the choice of stable rules of the game, well understood by economic agents. Only in such a setting will economic theory help predict the actions agents will choose to take. (Lucas and Sargent (1981, p. 317)). But they then drew the conclusion that

… the government countercyclical policy must itself be unforeseeable by private agents … while at the same time be systematically related to the state of the economy. Effectiveness, then, rests on the inability of private agents to recognize systematic patterns in monetary and fiscal policy. (Lucas and Sargent 1978)

If policy effectiveness rests on the "inability of private agents to recognize systematic patterns," there is little reason for economists to investigate optimal systematic policies. Contrast this with the recent view expressed by Woodford:

… the central bank's stabilization goals can be most effectively achieved only to the extent that the central bank not only acts appropriately, but is also understood by the private sector to predictably act in a certain way. The ability to successfully steer private-sector expectations is favored by a decision procedure that is based on a rule, since in this case the systematic character of the central bank's actions can be most easily made apparent to the public. (Woodford 2003)

While Woodford also emphasized rules, he stresses that it is the ability of private agents to discern systematic policy actions that contributes to the effectiveness of monetary policy. Thus, to be effective, policy must be systematic, predictable, and transparent, not, as Lucas and Sargent argued, unforseeable. This recognition has breathed new life into the study of systematic policy rules and explains why the research interests of academic and central bank economists have converged. Monetary theory has again become relevant for monetary policy.[2] The evolution of theory from the perspective offered by Lucas and Sargent to the one provided by Woodford is central to understanding why theory has, over the past fifteen years, had a much greater impact on practice than previously.

I will focus on four areas in which recent advances in monetary theory have relevance for the practice of monetary policy: understanding the monetary transmission mechanism, designing policy rules, dealing with uncertainty, and assessing the welfare gains from optimal policy. I begin, however, with brief comments on the use of dynamic stochastic general equilibrium (DSGE) models that integrate optimizing behavior with nominal rigidities.

2   THE DSGE APPROACH

Twenty years ago, the canonical academic paper in monetary economics employed a simple, linear rational expectations model to analyze monetary policy issues. Key components of the model were likely to be a Lucas supply function relating the output gap, deviations of output from potential, to surprise inflation and some variant of an IS-LM model to link the money supply, treated as the instrument of policy, to aggregate demand. Exogenous stochastic shocks were typically appended to both the supply and the demand relationships. These models made no pretense at empirical veracity, and they were far removed from the models used in central banks for providing actual policy advice. Policy makers viewed these models as unhelpful and academics viewed central bank models as crippled by the Lucas critique.

---

[2] Of course, earlier models employed by central banks also implied that systematic policy mattered. These models, though, "started from curves" and the equilibrium conditions of the models were not derived from the underlying decision rules of households and firms. Thus, the models were open to the Lucas critique, reducing their attractiveness as frameworks for conducting policy experiments. In contrast, the modern approach leads to models in which equilibrium conditions are based on well-specified decision problems faced by the households, firms, and even policy makers. The form these decision problems take depends on the environment the model builder specifies, but the objective is to develop models immune to the Lucas critique, able to match importance characteristics of macro data, and within which one can conduct policy experiments.

The contrast with today's canonical paper in monetary economics is striking. A modern paper would be based on a dynamic, stochastic general equilibrium (DSGE) model in which optimizing agents – households and firms – interact in an environment characterized by nominal rigidities. These models provide laboratories in which one can address normative issues of optimal policy design. As a consequence, an explosion in policy-relevant research has taken place, one in which both academic economists and central bank research economists are active participants. To take just two recent examples of this interplay, the Reserve Bank of New Zealand sponsored a workshop on "Dynamic Stochastic General Equilibrium (DSGE) models" in August 2005 and the Federal Reserve held a Conference on "DSGE Modeling at Policy Making Institutions: Progress and Prospects" in December 2005. Both these events involved academics and central bank economists, reflecting the prevalence of DSGE modeling approaches inside and outside of central banks.[3] Clarida, Galí, and Gertler (1999) pointed to the development of DSGE models with nominal rigidities as one of the two factors leading to the revival of interest in the study of monetary policy design. New empirical evidence suggesting the importance of monetary factors in accounting for cyclical fluctuations was the other factor they cited. I would add a third; the treatment of the interest rate rather than the quantity of money as the instrument of policy, a shift that made monetary theory much more relevant from the perspective of policy makers. ´

The current generation of DSGE models have contributed to policy in several important ways (see Galí 2001). First, they offer new insights into the transmission process of monetary policy. Second, they force model builders to think more carefully about the underlying sources of economic disturbances, and this has led to a better appreciation that the simple dichotomy between demand shocks and supply shocks is not helpful for policy analysis. Instead, one must understand the nature of the disturbances and whether they lead to inefficient fluctuations. Third, these models provide model-consistent measures of the output gap relevant for policy. Fourth, these models provide grounds for welfare-based policy, giving new insights into the costs of inflation and the appropriate objectives of stabilization policy.

The DSGE modeling approach is now wide spread among central bank researchers, and several central bank's have adopted DSGE models for use in policy analysis, affecting directly the practice of monetary policy. Parameters in these models are not arbitrary but characterize the economic environment faced by private sector decision makers. Economic theory can often, though not always, provide guidance as to the values of these parameters. This allows the models to be calibrated, a feature that can be particularly important in situations in which major structural changes have occurred that limit the informativeness of macro time series for estimating policy models.[4] However, these models are reaching the stage where they are being taken to the data and are able to match quarterly

---

[3] The common approaches taken by academic economists and central bank economists is a point emphasized by McCallum (1999).

[4] For example, some aspects of the Forecasting and Policy System (FPS) model of the Reserve Bank of New Zealand are calibrated rather than estimated.

business cycle data in ways that increase our confidence that they can serve to generate the type of short-run projections that are central to the monetary policy decision process. Central bank economists have been among the leaders in developing and estimating DSGE models (e.g., Smets and Wouter 2003).

3   FORWARD-LOOKING EXPECTATIONS AND THE MONETARY TRANSMISSION MECHANISM

Some of the most important insights from recent research have been into the role forward-looking expectations play in affecting the monetary transmission process and the implications this has for both policy design and central bank communications.

At least since the 1950s and the work of Friedman and Modigliani and Brumberg, economists have recognized the importance of forward-looking behavior. What is new in the models currently employed for policy analysis is the role played by forward-looking expectations in the adjustment of prices and wages. Standard models in which firms set prices that may remain unchanged for some time naturally imply that firms must be forward looking, assessing not just the current economic environment but the outlook for the future as well.

It is because forward-looking expectations matter that the systematic behavior of the central bank plays a critical role in determining the real effects of monetary policy, as only the systematic part of policy will affect future expectations. This lesson is one that has clearly influenced how central banker's think about monetary policy. To quote just one, Mervyn King (2005) has stated that "Because inflation expectations matter to the behaviour of households and firms, the critical aspect of monetary policy is how decisions of the central bank influence those expectations." He even goes so far as to quote Michael Woodford that "very little else matters."

There are many ways in which a consideration of forward-looking expectations is vital for understanding key elements of policy design, but let me highlight two: the gains from commitment and the role of transparency.

3.1   COMMITMENT

As Lucas and Sargent emphasized, one must think of policy in terms of stable rules, but central banks must not only follow rules, they must be seen to be doing so. That is, the ability of a central bank to commit to a rule is critical. Recent developments in monetary theory have provided new insights into the gains from credibility and policy commitment.[5]

Analysis of time inconsistency and the gains from commitment in the 1980s and 1990s focused on understanding the average inflation bias that might arise under

---

[5] See Bernanke (2004) for a discussion of what economists have learned about credibility since the Volcker disinflation.

discretion. In that framework, the underlying source of the inflation bias was an unrealistically ambitious policy goal for economic activity. At a zero rate of inflation, the marginal benefit of a more expansionary policy that moves real output closer to the central bank's goal exceeds the marginal cost of a little inflation. This creates an incentive for the central bank to engage in expansionary policy, and because the public understands this incentive, the public will expect inflation to be greater than zero. In equilibrium, inflation must be just high enough to make the marginal cost of further inflation exceed the marginal benefit from more expansion. If the central bank would only focus correctly on stabilizing the output gap, the inflation bias would disappear and so would the distinction between discretion and commitment.

Today, we understand better that even in the absence of an average inflation bias, there are gains from commitment. By anchoring future inflation expectations through a commitment to a low inflation target, actually, to price stability, central banks can improve the trade off they face between inflation and output gap volatility.

Inflation is influenced both by the output gap and by the public's expectations about future inflation. This means that the central bank potentially has two instruments at its disposal – the current short-term interest rate that influences real economic activity and private sector expectations of future inflation. In a discretionary environment, with the central bank unable to commit to future actions that would influence expected future inflation, only the first instrument can be used. If the central bank is able to commit to future policies, it can affect future expectations. The gain from commitment arises because, if both instruments can be used, less output gap volatility will be associated with any given level of inflation variability.

Of course, a central bank can only affect future expectations systematically if it is credible. And, just as recent theory has provided new insights into the gains from commitment, it has also illustrated the form that commitment policies take in practice. For example, when policy actions affect the economy with a lag, policy must be forward-looking; policy in such an environment is characterized as inflation-forecast targeting (Svensson 1997). But forward-looking behavior by the private sector leads optimal monetary policy to be backward looking. This introduces an inertia into policy that would be absent in a discretionary environment. Conditioning current policy on the past is a means of honoring past commitments. Private agents will believe the central bank's promises about future policies only if it has delivered on past promises.

There is a great deal of empirical evidence that central banks actually do display inertial behavior, but debate exists over how to interpret this behavior. Does it reflect attempts by central banks to honor past commitments? Or does it simply indicate sluggish behavior by central banks? Regressions of policy interest rates that included the lagged interest rate always find large and statistically significant coefficients on the lagged rate. This is often interpreted to mean that central banks engage in partial adjustment, moving the policy rate only gradually towards the desired rate. However, inertial behavior under optimal commitment is not

equivalent to partial adjustment – it is the desired rate itself that depends on past policies. Rudebusch (2005) argues that the Fed does not engage in partial adjustment behavior. Instead, the apparent inertia in the federal funds rate results from, as Rudebusch puts it, "slow accretion of information relevant to the setting of the policy interest rate by policymakers."

The causes of policy inertia are important, as they affect the predictability of future rate movements and future expectations. Predictability is enhanced when the private sector's understanding of the systematic policy of the central bank is clear, and recent theory has, therefore, investigated the role played by policy transparency.

3.2 TRANSPARENCY

If forward-looking expectations are important for the monetary transmission process, transparency about future policy is crucial in ensuring consistency between the central bank's intentions and private sector expectations. Yet despite this, few central banks are completely transparent about future policy. In recent years, the Federal Reserve has provided signals to the market about the future direction of rate changes, and the inflation reports of the Norges Bank now provide future interest rate projections along with inflation and output gap projections. But most central banks do not provide explicit interest rate projections and, until recently, several based output and inflation projections on constant interest rate paths that were clearly not meant as forecasts of future interest rates.

As Otmar Issing has noted, "Transparency is not an end in itself: a central bank is not established with the primary objective of communicating with the public" (Issing 2005a). However, transparency can improve the ability of monetary policy to achieve its goals by ensuring that private market expectations are consistent with the aims of central bank policy. In the forward-looking new Keynesian model that has seen wide-spread use for monetary policy analysis, the effectiveness of monetary policy depends on the ability of policy to affect expectations about the future path of interest rates (Woodford 2003). A transparent policy, one that reduces uncertainty about future policy actions, can improve the trade off between output and inflation objectives and increase the effectiveness of policy. This contrasts strongly with the analysis of transparency in models from the 1970s through 1990s in which policy could only be effective if it were opaque and able to surprise private agents.

Central banks increasingly recognize the importance of communication so that the public understands the systematic nature of policy. This recognition has played a large part in motivating the greater transparency with which policy is now conducted (Issing 2005a). Eijffinger and Geraats (2005) provide an index of transparency for a set of developed economies that includes some inflation targeters (Australia, Canada, New Zealand, Sweden, and the UK) as well as non-targeters (Japan, Switzerland, and the US). They find that between 1998 and 2002, transparency increased for virtually all the central banks they studied. Even the Federal Reserve, which has so far resisted calls to establish a formal inflation target, has moved to make its policy practices more transparent.

Transparency is not unambiguously desirable, however. Recent research has dropped the assumption of common information that characterizes most models and investigated the role of central bank announcements when private agents and the central bank have diverse and imperfect information.[6] With diverse information, agents must form expectations about economic developments such as inflation, but they must also assess what others are expecting. Because the central bank announcements are public information, information shared by all, private agents may overreact to it. This overreation arises because public information affects each individual's expectation about inflation as well as their expectation about what others are expecting. If a central bank announces forecasts that are subject to error, these forecast errors may introduce undesirable volatility into the economy as private agents overreact to the public nature of central bank announcements. This does capture a concern of policy makers. For example, in discussing the release of FOMC minutes, Janet Yellen expressed the view that "Financial markets could misinterpret and overreact to the minutes." (Yellen 2005). So, while conclusions from this literature are not yet firmly established, it provides a further example of how work in monetary theory is tackling directly issues that are of relevance to monetary policy makers.

4   POLICY RULES

John Taylor desires the credit for reviving academic interest in policy rules. In 1993, he demonstrated that a simple reaction function expressing the Fed's policy instrument as a function of an inflation gap and an output gap could track the actual path of the federal funds rate surprisingly well (Taylor 1993). This finding opened up new avenues of research in both theory and practice. Economists began exploring the extent to which the behavior of other central banks could be captured by simple rules, the characteristics of optimal simple rules in theoretical, calibrated, and estimated models, and the comparative performance of simple rules and optimal rules.

