

EUROPEAN CENTRAL BANK
WORKING PAPER SERIES

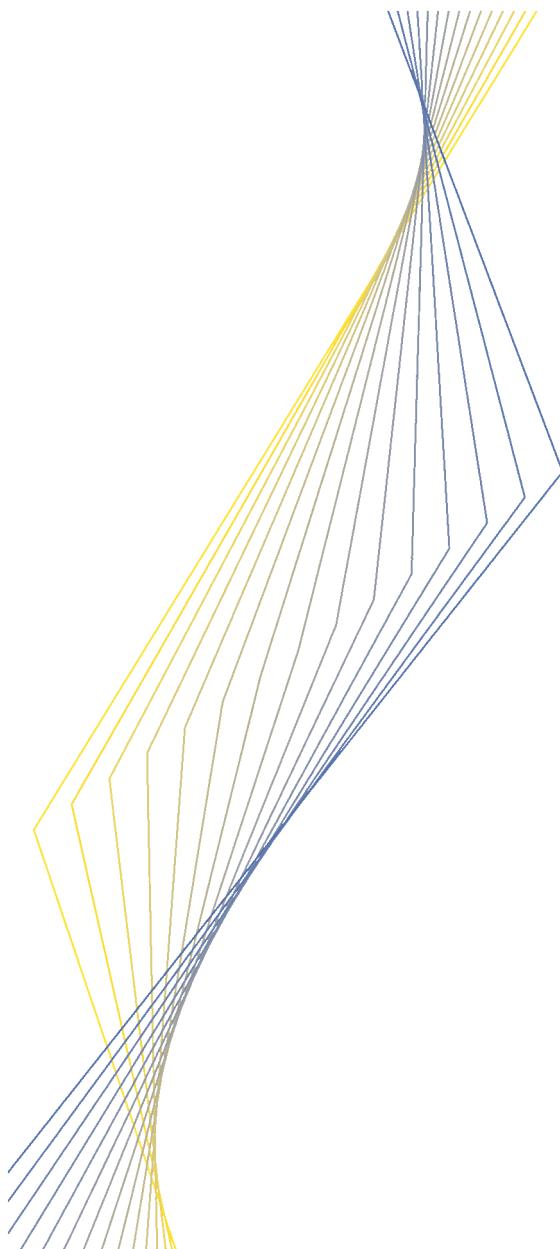


WORKING PAPER NO. 236
SWISS MONETARY TARGETING
1974-1996: THE ROLE OF
INTERNAL POLICY ANALYSIS
BY GEORG RICH

June 2003

EUROPEAN CENTRAL BANK

WORKING PAPER SERIES



WORKING PAPER NO. 236

**SWISS MONETARY TARGETING
1974-1996: THE ROLE OF
INTERNAL POLICY ANALYSIS¹**

BY GEORG RICH²

June 2003

¹ Currently honorary professor at the University of Bern and private consultant, formerly director and head of the economic division of the Swiss National Bank (until the end of November 2001). I wrote this paper in August and September 2002 while visiting the European Central Bank as part of the Research Visitor Programme. I would like to thank the ECB for affording me the opportunity to do research on Swiss monetary policy. In particular, I am indebted to Vitor Gaspar, director general of research at the ECB. I would never have embarked on this project without his encouragement and support. I am also grateful to Markus Zimmerli for helping me with the data underlying the tables and figures, to Peter Stalder for sending me the information contained in note 76, and to Michel Peytrignet for supplying Figure 3. I should emphasise that the analysis of this paper reflects my own views, which need not accord with those of the Swiss National Bank. The opinions expressed herein are those of the author(s) and do not necessarily represent those of the European Central Bank. This paper can be downloaded without charge from <http://www.ecb.int> or from the Social Science Research Network electronic library at: http://ssrn.com/abstract_id=457303.

² University of Bern, Home address: Parkweg 7, CH-5000 Aarau, Switzerland. Telephone: +41 62 822 2945. Fax: +41 62 823 3916. Email: g.rich@richcons.ch.

© European Central Bank, 2003

Address	Kaiserstrasse 29
	D-60311 Frankfurt am Main
	Germany
Postal address	Postfach 16 03 19
	D-60066 Frankfurt am Main
	Germany
Telephone	+49 69 1344 0
Internet	http://www.ecb.int
Fax	+49 69 1344 6000
Telex	411 144 ecb d

All rights reserved by the author/s.

*Reproduction for educational and non-commercial purposes is permitted provided that the source is acknowledged.
The views expressed in this paper do not necessarily reflect those of the European Central Bank.*

ISSN 1561-0810 (print)
ISSN 1725-2806 (online)

Contents

Abstract	4
Non-technical summary	5
1. Introduction	7
2. The Swiss approach to monetary targeting: an overview	12
3. The inception of monetary targeting: 1974-1978	17
4. Exchange rate targeting and the return to money: 1978-1981	24
4.1 Temporary target for the exchange rate	24
4.2 Annual target for monetary base	25
5. Tranquillity before the storm, 1982-1990	28
5.1 Tranquil period up to the summer of 1987	28
5.2 The storm of 1987-1990	33
6. Medium-term targets after 1990	38
6.1 Trial and error: 1990-1993	38
6.2 Money as a useful indicator: 1994-1996	44
7. Summary and conclusions	47
8. References	50
European Central Bank working paper series	53

Abstract

After the switch to a floating exchange rate in 1973, the Swiss National Bank at first adopted annual monetary targets and in the 1990s shifted to a medium-term targeting strategy. In this paper I review the SNB's internal policy analysis, an aspect of Swiss monetary targeting that has received little attention in the existing literature. I show that money played a key role in setting monetary policy and in communicating the SNB's decisions to the public. Due to the adoption of monetary targets, the SNB was able to reduce the inflation trend to low levels. However, it was less successful in preserving price stability during business-cycle expansions because the monetary targets did not call for a sufficiently pre-emptive policy stance. At the end of 1999, the SNB abandoned monetary targeting in favour of an approach based on inflation forecasts.