4.1 THE TAYLOR PRINCIPLE

When forward-looking expectations are important, multiple equilibria can often arise, so there has been interest in assessing the restrictions on policy rules that are necessary to guarantee a determinant equilibrium. In general, determinacy is ensured under interest rates rules that follow the Taylor Principle, adjusting the nominal interest rate more than one-for-one to deviations of inflation from target. The Taylor Principle is the means through which modern central banks provide a nominal anchor and ensure low and stable inflation.

Optimal policy is often described in terms of a description of "how a central bank would respond to any conceivable shock in the future ..." (King 2005). This sounds like a daunting task, but in fact, policy can be expressed, not in terms of reactions to hard to measure shocks, but as reactions to a small number of macro

---

[6] The basic theory is due to Morris and Shin (2003). For an application in a standard new Keynesian model of monetary policy, see Walsh (2005c).

variables. In fact, the analysis of policy rules that ensure determinacy has lead to a recognition that policy must respond to endogenous variables, not solely to exogenous shocks. This represents an important shift from earlier research that emphasized the role of policy in responding to exogenous shocks. Since shocks are generally unidentified, the recent research on optimal responses to endogenous variables such as inflation and output has led to findings that are much more relevant for policy makers.

4.2 LEARNING AND LEARNABILITY

While the Taylor Principle was initially viewed as a necessary requirement for determinacy, it has also been shown to play a role in determining whether a rule is learnable (Bullard and Mitra 2002). A policy rule is learnable if private agents can learn the fundamental, rational expectations equilibrium of the model under simple learning dynamics. Learnability is important; with the ability of policy makers to achieve their stabilization goals contingent on the public's understanding of the systematic aspects of policy, it is necessary that the private sector be able to learn correctly about the central bank's rule.

Of course, the central bank must also take into account the fact the private sector is learning. Gaspar, Smets, and Vestin (2005) have shown that if the private sector learns adaptively, simple policy rules can lead to explosive behavior. As they put it, central bankers must engage in 'sophisticated' policy that acknowledges the learning behavior of the private sector.

It is not just the private sector that is learning; policy makers too are learning about the economy. Optimal learning models generally imply some experimentation, a recommendation unlikely to win support among policy makers. However, Cogley, Colacito, and Sargent (2005) have shown that the gains from policy experimentation are small, and they conclude that central bankers should learn but not experiment.

4.3 INSTRUMENT RULES VERSUS TARGETING RULES

Policy rules can be expressed in many ways. For example, a Taylor rule is an instrument rule; it describes the setting of the policy instrument as a function of a small set of macro variables. In contrast, a targeting rule represents "a condition to be fulfilled by the central bank's target variables (or forecasts thereof)" (Svensson 2004). A targeting rule does not involve exogenous shocks; the condition to be maintained involves only the central bank's target variables.

Targeting rules are common among inflation-targeting central banks.[7] For example, a statement to the effect that policy will aim to ensure the x-period ahead inflation forecast equals the inflation target is an implicit statement of a targeting rule. Such a rule may or may not reflect an optimal policy.

[7] Svensson (2004) noted that a Google search on "'targeting rules' monetary" produced 1,700 results in April 2003 and 2,100 in August 2004. A similar search in January 2005 resulted in 16,800 hits.

Optimal targeting rules are first-order conditions. Thinking of policy in terms of such first order condition is natural. From the perspective of understanding how central banks behave, starting from the presumption that they have well defined objectives and set policy optimally to achieve those objectives is consistent with the approach economists normally take to studying private sector behavior.

There is at least one example of a central bank that is explicit about employing a targeting rule – the Norges Bank. In their January 2005 Inflation Report, the Norges Bank list several criteria a future interest rate path should meet. The first is basically the Taylor Principle. The second criterion requires that "… the inflation gap and the output gap should be in reasonable proportion to each other until they close. ... If both gaps are positive, for example, a path with a higher interest rate would be preferable, as it would bring inflation closer to the target and contribute to more stable output developments." This provides a description of a targeting rule. Under discretion, it corresponds to the optimal targeting rule in a simple model with a quadratic loss function in inflation and the output gap. As is well known, the first-order condition under discretion in this case implies that the output gap and the inflation gap should move in proportion to one another, and they should be of opposite sign.

There are two problems with the targeting rule criterion described by the Norges Bank. First, this rule is model specific. Alternative models of the monetary transmission mechanism or alternative formulations of policy objectives will not lead to such a simple targeting rule.

Second, this rule ignores the gains from commitment – it fails to exploit the expectational channel of policy. The optimal targeting rule under commitment relates inflation to the change in the output gap so that a positive inflation gap should not be accompanied by a rising output gap. Both inflation and the output gap could be positive, a long as the output gap is falling towards zero. The optimal targeting rule under commitment also displays inertia (Woodford 2003). The policy called for under the rule depends on past outcomes in a way that reflects the desirability of delivering on past promises.

Because targeting rules are model specific, they have not seen wide adoption. Central banks prefer simple rules, and, as the next section discusses, this preference may arise from a desire for robustness in the face of the uncertainty. However, the use of simple rules has been criticized, particularly by Svensson (2003, 2004), who highlights four problems with simple instrument rules: 1) they exclude important state variables; 2) commitment to a simple rule does not allow for any subsequent improvement in the rule as "new information about the transmission mechanism, the variability of shocks, or the source of shocks arrives"; 3) "commitment to a simple instrument rule does not provide any rules for when discretionary departures from the simple instrument rule are warranted" – as such, they are not sufficient descriptions of good monetary policy; and 4) no central bank has announced an explicit commitment to a simple rule.

All of these are serious criticisms, though simple rules also have their defenders (McCallum and Nelson 2004). As an alternative to such rules, Svensson makes

two proposals. The first, which he labels commitment to a general targeting rule, requires the central bank to announce, and commit to, a specific objective function. His second proposal is that central banks commit to a specific targeting rule, essentially an expression for the policy instrument derived from the first order condition for the central bank's optimal policy.

Unfortunately, each of these proposals is subject to many of same criticisms levied at simple rules. Committing to an objective function would require the central bank to state, explicitly, how willing it is to trade-off inflation for output gap fluctuations. But one of the key insights provided by Woodford (2003) is that how policy objectives should be balanced depends on the structure of the economy. As information about the transmission process changes, as structural change in the economy takes place, commitment to a general targeting rule would not allow the central bank to alter its preferences. In the face of structural change that affects the costs of inflation, it is likely to be easier for the central bank to alter its instrument rule than to alter its publicly announced objectives. Even when an objective function is announced, as Svensson notes "In practice, the loss function is not specified in this detail, and the central bank has some discretion over the translation of the stated objectives into a loss function." But how much discretion? And what are the rules for governing the departures? These questions are left unanswered. Finally, no central bank has announced an explicit loss function.

At this point, it seems both instrument rules and targeting rules have useful roles to play in policy analysis. But the debate over instrument and targeting rules provides another illustration of the real contribution modern monetary economics has made to issues of direct relevance for the practice of monetary policy.

5   UNCERTAINTY

I put forward an approach to monetary policy making under uncertainty that involves two main components: first, a firm reliance on the fundamental and robust results of monetary economics; second, a pragmatic attitude to policy implementation, which takes in due consideration lessons from central banking experience. (Issing 2005b)

Recently, economists have taken new looks at optimal monetary policy under uncertainty. Work by Levin and Williams (2003), Hansen and Sargent (2003), Giannoni and Woodford (2003), Svensson and Williams (2005) and many others have produce new insights and new perspectives on optimal policy in the face of uncertainty.

Giannoni and Woodford (2003) have emphasized that optimal targeting rules, because they involve only target variables, are independence of the specific stochastic behavior of economic disturbances. Optimal policy responses to inflation and output gap movements are the same regardless of whether shocks

tend to be transitory or highly persistent.[8] The Giannoni and Woodford approach, however, involves only additive uncertainty in settings in which certainty equivalence holds. This is clearly only a small subset of the forms of uncertainty policy makers face, and economist have developed methods for dealing with more general forms of uncertainty. Two of the most important sources of uncertainty are observational uncertainty and model uncertainty.

5.1 OBSERVATIONAL UNCERTAINTY

Observational uncertainty is the uncertainty faced by policy makers due to their limited ability to observe accurately the contemporaneous state of the economy. Observational uncertainty arises from data uncertainty and from the fact that quantities our theory implies should play a critical role in policy decisions are not directly measurable. The output gap illustrates both sources of this problem.

Policy decisions must be made using real-time data. The importance of real-time date for understanding, and reconstructing, the environment in which actual decisions were made is critical. Orphanides (2003) has shown, for example, how the failure to correctly assess changes in trend growth during the 1970s contributed to serious policy mistakes in the U.S. Researchers have investigated how outcomes under simple rules are affected by observational uncertainty. Simple rules that respond to output gap changes, so-called difference rules, appear to be more robust to data uncertainties than standard Taylor rules (Orphanides and Williams 2002, Walsh 2003), and the Norges Bank employes such a difference rule as one of its alternative simple rules used to construct projections.

Data uncertainty is not the only source of observational uncertainty. Equally important is the role of unobservable theoretical quantities in optimal policy design. For example, new Keynesian models imply central banks should focus on inflation and the gap between output and the flexible-price equilibrium output level, or between actual output and the welfare-maximizing output level. Neither the flexible-price nor the welfare-maximizing output levels are observable. Recently, a new generation of estimated DSGE models offer the possibility of measuring these theoretical quantities. Doing so forces model builders, and policy makers, to think carefully about the nature of economics disturbances and their implications for economic welfare.[9]

5.2 MODEL UNCERTAINTY

Several insightful new approaches to model uncertainty have been pursued by monetary economists. These approaches have emphasized the need to find policy rules that are robust to various aspects of model mis-specification.[10]

---

[8] Their result, however, is model specific. If lagged inflation appears in the inflation adjustment equation, for example, the optimal targeting rule will involve expectations of future inflation. To form forecasts of future inflation, the central bank must know the process followed by the disturbances.

[9] See Walsh (2005b).

[10] McCallum (1988) has long argued for assessing the robustness of rules across different models.

The notion that policy may be more robust if based on a systematically distorted model of the economy is a key implication of the approach to robust control explored by Hansen and Sargent (2003). The robust control approach proceeds from the assumption that the central bank has a model of the economy that is believed to be a reasonable approximation to the true model, but the policy makers also knows that this approximating model may be subject to mis-specification. Rather than viewing the set of possible mis-specifications as purely random, the policy maker assumes "nature" is an evil agent who will choose the mis-specification that makes the policy maker look as bad as possible. In such an environment, optimal policy aims to minimize the worst-case outcome that could arise. In a number of cases that have been analyzed, the worst-case model is characterized by increased persistence; the dangers of underestimating the degree of persistence in the economy appear to be greater than those of overestimating persistence.

From the perspective of policy strategies, the use of a distorted model has several problems. Basing forecasts on a model that the policy maker knows is distorted would make it more difficult to communicate the rationale behind policy actions. Robust control has been criticized on the grounds that worst-case outcomes are likely to be low probability events. As a consequence, a robust policy is, from a Bayesian perspective, too heavily influenced by such events.

An alternative approach is to seek policy rules that perform well across a range of possible models, even if the rule is not optimal for any one model. In exploring this approach, for example, Levin and Williams (2003) have shown that policy rules designed to be optimal in backward-looking models are much more robust than rules optimized for forward-looking models. Thus, somewhat paradoxically, the expectations channel is important for understanding the monetary transmission channel, but it should not be overly relied on by a central bank that desires its policies to be robust.

Seeking a rule that does well across a range of models is often done heuristically, without grounding the analysis in an explicit Bayesian assessment of the probabilities associated with the alternative models. When Bayesian approaches have been adopted, there has been a tendency to focused on specific sources of uncertainty while ignoring others. Recently, Svensson and Williams (2005) have proposed a general approach to optimal policy design under uncertainty, an approach that can simultaneously handle forms of data, coefficient, and model uncertainty. In fact, Svensson and Williams (2005, p. 11) claim that "Generally, aside from dimensional and computational limitations, it is difficult to conceive of a situation for a policymaker that cannot be approximated in this framework." However, their approach does require an assessment of the probability distribution over different models at each date t and the transition matrix that describes how these probabilities evolve over time. While these probabilities can be estimated, current theory is still far from addressing the Knightian uncertainty that concerned Issing when he concluded that " … while the academic profession has made tremendous progress in analyzing risk in well-defined stochastic economies, the 'Knightian' uncertainty that confronts central bankers and sometimes markets is of an all together different dimension." (Issing 2002)

5.3 COMMUNICATING UNCERTAINTY

In practice, central banks have always recognized the uncertainties they face. However, what has changed markedly in recent years are the ways this uncertainty is communicated to the public. Several central banks have followed the lead of the Bank of England in producing fan charts as a method for communicating the range of inflation outcomes that could occur. In practice, these fan charts reflect only the uncertainty arising from the additive and exogenous disturbance terms that appear in the forecasting model. A much more important source of uncertainty is undoubtedly model uncertainty, and theory is beginning to develop new methods that will allow central banks to incorporate forms of model uncertainty into the construction of fan charts. For example, the work of Svensson and Williams (2005) provides techniques for deriving optimal policy and forecast fan charts that can incorporate many forms of uncertainty. These fan charts both communicate the extend of uncertainty to the public and focus policy makers on distribution forecast inflation targeting in which policy is chosen so that the distribution of future inflation and output gap projections look good.

6   WELFARE AND POLICY OBJECTIVES

Recent developments in monetary theory have obtained important new insights into the costs of economic fluctuations, the benefits of stabilization policies, the conditions under which price stability is optimal, and the objectives of optimal policy. These developments are a natural consequence of the DSGE modeling approach. By specifying clearly the preferences of the economic agents in the model and the environment in which they operate, DSGE modeling has made it feasible to investigate the implications of policy for the welfare of the agents in the economy.

Lucas (2003) has argued that the welfare benefit from improved macroeconomic stabilization policies is small. As he puts it, "The potential gains from improved stabilization policies are on the order of hundredths of a percent of consumption, perhaps two orders of magnitude smaller than the potential benefits of available 'supply-side' fiscal reforms." The implication is that the energy directed towards fine-tuning stabilization policy is misdirected. Recent work in monetary theory, however, work closely associated with Mike Woodford, has demonstrated that focusing solely on consumption volatility misses important welfare costs associated with inflation. These costs are distinct from the traditional shoe-leather costs common to monetized economies with positive nominal interest rates. The recent literature has focused on the way non-zero inflation distorts the signals provided by the price system when non-synchronized price adjustment across firms leads to an inefficient dispersion of relative prices. One attractive aspect of this result is that it captures an older but not formally modeled view that inflation reduces the ability of the price system to allocate resources efficiently. Similarly, staggered wage adjustment causes inefficient relative wage dispersion when wage inflation is non-zero.

When the distortions due to relative price and wage distortions are accounted for, the potential gains from stabilization policy appear to be much larger than Lucas obtained. For example, employing an estimate DSGE model of the US with wage and price rigidities, Levin, Onatski, Williams, and Williams (2005) find that the welfare costs of business cycles are equivalent to a 2.6 percent reduction in steady-state consumption under the historical policy rule. Even under the optimal Ramsey policy, these costs are still a sizable 2 percent of steady-state consumption. Thus, theory is providing new understanding of the importance of well-designed monetary policies. Interestingly, most of these costs are the result of nominal wage rigidities, and a robust policy rule in their model is one that stabilizes nominal wages.

These new perspectives on the costs of inflation provide support from theory for the practice followed by many central banks of focusing on core inflation. Core inflation typically removes sectors with volatile prices such as food and energy from the overall price index. This leaves core inflation as a better measure of inflation in the sticky-price sectors of the economy, and these are the sectors that generate the largest welfare costs due to inflation.

The linkages between economic structure and policy objectives in modern theory have one important implication for policy makers who employ a range of models in evaluating alternative polices. Different models will imply different welfare consequences of inflation and real economic fluctuations. The importance of price stability relative to reducing real volatility will depend on the model's assumptions about the form of and rationale for nominal rigidities. In general, the common practice of employing a constant measure of welfare and evaluating it using several different economic models is internally inconsistent. Objectives will depend on the central bank's model (or models).

Central banks have been less transparency about objectives than about other aspects of policy. None have publicly revealed their loss function. This shows good judgment on the part of central bankers. We do not know enough, and our models are too simple, to take the welfare implications too literally. Despite the importance of the labor market and wage behavior for the costs of fluctuations, standard models are only now integrating the modern theory of unemployment into DSGE models with nominal and real rigidities.[11] Other work has began to investigate the extent to which the appropriate response to the distributional costs of business cycles is a social insurance program rather than macro stabilization (e.g., Costain and Reiter 2005). Current policy models also do not incorporate micro-founded financial markets that reflect the informational imperfections that help shape these markets. As theory moves away from simplistic financial structures, we will probably gain new insights into the role of money in the design of monetary policy.

By offering new understandings of the costs of fluctuations, the appropriate objectives of policy, and the potential benefits of well-conceived and designed

---

[11] For example, see Trigari (2004), Walsh (2005a), Gertler and Trigari (2006).

monetary policies, hopefully, theory will continue to be relevant for the practice of monetary policy.

7 CONCLUSIONS

The critical requirement … is an ongoing fruitful dialogue between monetary theory and monetary policy. (Issing 2001)

Today, the dialogue Issing called for is active and fruitful. Central banks employ DSGE models for policy analysis. Policy makers think in terms of rules. They recognize the value of credibility and commitment. They try to reduce uncertainty in markets by providing information about the likely future path of interest rates. All these characteristics of the modern practice of policy have been grounded in recent developments in monetary theory. And academic economists are focusing their analysis on issues that are of interest to and of practical relevance for policy makers.

I have tried to highlight a few of the topics that recent theory has investigated and that are relevant for policy makers. The role of forward-looking expectations, the importance of credibility and transparency, the design of systematic policy rules, new approaches to studying policy under uncertainty, and new insights into the welfare costs of inflation and real fluctuations are areas in which theory is relevant for practice. Some of the lessons from recent theory do qualify as, to quote Issing again, among "the fundamental and robust results of monetary economics" which can provide the foundation on which policy makers can ground their "pragmatic attitude to policy implementation."

REFERENCES

Bernanke, B. S. (2005), What Have We Learned Since October 1979?, Federal Reserve Bank of St. Louis *Review* 87(2), part 2, March/April, pp. 277-282.

Bullard, J. and Mitra, K. (2002), Learning about Monetary Policy Rules, *Journal of Monetary Economics* 49, pp. 1105-1129.

Clarida, R., Galí, J. and Gertler, M. (1999), The Science of Monetary Policy: A New Keynesian Perspective, *Journal of Economic Perspectives*, 37(4), pp. 1661-1707.

Clarida, R., Galí, J. and Gertler, M. (2000), Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory, *Quarterly Journal of Economics*, 115(1), pp. 147-180.

Cogley, T., Colacito, R. and Sargent, T. J. (2005), Benefits from U.S. Monetary Policy Experimentation in the Days of Samuelson, Solow, and Lucas.

Costain, J. S. and Reiter, M. (2005), Stabilization versus Insurance: Welfare Effects of Procyclical Taxation under Incomplete Markets, Aug.

Galí, J. (2001), New Perspectives on Monetary Policy, Inflation, and the Business Cycle, Jan.

Gaspar, V., Smets, F. and Vestin, D. (2005), Optimal Monetary Policy under Adaptive Learning, Dec.

Eijffinger, S. C. W. and Geraats, P. M. (2005), How Transparent Are Central Banks? *European Journal of Political Economy*, forthcoming.

Giannoni, M. and Woodford, M. (2003), Optimal Interest-Rate Rules: II. Applications, NBER Working Paper No. 9420.

Hansen, L. P. and Sargent, T. J. (2003), Robust Control for Forward Looking Models, *Journal of Monetary Economics*, 50(3), April, pp. 581-604.

Issing, O. (2001), Monetary Theory as a Basis for Monetary Policy: Reflections of a Central Banker, in Mon*etary Theory and Policy Experience*, Axel Leijonhufvud, ed., Palgrave.

Issing, O. (2002), Monetary Policy in a World of Uncertainty, Economic Policy Forum, Foundation Banque de France, Dec.

Issing, O. (2005a), Communication, Transparency, Accountability – Monetary Policy in the Twenty-first Century, Federal Reserve Bank of St. Louis *Review*, 87(2), Part 1, March/April, pp. 65-83.

Issing, O., Gaspar, V., Tristani, O. and Vestin, D. (2005b), *Imperfect Knowledge and Monetary Policy*, Cambridge University Press.

King, M. (2005), Monetary Policy: Practice Ahead of Theory, Mais Lecture May 17.

Levin, A., Onatski, A., Williams, J. and Williams, N. (2005), Monetary Policy under Uncertainty in Micro-Founded Macroeconometric Models, NBER Macroeconomic Annual.

Levin, A. T. and Williams, J. C. (2003), Robust Monetary Policy with Competing Reference Models, *Journal of Monetary Economics* 50, pp. 945-975.

Lucas, R. E. Jr. (2003), Macroeconomic Priorities, *American Economic Review* 93(1), Mar., pp. 1-14.

Lucas, R. E. Jr. and Sargent, T. J. (1978), After Keynesian Macroeconomics, in *After the Phillips Curve: Persistence of High Inflation and High Unemployment*, Conference Series No. 19, Federal Reserve Bank of Boston.

McCallum, B. T. (1988), Robustness Properties of a Rule for Monetary Policy, *Carnegie-Rochester Conference Series on Public Policy* 29, pp. 173-203.

McCallum, B. T. (1999), Recent Developments in Monetary Policy Analysis: The Roles of Theory and Evidence, *Journal of Economic Methodology* 6 (2), pp. 171-198.

McCallum, B. T. and Nelson, E. (2004), Targeting vs. Instrument Rules for Monetary Policy, mimeo.

Morris, S. and Song Shin, H. (2002), Social Value of Public Information, *American Economic* Review, 92(5), Dec., pp. 1521-1534.

Orphanides, A. (2003), The Quest for Prosperity without Inflation, *Journal of Monetary Economics* 50, pp. 633-663.

Orphanides, A. and Williams, J. C. (2002), Robust Monetary Policy Rules with Unknown Natural Rates, *Brookings Papers on Economic Activity*, pp. 63-145.

Reserve Bank of New Zealand (2004), The Reserve Bank's Forecasting and Policy System, Wellington, N.Z., August.

Rudebusch, G. D. (2005), Monetary Policy Inertia: Fact or Fiction? Federal Reserve Bank of San Francisco Working Paper 2005-19, July.

Smets, F. and Wouter, R. (2003), An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area, *Journal of the European Economic Association* 1(5), pp. 1123-1175.

Svensson, L. E. O. (1997), Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets, *European Economic Review*, Elsevier, vol. 41(6), pp. 1111-1146.

Svensson, L. E. O. (2003), What is Wrong with Taylor Rules? Using Judgement in Monetary Policy through Targeting Rules, *Journal of Economic Literature* 41, pp. 426-477.

Svensson, L. E. O. (2004), Targeting Rules vs. Instrument Rules for Monetary Policy, What Is Wrong with McCallum and Nelson? Princeton University.

Svensson, L. E. O. and Williams, N. (2005), Monetary Policy with Model Uncertainty: Distribution Forecast Targeting, Princeton University, Sept.

Taylor, J. B. (1993), Discretion versus Policy Rules in Practice, *Carnegie-Rochester Conferences Series on Public Policy*, 39, Dec., pp. 195-214.

Walsh, C. E. (2003), Implications of a Changing Economic Structure for the Strategy of Monetary Policy, *Monetary Policy Uncertainty: Adapting to a Changing Economy*, Federal Reserve Bank of Kansas City, Jackson Hole Symposium, pp. 297-348.

Walsh, C. E. (2005a), Labor Market Search, Sticky Prices, and Interest Rate Policies, *Review of Economic Dynamics*, 8(4), Oct., pp. 829-849.

Walsh, C. E. (2005b), Comment on Levin, Onatski, Williams, and Williams, NBER Macroeconomic Annual.

Walsh, C. E. (2005c), Transparency, Flexibility, and Inflation Targeting, paper presented at the Ninth Annual Monetary Policy Conference, Banco Central de Chile, Santiago, Chile, Oct. 19-20.

Woodford, M. (2003), *Interest and Prices*, Princeton, NJ: Princeton University Press.

Yellen, J. L. (2005), Policymaking on the FOMC: Transparency and Continuity, Federal Reserve Bank of San Francisco *Economic Letter*, No. 2005-22, Sept. 2.

PANEL DISCUSSION: CENTRAL BANKING: IS SCIENCE REPLACING ART?

OLIVIER BLANCHARD[1]

The title of our panel is "Central Banking: Is science replacing Art?" I am not quite sure what "science" and "art" mean in this context, and so let me, for purposes of discussions, offer two working definitions.

Monetary policy can pretend to be close to science if it can be conducted using simple and robust rules. The rules can be formal, or informal. They may not be perfect, but they have to be robust, i.e. to do well especially when things are bad.

Monetary policy must be closer to art if it is frequently confronted to new, poorly anticipated and poorly understood, contingencies. In that case, each of these contingencies requires fast thinking and having to make decisions, not fully based on existing research but rather on well trained intuition. In other words, it requires Otmar Issings as central bankers.

There is little doubt that the theory of monetary policy has made tremendous strides over the last twenty years. Inflation targeting, Taylor rules, are gigantic improvements over the morass of conflicting monetary targets, intermediate targets, and instruments that passed for monetary policy theory twenty years ago. In this sense, monetary policy is much closer to science than it was then.

But it is still very far from science. Indeed, I worry that we have been lulled – or we have lulled ourselves – into a sense of complacency which is not warranted. There are still many issues we do not understand, and these may come back to bite us with a vengeance in the future.

Let me develop these themes in a bit more depth.

I   STARTING POINTS

I refuse to start from the assumption that the role of monetary policy is to control and stabilize inflation. The only acceptable way to start is, I believe, to think of the goal of monetary policy, together with fiscal policy, as the maximization of welfare.

More concretely (and with a number of implicit intellectual jumps that those who have worked on relating welfare to macro variables will recognize), I see the goals of monetary and fiscal policy as not only maintaining low and stable inflation, but also as stabilizing the distance of output from first best, stabilizing

---

[1] Massachusetts Institute of Technology.

the "welfare relevant output gap". (The terminology may sound a bit academic and pretentious, but will prove useful below).

If this leads to an allocation of tasks where monetary policy can focus exclusively on inflation, so be it. But it has to be a result, not an assumption.

2   TOWARDS SCIENCE

In that light, let me focus on the two main implications of the "New Keynesian" models, the class of models used today to derive optimal monetary policy.

The first implication is what I have called elsewhere the "divine coincidence" (Blanchard and Gali 2005). The divine coincidence result states that, under plausible conditions (conditions which are satisfied in the baseline New Keynesian model), stabilizing inflation also stabilizes the distance of output from first best, the welfare-relevant output gap.

This is a really important result. It implies that central banks should indeed focus just on inflation, and can sleep well at night. If they succeed in stabilizing inflation, they will automatically generate the optimal level of activity.

Put another way, even if you did not care about inflation, but only about activity, you would still want the central bank to focus on inflation. Inflation targeting is an output-friendly rule.

The second implication is that such stabilization can be achieved through a Taylor rule, where the interest rate is adjusted in response to inflation. Again leaving aside many caveats and details, the basic condition is that the interest rate responds more than one for one to inflation.

How robust are these two rules?
• More robust than one might have thought. For example, inflation stabilization remains optimal even in the presence of "supply shocks", such as changes in the price of oil or decreases in the rate of total factor productivity growth. Output may indeed go down as a result of inflation stabilization; but if it does, it is because first-best output would have gone down as well, so the decline is fully justified.
• But not so robust that they should be followed blindly. Let me take three examples. All three are taken from my research, not because of a bloated ego, but because I have worked them out and I believe they are empirically relevant.

3   WHICH INFLATION RATE?

From the point of view of welfare, which inflation rate should be stabilized? Most central banks focus on a consumer price index, or some modification of it, and, from the point of view of consumers, this may well be the appropriate inflation index to focus on.

But, one may ask, what is the right inflation rate to focus on if the goal is to stabilize the welfare-relevant output gap? The answer, worked out by Erceg et al. (2000), is that it depends on the details of price and wage setting. If, to take one extreme, the only source of nominal rigidities is in price setting, then price inflation should be stabilized. If, to go the other extreme, the only source of nominal rigidities is in wage setting, then wage inflation should be stabilized. If, as is surely the case in practice, nominal rigidities come from both sources, then some properly weighted average of wage and price inflation should be stabilized.

Put another way, focusing on price inflation stabilization can be the right thing to do from the point of view of activity. But it could also be a very wrong thing to do, with large welfare costs, if most of the nominal inertia comes from wage setting.

How empirically relevant is this issue? In quiet times, not so much. But one does not have to go very far in time or space to find examples where it matters a lot. The table below shows the evolution of wage and price (CPI) inflation for Hungary in the late 1990s and early 2000s. The differences between the two are quite striking. The example may be extreme, but revealing. Which inflation rate we target matters for output and for welfare. And which inflation rate we should target depends very much on things we do not know much about, such as the details of the structure of price and wage setting.

Hungary. Wage and Price inflation, 1997 to 2002						
	1997	1998	1999	2000	2001	2002
Wage inflation	18.7	12.4	1.8	17.0	14.8	10.1
Price inflation	18.3	14.2	10.0	9.8	9.1	5.2

Source: OECD Economic Outlook Database

4   FISCAL DOMINANCE AND THE FAILURE OF THE TAYLOR RULE

In some cases, inflation targeting should be followed, whether fiscal policy is optimal or not. Sometimes, it should not. The issue was particularly obvious in the run-up to the elections in Brazil in 2002.

As the probability increased that the left-wing candidate, Luiz Inacio Lula da Silva, would be elected, financial and foreign exchange markets became increasingly worried that budget deficits would increase, and that the Brazilian government would eventually default on its debt. The rate of interest on Brazilian dollar-denominated debt increased sharply, and the Brazilian currency, the Real, depreciated sharply against the dollar.

In that environment, a Taylor rule would have prescribed an increase in the real interest rate in reaction to the higher inflation. But such an increase in the real interest rate would likely have been counterproductive. To the extent that it led

to higher real interest payments on the debt, it would have increased the risk of default, leading to further depreciation, further inflation, and so on.

Note the use of the conditional tense. The reason is that, as soon as Lula was elected, he credibly committed to larger primary surpluses, the crisis passed, the Real appreciated, and inflation decreased. So, we shall never know for sure what would have happened, had fiscal policy been less responsible. (My contribution (Blanchard 2005), was to write down a model and estimate the relevant parameters. I concluded that, given those estimated parameters and the debt and deficit configuration at the time, Brazil was indeed in the region where inflation targeting would have been perverse). But the general point remains: Inflation targeting, in a high debt environment and suboptimal fiscal policy may not be the right policy. Indeed, in a recent paper, Schabert and van Wijnbergen (2006) have shown that the best policy in a context such as this one, may be a passive Taylor rule, a less-than-one-for-one response of the nominal interest rate to inflation.

5   OIL PRICE SHOCKS, REAL WAGE RIGIDITIES, AND INFLATION TARGETING

Sitting in Frankfurt, and thinking about the problems of the Euro area, the first two examples may feel a bit exotic. Let me end with an example closer to home, the optimal response of monetary policy to an increase in oil prices.

As I indicated earlier, in the benchmark New Keynesian model, the optimal response of monetary policy to movements in oil prices is to fully stabilize inflation. This is a strong recommendation, and even central banks clearly do not fully follow it. Rather they aim at stabilizing inflation only over some horizon. And they are right. A highly plausible extension of the basic model yields a more balanced conclusion:

The extension recognizes the presence of "real wage rigidities". These can be formalized in different ways, but one can generally think of them as implying that it takes time for workers to accept the required adjustment in real wages implied, for example, by higher real oil prices.

In this case, strict inflation targeting (or a closely related policy, that of allowing for "first round effects" but not "second round effects") will be suboptimal. It will lead to a decrease in output much larger than is optimal; equivalently, it will lead to a potentially large increase in the welfare relevant output gap. The divine coincidence no longer holds (the precise argument is developed in Blanchard and Gali 2005)

What is the optimal policy in that context? It is to allow for some more inflation for some time. How much more and for how much time depends on the degree of real wage rigidities. The higher the higher real wage rigidities, the more inflation the central bank should tolerate.

One may argue that one should not take real wage rigidities as given, that less monetary accommodation may itself eliminate real wage rigidities: If workers understand policy will not accommodate, they may reconcile themselves faster with the required decrease in the real wage. The argument goes only so far: The evidence from the Euro area is that the tough monetary policy followed in Europe since the early 1990s has not led to dramatic reforms in labor market institutions, or in wage setting. I will be the first to admit that we have a limited understanding of real wage rigidities. I surely expected more real wage resistance in Europe in the face of the increases in the price of oil over the last year. But, in a way, my failure to predict accurately proves my point... The right monetary policy, and the way we should think and use inflation targeting depends on factors we still understand quite poorly.

6   CONCLUSIONS

Had I been more knowledgeable, I would have discussed other very relevant examples, in which the form optimal monetary policy should take remains very unclear. Let me mention some of the obvious ones, from the zero bound and the role of quantitative easing in Japan, to the relation between inflation and the output gap at low inflation – an issue central to the Euro area today –, to the way monetary policy should react to sharp movements in exchange rates coming from portfolio shifts – an issue the Fed may well be confronted with in the not too distant future.

In each of these cases, we (at least I) do not know the right answers. In each case, much work is needed before we go from art to science. Until then, maybe more humility is needed in the articulation of policy. While it is important to articulate clear policies, it is also important to indicate the limits of our knowledge. Otherwise, when faced with contingencies such as those I just discussed, we may be stuck between keeping the same policies to maintain credibility, or adopt better policies at the potential cost of losing credibility.

REFERENCES

Blanchard, O. (2005), Fiscal dominance and inflation targeting. Lessons from Brazil, in Inflation Targeting, Debt, and the Brazilian Experience, 1999 to 2003, Francesco Giavazzi, Ilan Goldfajn, and Santiago Herrera eds, MIT Press, pp. 49-84.

Blanchard, O. and Gali, J. (2005), Real wage rigidities and the New Keynesian Model, NBER WP 11806, November.

Erceg, C., Henderson, D. and Levin, A., Optimal monetary policy with staggered wage and price contracts, JME, 46-2, pp. 281-313.

Schabert, A. and van Wijnbergen, S. (2006), Debt, deficits, and destabilizing monetary policy in open economies, mimeo Amsterdam, February.

MARTIN FELDSTEIN[2]

I am delighted to be here and to be able to join with all of the others in expressing my admiration for Otmar Issing. Through the years whenever Otmar and I met, I always was impressed with the depth of his thinking and his contribution to price stability (first in Germany and then more broadly in Europe) and particularly with his contribution to practical analytic thinking about how we should understand monetary policy and how monetary policy should be guided. I am grateful, and I am sure everyone here is grateful, to the ECB for sponsoring this remarkable occasion.

As I flew here on Wednesday night from New York, I was reminded of the old story about the first fully automatic air flight between New York and Europe. After the plane had taken off and reached cruising altitude, the voice came over the loudspeaker and said "Ladies and Gentlemen, welcome to the first fully automatic flight. There is no pilot on this plane. Thanks to the wonders of modern science it is all being done automatically and you have nothing to worry about, about, about, about, …". So I was pleased as I flew here that Lufthansa had at least two pilots on board.

In the current context, the implication of that story is that monetary policy is best if it uses science to assist judgement rather than to replace it.

Before I talk about the issue of combining science with art or judgement, I want to talk about something different that has not been mentioned and that I think can be crucial for successful central banking. That is courage: the courage to stick with your beliefs, your convictions, the courage to speak about them publicly even when they are not popular, and the courage to act on them even if they will cause economic pain in the short-run if you are convinced that they are the right policies for the longer-run. I think Otmar Issing has demonstrated that kind of courage, as did Paul Volcker in the most difficult period for U.S. monetary policy during my lifetime. So as we talk about judgement and science we should not forget courage.

I think that over the last few decades, we have seen better economic outcomes than in the past. We have seen it in the US and in Europe and in other parts of the world. Inflation is lower and more stable and the real business cycle fluctuations are more modest. Of course, everything is not perfect. We see high unemployment and low productivity growth, but these are (as previous speakers have emphasized) the result of poor structural policies rather than inappropriate monetary policy.

Why has this improvement in inflation and in the business cycle occurred? I think the answer is better monetary policy, better central banking. This important improvement reflects the combination of better judgement and better science. It is worth emphasizing that this improvement in economic science is the result not

---

[2] National Bureau of Economic Research.

only of "academic scribblers" (to use Keynes' term) but also of research in the central banks and of the accumulation of experience.

Let me quickly mention just five of the ways in which the science of monetary economics is, in my judgement, fundamentally better now than it was a few decades ago.

First there is the understanding of the cost of inflation. Thirty years ago, many economists argued that inflation was a kind of minor inconvenience and that the cost of reducing inflation was too high a price to pay. No one would make those arguments today.

Second, there is a better understanding that there is no long-run trade off between inflation and unemployment but that there is a short-run tradeoff. We pay some price when necessary to bring down inflation but that price is temporary and is not large relative to the permanent gain from reduced inflation.

Third, there is a better understanding of the role of interest rates. Allan Meltzer's masterful history of the Federal Reserve reminds us that until not too many years ago central bankers and academics failed to distinguish between nominal interest rates and real interest rates. The result was a failure by the Federal Reserve to respond strongly enough to increases in inflation. In those days, the Fed raised nominal interest rates when inflation rose but by less than the increase in inflation, allowing the real interest rate to decline. We understand that much better now.

The fourth example of the improvement in science is the improving data, including both fundamental measures and the better day to day availability of evidence on the state of economy.

And, finally, the fifth example is the development of new analytic models that provide useful insights. If we think about the difference between the kind of simple static models that we learned when I studied monetary analysis for the first time and the array of dynamic stochastic models with various forms of expectations that we think about today, it really is a remarkable difference. Of course none of these modern models represents the real world. But they do teach us important lessons.

So there has been scientific progress that has contributed to strengthening the practice of monetary policy. But despite the progress, our scientific knowledge is really limited in many ways. The analytic models are valuable, but they are still only useful as heuristic devices to help clear our thinking rather than to design specific real-time policies.

The goal of applying Bayesian statistical decision theory to monetary policy is of course a very attractive one. The basic idea is to optimize a preference function taking into account the uncertainty of parameters, of exogenous variables, and of random shocks. But in reality this paradigm fails because we do not know the structure of the model and because the true structure itself is changing. We cannot express our Bayesian priors over a set of models that we cannot specify. The

Bayesian approach can be a guide to thinking about monetary policy rather than a formal procedure.

There are also too many things that we do not understand. We are particularly poor at the open economy issues. We also do not understand why long-term rates have not increased while the Federal Reserve has been raising short-term rates. (Of course there are many explanations but we do not know how much weight to put on each of them.) We do not understand the links between asset prices, monetary policy, and aggregate demand. We do not understand speculative markets adequately. I could continue but that gives you a sample of what I believe are the limitations of our scientific knowledge at this time.

Of course the science will continue to improve. But I suspect that even as the science improves central banking will always still need judgement. Let me mention just two reasons why we cannot expect science to replace judgement. The first is shocks: unusual shocks, unique shocks, shocks that simply cannot be part of any model. Think about the Mexican default, the 1987 stock market collapse, the collapse of Long Term Capital Management, the 9/11 attacks in New York. The key question in each of these circumstances for the central bank was what steps had to be taken to reassure markets in order to avoid that shock turning into a cumulative downtown in the economy. Science and models simply cannot give us the answer.

A second reason why science cannot replace judgement is the behavior of financial markets. Let me just mention two examples of the kind of issues that central banks must now consider. For example now we see very low credit spreads. What is going to cause those to change? Why are they so low today and how should the Federal Reserve and other central banks respond when they do? And second, I worry a lot about the US current account deficit, the $800 billion, rising to a $900 billion annual rate in the fourth quarter. Who is financing that? What will cause that willingness to finance that current account deficit to change? And how should the reaction to that be managed to minimize the damage?

Let me summarize what I have been saying. First, I think the science of monetary economics has clearly gotten better. Second, it has contributed to better economic policy, reinforcing good judgement. But, third, science cannot replace judgement because there are too many things that we simply do not understand. And finally, no matter how good the science gets, there are problems that inevitably depend on judgement, on art, on a feel for financial markets.

So just as I want pilots on the planes that I fly, when it comes to monetary policy, I want to think that there is someone with sound judgement at the controls. I cannot think of anyone who has done a better job of that than Otmar.

ROBERT E. LUCAS[3]

Congratulations to Otmar Issing for his leadership during the first years of the Euro and the European Central Bank! An important and valuable international institution has been founded and set on course, earning the confidence of the world. It is a great pleasure and honor for me to be included in the celebration of this achievement.

As an economist I take a special pleasure in the central role that economic analysis has played in the design and operation of the ECB. Since 1999, Otmar Issing and his coauthors have published a flow of books and articles articulating the specifics and underlying principles of the ECB's monetary policy. These publications are distinguished by their clarity, their directness, and their sophisticated and up-date use of statistics and monetary theory. They are inspiring examples of economics in the service of a better world.

The ECB, in common with central banks everywhere today, has adopted the "primary objective of maintaining price stability." A distinctive feature of the ECB approach to inflation control is the emphasis on the "two pillars" of monetary policy. In addition to the ongoing readjustment of the money market interest rate in response to real and nominal information on inflationary pressures, the ECB is also committed to the systematic use of information in monetary aggregates.

Events since 1999 have not tested the importance of this second, monetary, pillar, and central banks that do not make explicit use of money supply data have recent histories of inflation control that are quite as good as the record of the ECB. I am concerned that this encouraging but brief period of success will foster the opinion, already widely held, that the monetary pillar is superfluous, and lead monetary policy analysis back to the kind of muddled eclecticism that brought us the 1970s inflation.

One source of this concern is the increasing reliance of central bank research on New Keynesian modeling. New Keynesian models define monetary policy in terms of a choice of a money market rate, and so make direct contact with central banking practice. Money supply measures play no role in the estimation, testing, or policy simulation of these models. A role for money in the long run is sometimes verbally acknowledged, but the models themselves are formulated in terms of deviations from trends that are themselves determined somewhere off stage. It seems likely that these models could be reformulated to give a unified account of trends, including trends in monetary aggregates, and deviations about trend but so far they have not been. This remains an unresolved issue on the frontier of macroeconomic theory. Until it is resolved, monetary information should continue be used as a kind of add-on or cross-check, just as it is in ECB policy formulation today.

[3] University of Chicago.
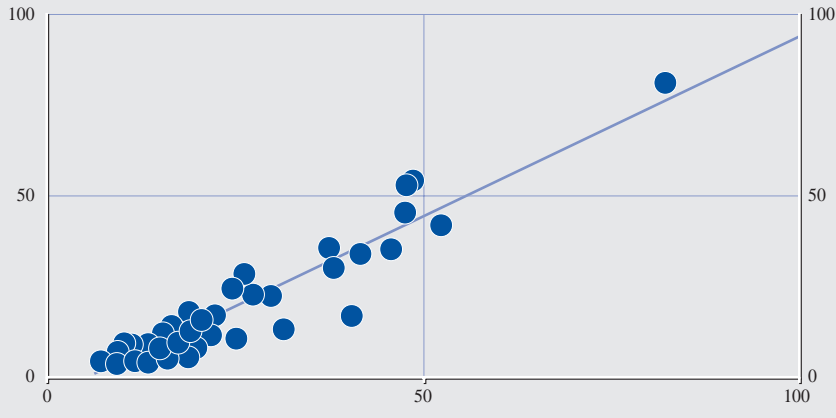
It would be simpler, I suppose, to ignore monetary information altogether. But this would entail ingoring the only explanation we have for the inflation of the 1970s, the only major macroeconomic policy mistake of the OCED economies in the last 60 years. It would entail as well ignoring the only principle that proved useful in bringing that inflation to an end. I will elaborate briefly on both these assertions.

Figure 1, taken from McCandless and Weber (1995), plots average rates of M2 growth and CPI inflation for 110 countries over the years 1960-1990. They lie roughly on a line of slope one as predicted by the simplest, constant-velocity form of the quantity theory of money. When Otmar Issing (2005, p.8) writes of a "fundamental and robust result of monetary economics," this is the kind of theory and evidence he is referring to.

But what does this have to do with the 1970s inflation? Figure 2, taken from Benati (2005) is one way to answer this question. The figure plots annual growth rates of M2 and the GDP deflator against time for more than a century of U.S. data, but obviously the series shown are not simply the originally published data. In order to reveal the long term connections between money and inflation, Benati has used a standard statistical formula – a "filter" – to remove all but the most slowly moving components in the two series. A lot of information is lost in applying such a procedure, but what remains is a demonstration that the same simple version of the quantity theory of money that accounts for cross-country differences in the postwar period accounts as well for the three major 20th century U.S. inflations: the two world wars and the 1970s. In particular, the 1970s inflation in the United States is fully accounted for as a one-for-one response to increased money growth.

I want to emphasize that there is no Keynesian – old or New – counterpart to these two figures. Whatever its limitations, and there are many, the quantity theory of money gives a useful account of the main features of the major historical

Figure 2

Figure 2

M2 growth
GNP deflator inflation
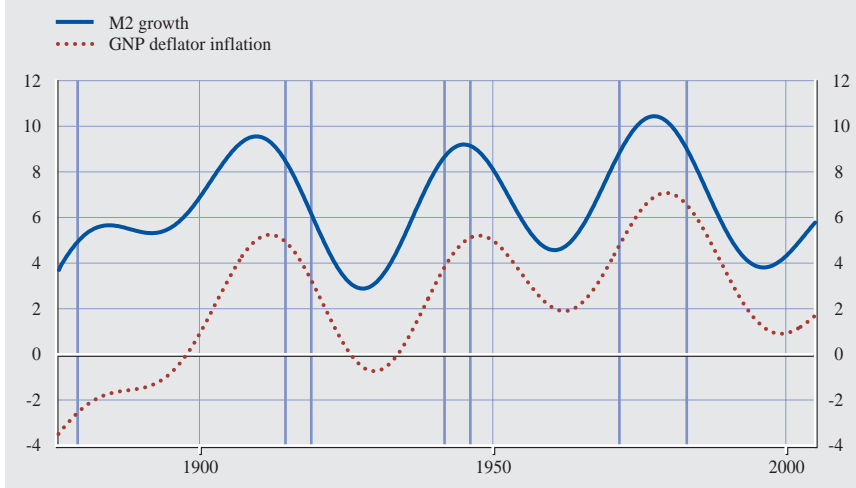
inflations. The New Keynesian theory and the conventional banking wisdom with which it was designed to be compatible accounts for none.

The first central banks to deal effectively with the 1970s inflation were the Bundesbank and the Swiss National Bank, and both did so in the mid-70s by deliberate reductions in money growth rates. In October, 1979 the U.S. Federal Reserve followed suit, with new operating procedures defined in terms of the monetary base and with the federal funds rate left up to market forces. Figure 3 plots the funds rate against time (in weeks) for a few years before and after October, 1979.

Figure 3 Federal Funds Rates – Weekly, 1975-1984

per cent

The change in Fed operating procedure was announced and explained at the time, but even if it had not been, one can see the abrupt change in the behavior of the funds rate in the figure. In the period before 1979 the week-to-week changes in the funds rate are tiny: The little high frequency variation we see reflects only the fact that the old (like the current) interest rate policy is not an exact peg. After October, a large high frequency component appears in the series and continues to be visible for several years. New Keynesian theorists describe these movements in the funds rate in terms of the "Taylor rule" used to describe deliberate open market committee decisions. One often sees references to Paul Volcker's "use" of high interest rates to curb the inflation. But can anyone seriously argue that the fluctuations after October, 1979 represent the deliberations of the Open Market Committee? If so, they must have been meeting every week and been ridiculously undecisive when they did!

Anyone familiar with financial time series will recognize these funds rate movements as fluctuations in an uncontrolled market price. In particular, they reflect the large amount of uncertainty about future inflation that prevailed in 1979, and the resulting high sensitivity of the inflation premium to new price information. The peaks in the figure are Fisherian market responses to inflation announcements, not applications of a Taylor rule. All of this was completely understood at the time: Volcker had been explicit that open market operations would no longer be used to stabilize the funds rate. The inflation in the United States was brought to an end by a focus on money growth, just as it was in Germany and Switzerland.

To sum up, neither the occurence of the inflation of the 1970s nor the policies that brought it to an end can be understood without emphasis on the second, monetary pillar of central bank policy. To let the success of inflation control of the last 20 years lead us to forget this fact would be a very foolish mistake.

At the same time – and this is not easy for an old monetarist to say – the use of interest rate control to target inflation rates in the short run has succeeded far beyond the possibilities suggested by the quantity theory of money. Relative to what we knew 20 years ago, inflation targeting is a genuine practical breakthrough. The New Keynesian program to develop a useful theoretical understanding of this success is a well-motivated and valuable enterprise.

REFERENCES

Benati, L. (2005), Long-run Evidence on Money Growth and Inflation, *Bank of England Quarterly Bulletin*.

Issing, O. and Gaspar V. (2005), *Imperfect Knowledge and Monetary Policy: The Stone Lectures in Economics*.

McCandless, G. T. Jr. and Weber, W. E. (1995), Some Monetary Facts, *Federal Reserve Bank of Minneapolis Quarterly Review*.

ALLAN H. MELTZER[4]

It is a privilege to present these comments at a symposium that honors Otmar Issing. I join those who have congratulated him on the guidance and leadership that he gave to the introduction of the euro and its establishment as a stable currency.

I am one of those who was skeptical about a single currency for Europe. I did not oppose the idea. Skepticism concerned the wisdom of eliminating exchange and interest rate changes to adjust differences between countries. The system put too much emphasis on labor and product price adjustment, the principal and practically speaking the only market adjustment left. Along with many others, I argued that the new system would only achieve full employment and price stability if countries substantially modified their costly welfare and regulatory systems. Otmar's rejoinder was that these structural changes had to occur in any case and that removing monetary policy responses would focus attention on the need for structural changes.

Otmar Issing and others at the ECB deserve credit for maintaining price stability despite the slow pace of structural reform and high unemployment rates in the principal member countries. Some reforms have occurred. I believe it remains a matter of judgment whether the euro members will develop an adequate adjustment mechanism.

The topic of this panel is about the relative importance of economic science and art or judgment in monetary policy. In his Stone lecture (Issing, 2005), Otmar Issing explained why both science and judgment are important. More than any top central banker, he actively participated in discussions with academics and tried to apply new analytic developments in his policy work and the work of his research staff. But he recognized, too, that important differences remain between the analytic models developed by researchers and the tools that he used in practice.

One of the examples that Issing used in his Stone lecture is the measurement of the output gap and normal or full employment output. In the most popular academic models, the output gap has a prominent role. A positive output gap, other things unchanged, calls for a lower interest rate and a more expansive policy. In several countries of the ECB, the size of the output gap reflects the real cost of structural impediments to employment. Despite the almost unabated criticism by politicians in some member countries, the ECB insisted that the output gap and high unemployment were mainly real not monetary problems. It did not accept responsibility for the level of unemployment, but it used this message from theory as a guide to action when the unemployment rate changed; rising unemployment rates called forth policy ease. The size and timing of the policy action relied on judgment.

As Issing has noted repeatedly, in the general equilibrium macro theory that most academics teach and most students learn, money has no role. Inflation comes from the Phillips curve relation when output exceeds the natural rate or NAIRU. Much research shows that this is not a reliable relationship in part because of uncertainty about NAIRU, inability to pin down full employment output with sufficient precision, and difficulty in identifying changes as they occur. As is now well known, Alan Greenspan's judgment identified the productivity increase in the mid 1990s. Alan Blinder showed that econometric estimates do not discover the change for several years. Judgment proved useful to supplement the model.

As I approach the end of my long study of Federal Reserve history, I try to draw some general explanation of the poor policy record of most years from 1913 to 1980 or 1985. The financing of wars, the Great Depression, and the Great Inflation cannot be counted as policy successes. That leaves at most 17 years in the 1920s and from say 1954 to 1964 as years of mostly high employment and low inflation with a few years of recession included. In about three-fourths of the years from 1913 to 1985, either unemployment or inflation was high. In the past 25 years, the United States experienced two of the longest periods of growth with relatively low inflation in its history, punctuated by two mild recessions. In the 1960s and 1970s, most of the world suffered from the Great Inflation, but Germany and Switzerland that gave greatest emphasis to sustained money growth avoided the very high inflation rates experienced by other developed countries.

Should improvements in monetary or economic theory get credit for the better policy outcomes? My answer is a qualified yes. For Germany after Bretton Woods collapsed, Issing reminds us that the quantity equation modified by judgment guided the Bundesbank's policy actions. The theory on which they relied was not the dynamic general equilibrium model of the textbooks. It gave a large role to sustained money growth. And when Paul Volcker became Federal Reserve chairman, he began to control money and permitted interest rates to increase enough to achieve better control of inflation.

I conclude that the two major sources of mistakes in the history of Federal Reserve policy are applying incorrect theory and yielding to political pressures.

The first of these was acceptance and application of real bills doctrine from the early years through the Great Depression and acceptance of Keynesian theory in the 1960s and 1970s. In the Keynesian era policymakers believed that they should coordinate monetary and fiscal policy. In practice this meant that the Federal Reserve financed more of the government's budget deficit. In the 1960s and 1970s, policymakers and many economists claimed that economic policy could not achieve full employment and price stability without help from wage-price policy, controls or exhortations and threats. This claim disappeared in the 1980s, replaced by the assertion that credible low inflation contributed to real growth and higher employment. And not to be forgotten is the non-vertical Phillips curve that was said to permit a permanent increase in employment in exchange for higher inflation.

Political pressures took several forms. Policy coordination limited central bank independence. The Bundesbank, the Swiss National Bank, and the ECB rejected coordination as did Paul Volcker when he became Federal Reserve chairman in

1979. Despite the largest peacetime budget deficits in U.S. history, monetary growth did not become excessive and large deficits were not followed by high inflation.

The policy or political framework was important also. Until 1979, central bankers in the United States accepted an interpretation of the 1946 Employment Act that gave most importance to avoiding unemployment. In practice, attempts to control inflation stopped in 1966, 1970, 1974, and 1977 when unemployment rose. Market participants rationally concluded that inflation would not be reduced permanently. And contrary to Phillips curve theory, on average unemployment rates and inflation rose and later fell together. And high among the political failures is Arthur Burns's response to President Nixon's urgings prior to the 1972 election.

Academic economists and central bankers should ask themselves which parts of today's conventional theory are likely to mislead policymakers who apply these models. I agree with Issing's essay that neglect of sustained money growth must be high on the list. In fact, I find it hard to understand why academic economists quickly dismiss the role of money growth but just as quickly accept the Phillips curve as a highly useful tool. Successful central bankers like Issing or Greenspan are more skeptical about the usefulness of the Phillips curve as a theory of inflation.

There is simply no evidence that a single short term interest rate contains all the information about asset price changes relevant for the transmission of monetary impulses. Friedman (1956) included many relative prices in his model and Brunner and I developed more fully the role of asset prices in the transmission of monetary and other impulses. In the monetarist tradition, relative prices of assets are a significant omission from the standard general equilibrium model.

Issing (2005) cites the pervasive uncertainty faced by policymakers and the public. He recognizes that a major source of the uncertainty is the absence of information about the duration of shocks to the system. Will an increase in oil prices continue at the same rate, at a higher rate, or will oil prices return to their previous level? Is the shock transitory, a permanent shock to the level, or a persistent shock to the rate of change of oil prices? How long will it continue? Correct quick answers are not available. Judgment is needed. If markets and policymakers disagree, relative prices of assets and output will reflect the disagreement. Brunner, Cukierman, and Meltzer (1980) showed that inability to distinguish between permanent and transitory shocks becomes a source of stagflation even with rational expectations.

One further example is the use of the same term – inflation – to refer to both the persistent or maintained rate of price change and the change in price level caused by one-time shocks. Proper policy requires that a central bank faced with a one-time shock such as an increase in the price of oil recognize that it has two different problems. First, it should monitor expectations of long-or medium-term inflation to be confident that the public sees the shock as a one-time event that will pass through. Second, it must recognize and explain that the temporary rise in reported inflation is the means by which returns to workers and owners of capital adjust

downwards as required by the transfer to owners of oil wells. Suppressing these changes by failing to recognize that they differ from maintained inflation does not eliminate the transfer. It forces reductions in wage change and asset prices, most likely a more costly way.

The basic problem in this example is to decide whether monetary policy stabilizes the price level or the maintained rate of price change. The former requires a policy of rolling back the effects on the price level. The latter allows the price level to act like a random walk around a non-inflationary rate of price change.

Economic theory does not tell us which is the right thing to do. Many central banks do not even recognize that there is a choice. And the now standard general equilibrium model can not recognize the problem because it treats all price changes as equivalent. To a monetarist, Friedman's statement that inflation is always a monetary phenomenon does not mean that all price level changes are evidence of inflation.

Otmar Issing did not succumb to the academician's confidence in a model. In his lecture, he cites the unification of Germany and the start of the common European monetary policy as examples where judgment became a critical supplement to the model in dealing with massive uncertainty. He could have added banking crises and more generally, lender of last resort functions.

Many years ago, Karl Brunner and I complained about the large gap between monetary theory and monetary policymaking. I believe the current gap is smaller today both because many academicians have become more aware of central bankers problems and because central bankers like Ottmar Issing tried hard to use the insights from the model to guide their actions. But the gap remains, and good judgment remains important.

REFERENCES

Brunner, K., Cukierman, A. and Meltzer, A. H. (1980), Stagflation, Persistent Unemployment, and the Permanence of Economic Shocks, *Journal of Monetary Economics*, (October) pp. 467-92.

Friedman, M. (1956), *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press.

Issing, O. (2005), *Imperfect Knowledge and Monetary Policy*. Cambridge: Cambridge University Press.

LARS E.O. SVENSSON[5]

I BEST-PRACTICE MONETARY POLICY

Otmar Issing and I have not always agreed on everything. However, we agree completely on the most important things, for instance, that price stability should be the primary objective for monetary policy.

Almost eight years ago, Europe was full of rumors about who the Euro-area governments might nominate for the ECB's Executive Board. There was considerable uncertainty about who those people might be, and I remember being nervous about whether the nominees would be sufficiently competent and independent. I remember vividly how very relieved I was when I received the news that the German government was nominating Otmar Issing. I was convinced that, with Otmar in the Executive Board, the common monetary policy in the Euro areas was in the safest possible hands.

Whereas Otmar and I agree on the most import things, we have not always agreed on the details, for instance, what degree of transparency is best, or what weight should be given to monetary aggregates as monetary-policy indicators. Over the years, I have had the great privilege of having had regular and most interesting and rewarding discussions with Otmar on various issues in monetary policy, in his office, at various conferences, at various dinners, and in his car. I am extremely grateful for all these occasions. I have learned so much from our discussions, and I hope very much that we can continue to have them in the future.

Today I will talk briefly about the role of science in best-practice monetary policy. By best-practice monetary policy, I mean flexible inflation targeting, where the central bank aims at stabilizing inflation around a low inflation target, but also gives some weight to stabilizing real activity, measured by the output gap between actual output and potential output, for instance.

Because of the lags between monetary-policy actions and the effects on inflation and output, best-practice monetary policy has to rely on forecasts, using a procedure that can be called "forecast targeting." Forecast targeting involves both a policy decision and the implementation of the policy decision.

The policy decision under forecast targeting involves using all relevant information about the state of the economy and transmission mechanism to select an instrument-rate path, indeed an instrument-rate plan, such that the resulting forecasts of inflation and the output gap "look good." Using all relevant information about the transmission mechanism means using all relevant results from simulations of different models, but also using judgment. By judgment, I mean information, views, and knowledge beyond the scope of a particular model.[6]

---

[5] Princeton University, CEPR and NBER. I thank Kathleen Hurley for editorial and secretarial assistance. Expressed views and any remaining errors are my own responsibility.

[6] Svensson [16] and Svensson and Tetlow [20] provide a detailed treatment of how to use judgment in optimal monetary policy.

Because the inflation and outputgap forecast depend on the entire path of the instrument rate, it is not sufficient to decide on just the current instrument rate. Implicitly or explicitly, a path and not just the current level needs to be chosen.

What do I mean by the inflation and output-gap forecasts "looking good?" I mean that the inflation and output-gap forecasts provide a good compromise between the inflation forecast approaching the inflation target and the output-gap forecast approaching zero (that is, the output forecast approaching the potential-output forecast). More precisely, the inflation and output-gap forecasts minimize an explicit or implicit intertemporal loss function, for instance of the form

$$
E_t \sum_{s=t}^{\infty} \delta^\tau \; [(\pi_s - \pi^*)^2 \; + \; \lambda(y_s - \bar{y}_s)^2],
$$

the expected sum of discounted future squared inflation gaps between inflation (π_s) and the inflation target (π^*) and output gaps between output (y_s) and potential output ($\bar{y}_s$), where δ ($0 < \delta < 1$) is a discount factor and $\lambda > 0$ is the weight on output-gap stabilization relative to inflation stabilization.

The implementation of best-practice monetary policy takes into account that monetary policy is actually the management of private-sector expectations (Woodford [21]). The impact of monetary policy on inflation and output depends on the private-sector decisions about prices and output that it induces. These decisions depend on the expectations about future inflation, output, and interest rates that monetary policy induces. The current instrument rate matters hardly at all; what matters for private-sector decisions are the private sector's expectations about future interest rates. Therefore, the implementation of best-practice monetary policy consists of announcing and motivating the bank's forecasts of inflation, the output gap, and, importantly, the instrument rate. This is the most effective way of managing private-sector expectations.

There has been much recent debate about the pros and cons of alternative assumptions about the instrument-rate path in the central bank's decision process (see, for instance, Archer [1] and [2], Bean [3], Goodhart [4], Heikensten [5], Honkapohja and Mitra [6], Leitemo [8], Lomax [9], Svensson [14], [17], and [18], and Woodford [21]). Four alternatives have been discussed for the instrument-rate path: (1) A constant instrument rate, (2) market expectations of future interest rates, (3) an instrument rate following an instrument rule, such as the Taylor rule, (4) an optimal instrument-rate path, that is, the path the central bank believes best achieves the bank's objectives, which will also be the central bank's own best forecast of future instrument rates.
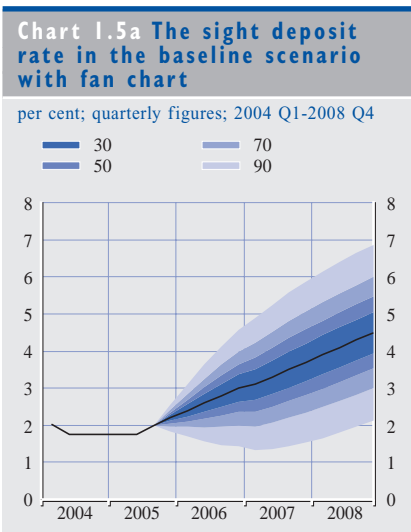
I am convinced that best-practice monetary policy involves alternative (4), the optimal instrumentrate forecast, that is, the central bank's best forecast of its own future policy. By definition, this is the path the central bank deems to be optimal. Furthermore, since it is the best forecast of future interest rates, it provides the best information for private-sector decisions. Therefore, this is the most effective implementation of monetary policy, that is, the most effective way to manage privatesector expectations. Finally, it provides the most accountability for the central bank. Since the resulting inflation and output-gap forecast rely on the

central bank's best instrument-rate forecasts, they are the central bank's best inflation and output-gap forecast. Therefore, these forecasts are the most relevant ones to compare with other forecasters' forecasts and with the actual outcomes.
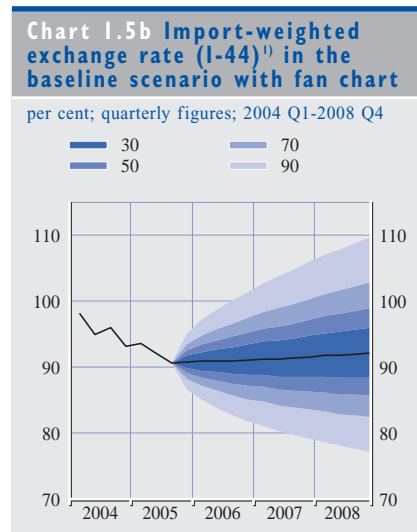
2   THE NORWEGIAN EXAMPLE

The Reserve Bank of New Zealand is the pioneer in inflation targeting. It is also the pioneer in introducing and publishing not only inflation and output-gap forecasts but also explicit instrument-rate paths. It has done so since 1997 (Archer [1] and [2], Svensson [13]). Norges Bank is an enthusiastic and competent newcomer to the inflation-targeting camp. An evaluation of monetary policy in Norway by Svensson, Houg, Solheim, and Steigum [19] gave the bank excellent marks. With its Inflation Report of November 2005 (Norges Bank [10]), the bank has made monetary-policy history by starting to publish an explicitly optimal instrument-rate path with uncertainty bands together with criteria for optimal inflation and output-gap forecasts and other innovations in transparent monetary policy. This section briefly discusses the Norwegian example. Qvigstad [12] provides a more analytic background to this development; Norges Bank [10] and [11] provide more details.

In each Inflation Report, Norges Bank states (Norges Bank [10, p. 4]): "The operational target of monetary policy is low and stable inflation, with annual consumer price inflation of approximately 2.5% over time. In general, direct effects on consumer prices resulting from changes in interest rates, taxes, excise duties and extraordinary temporary disturbances are not taken into account." In line with this, Norges Bank focuses on changes in the CPI-ATE, the consumer price index adjusted for taxes and excluding energy products. Furthermore, the bank

Chart 1.5a The sight deposit rate in the baseline scenario with fan chart

per cent; quarterly figures; 2004 Q1-2008 Q4

Source: Norges Bank.

Chart 1.5b Import-weighted exchange rate (I-44)[1] in the baseline scenario with fan chart

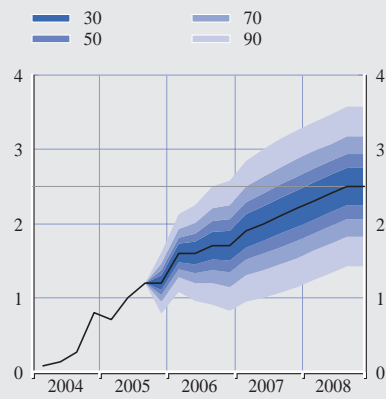per cent; quarterly figures; 2004 Q1-2008 Q4

Source: Norges Bank.
1) A rising curve denotes a weaker krone exchange rate. It is assumed that strengthening by a certain percentage is just as likely as weakening by the same percentage.

Chart 1.5c Projected CPI-ATE in the baseline scenario[1] with fan chart

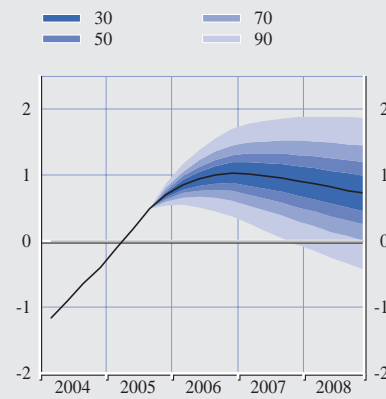per cent; 4-quarter change; 2004 Q1-2008 Q4

Sources: Statistics Norway and Norges Bank.
1) Other measures of underlying inflation are shown in a separate box in Section 2.

Chart 1.5d Estimated output gap in the baseline scenario[1] with fan chart

per cent; quarterly figures; 2004 Q1-2008 Q4

Source: Norges Bank.
1) Uncertainty concerning the current situation is not taken into account in the calculation.

is explicit about being a flexible inflation targeter and in explaining what that means: "Norges Bank operates a flexible inflation targeting regime, so that weight is given to both variability in inflation and variability in output and employment." Thus, Norges Bank can be seen as attempting to stabilize both the inflation gap (the gap between inflation and the inflation target) and the output gap, which is consistent with minimizing a conventional intertemporal quadratic loss function (Qvigstad [12]).

Charts 1.5a-d in the Inflation Report [10] show the optimal forecasts with fan charts in the report's baseline scenario of, respectively, the instrument rate (the so-called sight deposit rate), the exchange-rate (import-weighted), inflation (CPI-ATE), and the output gap.[7]

That the bank is a flexible inflation targeter and puts weight on stabilizing both the inflation gap and the output gap is emphasized in chart 1.7, where the inflation and output-gap forecasts are displayed in the same graph with the same scale. As seen in chart 1.7, inflation is currently below the 2.5% target in Norway, and the bank projects that inflation will gradually rise towards the target and reach that at the end of 2008. The projected rise in inflation is brought about by a projected positive output gap. These forecasts of the bank's target variables require an instrumentrate forecast as displayed in chart 1.5a. The editorial of the report states that "the interest rate path presented provides a reasonable balance between the objectives of monetary policy," which can be interpreted as the inflation, output-gap, and instrument-rate forecasts in charts 1.5a-d being optimal forecasts of these variables.

[7] These graphs are from the Inflation Report [10] of November 2005. On the first day of the Issing Colloqium, March 16, Norges Bank published a new Inflation Report, [11].

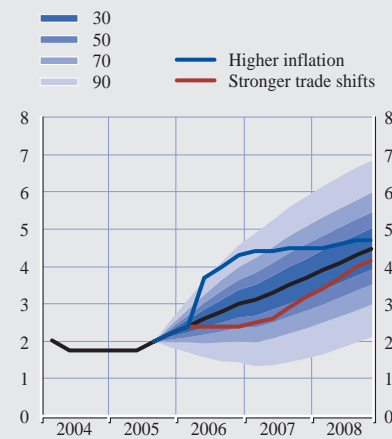**Chart 1.7 Projections for the CPI-ATE and output gap in the baseline scenario**

per cent; quarterly figures; 2004 Q1-2008 Q4
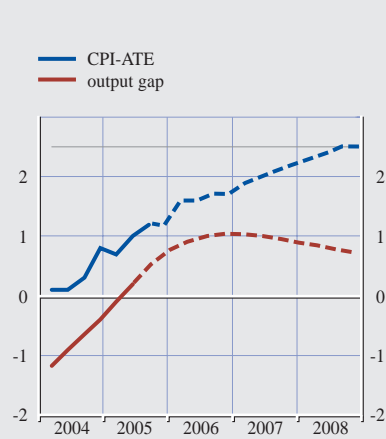
— CPI-ATE
— output gap

Sources: Statistics Norway and Norges Bank.

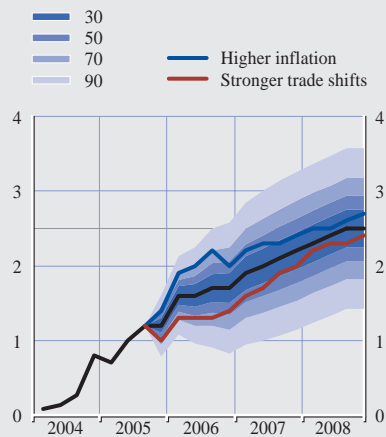**Chart 1.9a Sight deposit rate in the baseline and two alternative scenarios**

per cent; quarterly figures; 2004 Q1-2008 Q4

30
50
70
90

— Higher inflation
— Stronger trade shifts

Source: Norges Bank.

Chart 1.9b Projected CPI-ATE in the baseline and two alternative scenarios

per cent; quarterly figures; 2004 Q1-2008 Q4

30
50
70
90

— Higher inflation
— Stronger trade shifts

Sources: Statistics Norway and Norges Bank.

Chart 1.9c Estimated output gap in the baseline scenario[1] and two alternative scenarios
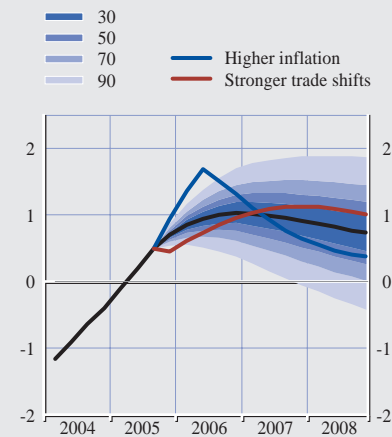
per cent; quarterly figures; 2004 Q1-2008 Q4

30
50
70
90

— Higher inflation
— Stronger trade shifts

Source: Norges Bank.
1) Uncertainty concerning the current situation is not taken into account in the calculation.

The bank also provides six criteria for an "appropriate" instrument-rate path, that is, and optimal instrument-rate path. These criteria are discussed and justified in detail in Qvigstad [12]. They can be understood as verbal forms of optimality conditions, that is, the optimal targeting rules that Svensson [15] advocates rather than instrument rules such as Taylor rules. Norges Bank's criteria are reproduced in the appendix.

Chart 1.10 3-month money market rate in the baseline scenario[1] and band with highest and lowest forward interest rate last 10 days[2]

per cent; quarterly figures; 2005 Q4-2008 Q4

— baseline scenario
▬▬ highest and lowest forward interest rate
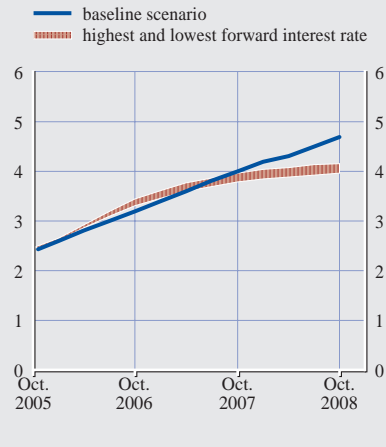
Source: Norges Bank.
1) The money market rate is normally about ¼ percentage point higher than the sight deposit rate.
2) Highest and lowest forward interest rate in the period 14-27 Oct. 2005.

Chart 1.11 Sight deposit rate, Taylor rule, Orphanides rule and rule with external interest rates. Inflation as in the baseline scenario

per cent; Quarterly figures; 2000 Q1-2006 Q2

— Taylor rate
···· sight deposit rate
▬ ▬ Orphanides' rule
— rule with external interest rates
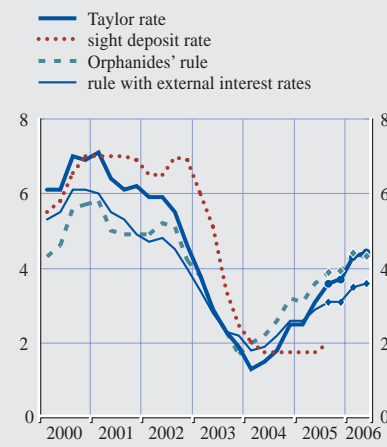
Source: Norges Bank.

The bank also provides optimal forecasts of the instrument rate, inflation, and the output gap for alternative scenarios. Charts 1.9a-c show such forecasts for two alternative scenarios, one with stronger trade shifts (leading to lower import prices) and lower wage growth, and one with inflation rising more rapidly than predicted.

As explained in Qvigstad [12] and Norges Bank [10] and [11], the bank cross-checks its optimal instrument-rate path against various simple instrument rules and indicators that are less dependent on a specific analytical framework and specific forecasts for the Norwegian economy. Chart 1.10 provides a comparison with market expectations of future instrument rates as represented by forward interest rates. Chart 1.11 compares the instrument rate with alternative simple instrument rules. Chart 1.12 provides a comparison with an empirical reaction function estimated from previous instrument-rate responses.
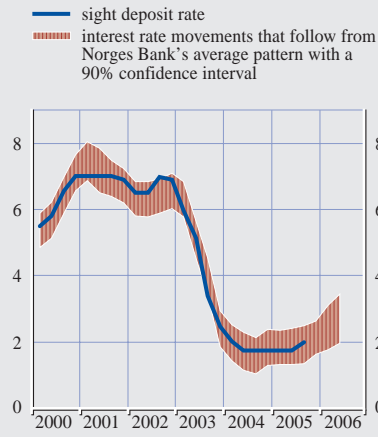
Finally, implicitly paying tribute to Otmar's and the ECB's emphasis on monetary aggregates as monetary-policy indicators, chart 1.14 displays money growth, both actual and estimated trend growth of M2.

3   CONCLUSIONS

There is much science in current best-practice monetary policy. But there is also considerable use of judgment, where by judgment I mean information, views,

Chart 1.12 Sight deposit rate actual and counterfactual

per cent; quarterly figures; 2000 Q1-2006 Q2

— sight deposit rate
▨ interest rate movements that follow from Norges Bank's average pattern with a 90% confidence interval
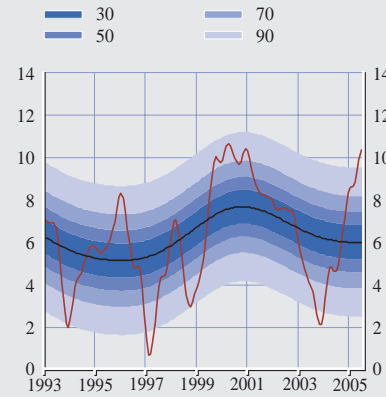
Source: Norges Bank.
1) The interest rate movements are explained by developments in inflation, mainland GDP growth, wage growth and 3-month interest rates among trading partners. See Inflation Report 3/04 for further discussion.

Chart 1.14 Money supply (M2). 12-month growth, estimated trend growth and intervals[1]

per cent; monthly figures; Jan. 1993-Aug. 2005

— 30   — 70
— 50   — 90

Source: Norges Bank.
1) Actual M2 growth is smoothed. Trend growth is estimated using a Hodrick-Prescott filter (lambda = 100 000). The confidence intervals are based on the standard deviation calculated using the deviation between actual M2 growth and trend growth.

and knowledge beyond the scope of a particular model. The use of judgment is both unavoidable and desirable. I believe that best-practice monetary policy will never be able to rely on models alone. As Otmar states in his Stone Lectures with Gaspar, Tristani, and Vestin [7, p. 9], "the judgmental elements are necessary to bridge the gap between the simplifications of monetary theory and the complexities of real-world decision making." Therefore, monetary-policy with the right use of judgment will be better than monetary policy that relies only on models. Importantly, the process of forecast targeting that is part of best-practice monetary policy implies that judgment is used in a more systematic and disciplined way. For instance, new information is "filtered through the forecast." That is, if new information has no impact on the forecasts of inflation and/or the output gap at the existing instrument-rate path, it should normally warrant any change of the instrument-rate path. Only if new information has an impact on future inflation and the output gap should it normally affect the instrument-rate plan. Svensson [16] and Svensson and Tetlow [20] provide more details on how judgment can be used in a systematic and disciplined way.

Norges Bank has set a model for other central banks in publishing optimal inflation, output-gap, and instrument-rate forecasts, with fan charts indicating the degree of uncertainty and with ample discussion and justification of the forecasts, including alternative scenarios, cross-checking with alternative policy rules, and the application of a list of criteria for optimal instrument-rate forecasts.

That Otmar is retiring at this juncture is very unfortunate and a big loss to world central banking from several points of view. For instance, I would think that, if Otmar would have stayed a few more years at the ECB, he would have enthusiastically worked on implementing the great improvements in best-practice monetary-policy that Norges Bank has demonstrated to us.

APPENDIX

From Norges Bank [10, p. 8, box]:

CRITERIA FOR AN APPROPRIATE FUTURE INTEREST RATE PATH

The following criteria may be useful in assessing whether a future interest rate path appears reasonable compared with the monetary policy objective.
1. If monetary policy is to anchor inflation expectations around the target, the interest rate must be set so that inflation moves towards the target. Inflation should be stabilised near the target within a reasonable time horizon, normally 1-3 years. For the same reason, inflation should also be moving towards the target well before the end of the three-year period.
2. Assuming that inflation expectations are anchored around the target, the inflation gap and the output gap should be in reasonable proportion to each other until they close.[8] The inflation gap and the output gap should normally not be positive or negative at the same time further ahead.
3. Interest rate developments, particularly in the next few months, should result in acceptable developments in inflation and output also under alternative, albeit not unrealistic assumptions concerning the economic situation and the functioning of the economy.
4. The interest rate should normally be changed gradually so that we can assess the effects of interest rate changes and other new information about economic developments.
5. Interest rate setting must also be assessed in the light of developments in property prices and credit. Wide fluctuations in these variables may in turn constitute a source of instability in demand and output in the somewhat longer run.
6. It may also be useful to cross-check by assessing interest rate setting in the light of some simple monetary policy rules. If the interest rate deviates systematically and substantially from simple rules, it should be possible to explain the reasons for this.

[8] The inflation gap is the difference between actual inflation and the inflation target of 2.5%. The output gap measures the percentage difference between actual and projected potential mainland GDP.

REFERENCES

Archer, D. (2004), *Communication with the Public*, paper presented at the Czech National Bank Conference on Practical Experience with Inflation Targeting, Prague, May 13-14.

Archer, D. (2005), *Central Bank Communication and the Publication of Interest Rate Projections*, paper prepared for Inflation Targeting: Implementation, Communication and Effectiveness, a workshop at Sveriges Riksbank, Stockholm, June 10-12.

Bean, C. (2004), *Some Current Issues in UK Monetary Policy*, speech in London, July 28, www.bankofengland.co.uk.

Goodhart, C. A. E. (2001), Monetary Transmission Lags and the Formulation of the Policy Decision on Interest Rates, *Federal Reserve Bank of St. Louis Review* July/August 2001, pp. 165-181, www.stlouisfed.org.

Heikensten, L. (2005), *Thoughts on How to Develop the Riksbank's Monetary Policy Work*, speech in Stockholm, February 22, www.riksbank.se.

Honkapohja, S. and Mitra, K. (2003), Problems in Inflation Targeting Based on Constant Interest Rates, working paper.

Issing, O., Gaspar, V., Tristani, O. and Vestin, D. (2005), *Imperfect Knowledge and Monetary Policy*, The Stone Lectures in Economics, Cambridge University Press.

Leitemo, K. (2003), Targeting Inflation by Constant-Interest-Rate Forecasts, *Journal of Money, Credit and Banking* 35, pp. 609-626.

Lomax, R. (2005), *Inflation Targeting in Practice: Models, Forecasts and Hunches*, speech in London, March 12, www.bankofengland.co.uk.

Norges Bank (2005), *Inflation Report 3/2005 with Monetary Policy Assessment*, www.norgesbank. no.

Norges Bank (2006), *Inflation Report 1/2006 with Monetary Policy Assessment*, www.norgesbank. no.

Qvigstad, J. F. (2005), *When Does an Interest Rate Path 'Look Good'? Criteria for an Appropriate Future Interest Rate Path – A Practician's Approach*, Norges Bank Staff Memo No. 2005/6, www.norges-bank.no.

Svensson, L. E. O. (2001a), *Independent Review of the Operation of Monetary Policy in New Zealand: Report to the Minister of Finance*, www.princeton.edu/ svensson/.

Svensson, L. E. O. (2003a), The Inflation Forecast and the Loss Function, in Paul Mizen, ed., *Central Banking, Monetary Theory and Practice: Essays in Honour of Charles Goodhart*, Volume I, Edward Elgar, pp. 135-152, www.princeton.edu/svensson/.

Svensson, L. E. O. (2003b),What Is Wrong with Taylor Rules? Using Judgment in Monetary Policy through Targeting Rules, *Journal of Economic Literature* 41, pp. 426-477, www.princeton.edu/svensson/.

Svensson, L. E.O. (2005a), Monetary Policy with Judgment: Forecast Targeting, *International Journal of Central Banking* 1, pp. 1-54, www.ijcb.org.

Svensson, L. E. O. (2005b), Optimal Inflation Targeting: Further Developments of Inflation Targeting, working paper, www.princeton.edu/svensson.

Svensson, L. E. O. (2006), The Instrument-Rate Projection under Inflation Targeting: The Norwegian Example, working paper, www.princeton.edu/svensson/.

Svensson, L. E. O., Houg, K., Solheim, H. and Steigum, E. (2002), An Independent Review of Monetary Policy and Institutions in Norway, *Norges Bank Watch 2002*, Centre for Monetary Economics, Norwegian School of Management BI, www.princeton.edu/svensson/.

Svensson, L. E. O. and Tetlow, R. J. (2005), Optimal Policy Projections, *International Journal of Central Banking* 1(3) pp. 177-207, www.ijcb.org.

Woodford, M. (2005), Central-Bank Communication and Policy Effectiveness, in *The Greenspan Era: Lessons for the Future: A Symposium Sponsored by The Federal Reserve Bank of Kansas City, Federal Reserve Bank of Kansas City*, pp. 399-474, www.kc.frb.org.

CONCLUDING REMARKS

OTMAR ISSING

A long journey from theory to practice comes to an end. And I must confess the last stop is the absolute highlight, since it brings together outstanding representatives from both "camps". While listening to so many authentic statements these past two days, I felt like the person who was recommended to read Goethe's Faust without having the slightest idea about the importance of the text. Asked for his reaction, his reply was that he was very disappointed; it was just a collection of daily commonplaces.

I am overwhelmed by this unique gathering, and it will take time to digest all of the thoughts given over the past two days to this eternal problem, the link between theory and practice. Allow me to thank all my colleagues from the worlds of academia and central banking who have made this colloquium such a great event.

Manfred Neumann, Mervyn King, Don Kohn, Vítor Gaspar and Carl Walsh presented outstanding papers combining empirical evidence, new theoretical approaches and central bank experience in different ways. The contributions by the many panellists cover a wide range of aspects, opening a cornucopia of new insights.

It is impossible to give due tribute to all of the contributions. I will just try to combine some comments on what we have heard with a few remarks of my own on the subject of this conference, which is organised around the themes of "credibility" and "the art of central banking".

Today, central bankers worldwide agree on the importance of price stability – or low inflation – and the establishment and maintenance of credibility in order to allow society to fully exploit the advantages of such a regime. At this conference, almost all participants have discussed this aspect. Credibility cannot be won and maintained on the basis of political manoeuvres or tricks. The public and, first of all, the financial markets will soon discover any discrepancy between words and deeds, between announcements and monetary policy actions. When still teaching, from time to time I would quote from D. H. Robertson's small but thoughtful book "On Money" from the chapter on "The question of the standard":

"If a gold standard had never existed, it might be necessary to invent something of the kind for their benefit. It is said that there was once a mine manager in Johannesburg who had a glass eye. When business called him away he would take his eye out and leave it in a prominent place; and while the master's eye was on them the workmen continued to work […] But one day, one of the workmen, more daring than the rest, stealthily approached the all-seeing orb and covered it up with an inverted cigarette tin: whereupon he and all his fellows promptly went away and got drunk."

Robertson concludes that this, "is a parable of what might happen if all semblance of a gold standard were obliterated." The lesson we learn from this is pertinent across time: Credibility cannot come from delusion, but must be based on a firm, convincing commitment.

As a new central bank – responsible for the new currency of a large and heterogeneous area – we were confronted with a unique challenge. On the fundament of our mandate and the guarantee of independence we committed ourselves by establishing a quantitative definition of price stability and pre-announcing our strategy, i.e. the framework by which we would organise all information, structure our analysis and discussion and conclude by consistent monetary policy decisions. Our jury, which is the general public and financial markets, has attested to our success through inflation expectations that are in accordance with our commitment to maintain price stability.

Let me now turn to the central subject of this conference, the link between theory and practice. Our knowledge is and will always remain limited. Therefore, the necessity to act invariably exceeds the measure of our understanding of the world. Goethe takes this conflict to the extreme by saying that the doer is always unscrupulous, whereas only those who contemplate can have a conscience. But, even if one would like to follow the implicit maxim in institutions such as a central bank, there is no such thing as not acting. Conscience is reflected in trying to act responsibly and in accordance with Max Weber's "Verantwortungsethik" or "Ethics of Responsibility".

This opens the door into the vastness of philosophical speculation. Philosophers have been pondering this question for more than 2000 years, all the way back to Aristotle and his system of metaphysics. At this point, very often "The Art of Central Banking" – the title of a book by Ralph G. Hawtrey – enters the stage. It might come as a surprise that in his book on the theory of money, Jürg Niehans concludes that:

"Economics should be under no illusion that central banking will ever become a science. Academic critics love to chide central bankers for their lack of a fully articulated doctrine of monetary policy, based on testable – and perhaps even tested – hypotheses. These critics mistake central bankers for what they are themselves, namely teachers and intellectuals. In fact, a good central banker is a doer and a politician, for whom even ambiguity and inconsistency may sometimes serve his purposes. His field of action is the ever-changing stream of economic history, where everyday may pose new problems requiring new solutions […] This treatise may thus end on a role of humility: however far monetary theory may progress, central banking is likely to remain an art."

So, we are back to square one. I do not deny that we central bankers are sometimes tempted to send this quote to our critics in academia. However, I am very critical of this reasoning. "Art" must under no circumstances be understood as a licence to ignore the results of economic research. In his masterpiece on the relationship between theory and practice, Immanuel Kant concludes: "Hence no one can claim

to have acquired practical knowledge in a particular discipline and at the same time despise theory without revealing that he is an ignoramus in his field."

Central banking is a permanent challenge to make best use of research and progress in theory, and to check empirical results. I would even claim that in hardly any other policy-making institution is the role of research, of sound analysis – based on economic theory and empirical evidence – more important than in central banks of our time. This implies a critical judgement on the limits of methods and models. I have never felt that I am an "artist"; for me, central banking is not "Art", it is applied economics or rather political economy in the meaning of Adam Smith.

This colloquium, which has brought together such a large number of outstanding experts from the world of academia and the central banking community, some of whom have expertise in both theory and practice, should be seen as a contribution to the quasi eternal debate of how to improve our understanding of the best way to conduct monetary policy in the interests of the people. I would like to express my deep gratitude to all those who have contributed to this conference, as well as to those behind the scenes. In particular, I should like to thank Klaus Masuch, Lucrezia Reichlin, Wolfgang Schill, and Frank Smets.

MONETARY POLICY: A JOURNEY FROM THEORY TO PRACTICE – AN ECB COLLOQUIUM HELD IN HONOUR OF OTMAR ISSING

FRANKFURT AM MAIN

Thursday, 16 March

14:30   Registration/coffee

15:00   Welcome
               Jean-Claude Trichet (President of the European Central Bank)

Session 1
Chair: **Jean-Claude Trichet** (President of the European Central Bank)

15:10-15:40   **Pre-commitment and guidance:**
               lessons from the Bundesbank's history
               Manfred Neumann (University of Bonn)

15:40-16:10   **The danger of inflating expectations**
               Mervyn King (Governor of the Bank of England)

16:10-16:40   **Monetary policy and asset prices**
               Donald Kohn (Governor of the Federal Reserve Board)

16:40-17:10   Coffee

17:10-18:30   **Panel discussion: The art of central banking**
               Stanley Fischer (Governor of the Bank of Israel),
               Arminio Fraga (Gavea Investimentos, former President of the
               Central Bank of Brazil),
               Jacob Frenkel (Vice Chairman of the American International
               Group, Inc., former Governor of the Bank of Israel),
               Lars Heikensten (Former Governor of Sveriges Riksbank),
               Hans Tietmeyer (Former President of the Deutsche
               Bundesbank),
               Paul Volcker (Former Chairman of the Federal Reserve Board)

19:30 Dinner   Speeches by **Jean-Claude Trichet, Martin Wolf** (Financial
               Times) and **Otmar Issing**

Friday, 17 March

Session 2
Chair: **Axel Weber** (President of the Deutsche Bundesbank)

09:00-09:15   **Stability first: reflections inspired by Otmar Issing's central banking career**
Vítor Gaspar (Banco de Portugal) and
Anil Kashyap (University of Chicago)

09:30-10.50   **Panel discussion: ECB monetary policy: the first seven years**
Leszek Balcerowicz (Governor of Narodowy Bank Polski),
Charles Goodhart (London School of Economics, former Member of the Monetary Policy Committee of the Bank of England),
Malcolm Knight (General Manager of the Bank for International Settlements),
William McDonough (Former President of the Federal Reserve Bank of New York),
Axel Weber (President of the Deutsche Bundesbank)

10:50-11:20   Coffee

Session 3
Chair: **Kazumasa Iwata** (Deputy Governor of the Bank of Japan)

11:20-11:50   **The contribution of monetary theory to the practice of monetary policy**
Carl Walsh (University of California, Santa Cruz)

11:50-13:10   Coffee Break

13:10-13:25   **Concluding remarks by Otmar Issing**

13:30   Buffet lunch

14.30-15.30   **Panel discussion:**
Central banking: is science replacing art?
Olivier Blanchard (Massachusetts Institute of Technology),
Martin Feldstein (National Bureau of Economic Research),
Robert Lucas (University of Chicago),
Allan Meltzer (Carnegie Mellon University),
Lars Svensson (Princeton University)