Key words: Monetary policy, monetary targets, policy rules, price stability

JEL classifications: E31, E32, E41, E52, E58

Non-Technical Summary

After the switch to a floating exchange rate in 1973, the Swiss National Bank adopted a policy strategy based on monetary targets. At first, it set annual growth targets for the money stock M1 and later for the monetary base. In 1991 it shifted to a medium-term targeting strategy for the monetary base. At the end of 1999, the SNB abandoned monetary targeting altogether in favour of an approach resting on inflation forecasts.

This study focuses on an aspect Swiss monetary targeting that has not received much attention in the existing literature. It demonstrates how the SNB used its internal policy analysis in setting monetary policy and in communicating its decisions to the public. An examination of these issues is interesting because it sheds light on the problems the SNB encountered in trying to extract useful policy signals from money growth.

Monetary targets acted as an effective anchor prompting the SNB not to lose sight of its ultimate policy objective – price stability. Under the annual monetary targeting regime in force until the end of the 1980s, the SNB was able to develop a coherent and effective framework for analysing and communicating monetary policy. Under this framework, the SNB – relying on forecasts for real GDP growth and inflation for the following year – predicted activity-induced changes in money demand (i.e., changes expected to occur if short-term interest rates were to stay constant). Moreover, it compared the expected demand changes with a benchmark for money growth. The benchmark defined the trend rate of money growth that the SNB thought to be consistent with price stability and potential real growth in the Swiss economy. Until the mid-1980s, the SNB set its annual targets somewhat above the benchmark because of a desire to curb inflation gradually. From the end of 1985 onwards, it normally fixed its targets at the benchmark level. On the whole, this framework provided for a highly transparent monetary policy.

Nevertheless, annual monetary targets suffered from several drawbacks. They did not serve as an adequate compass in the presence of major unexpected shocks – such as sustained money-demand shifts and excessive movements in the exchange-rate – requiring a policy response. Even though the SNB stressed the state-contingent nature of its targeting approach, it did not always react appropriately to such shocks. Another problem arose from cyclical fluctuations in output growth and inflation. Due to the annual targeting framework, the SNB failed to adopt a sufficiently pre-emptive stance in countering cyclical threats to price stability. Unexpected shocks also complicated the SNB's communication efforts. In difficult economic circumstances, the annual targeting framework did not necessarily induce the SNB to choose optimum procedures for explaining its policy decisions to the public.

With the switch to the medium-term targeting approach, the SNB undertook to rectify the flaws of its annual targeting framework. The idea was to fix a medium-term target line for the monetary base, matching the trend growth in this aggregate consistent with price stability and potential growth. In the presence of major shocks threatening to disturb price stability, the SNB, if necessary, was prepared to deviate from its medium-term target line. While the medium-term strategy was superior to annual targeting, it was fraught with a variety of difficulties too.

A major problem lay in the need to take account of cyclical movements in aggregate demand, which bore both on the SNB's communication efforts and its internal analysis. As to its public pronouncements, the SNB was reluctant to admit that – among other indicators – it was considering the business cycle in ascertaining the need for deviations in money growth from the medium-term target line. The SNB was concerned that the public might mistake references to the business cycle for an activist policy approach aimed at achieving multiple objectives of high employment and price stability.

Recognising the business cycle also raised a tricky analytical question. The SNB realised that the required deviations from the medium-term target line could be determined only on the basis of inflation forecasts over horizons long enough to capture the full effects of destabilising shocks and of the policy reactions to such shocks. However, if the SNB was to rely on longer-horizon forecasts, its medium-term strategy would become similar to the approaches followed by central banks setting inflation targets. Therefore, it might just as well make a move in the direction of inflation targeting. At the end of 1999, the SNB decided to abandon monetary targeting and to switch to an approach centred on inflation forecasts. It believed that inflation forecasts were easier to communicate to the public than its medium-term strategy. Even though the SNB no longer sets monetary targets, the monetary aggregates, notably the money stock M3, still play an important role as policy indicators.

Despite the flaws in the SNB's targeting strategy, money, for the most part, turned out to be a highly useful guide to policy makers. Critics of the SNB often argue that in the 1990s the Swiss central bank was misled by its "monetarist" beliefs to pursue an overly restrictive policy course. I should emphasise that due to a temporary surge in inflation in 1989 and 1990, the SNB could not help tightening significantly its monetary reins. It eased monetary policy again in 1992, when the inflationary pressures began to subside. Admittedly, the SNB mistakenly refused to relax monetary policy further in 1994 despite a strong appreciation of the Swiss franc on the foreign exchange market hurting the domestic economy. However, it was not led astray by its "monetarist" beliefs. On the contrary, the SNB ignored important warning signals arising from a contraction in the monetary base. When it recognised its error at the end of 1994, it loosened decisively monetary policy in an effort to boost the monetary base in line with its medium-term target.

In summary, the monetary targets helped the SNB to keep the trend increase in the CPI at low levels. Thanks to its monetary targets, the SNB over the last quarter of the twentieth century managed to achieve a lower inflation rate than virtually all the other central banks. Aside from a few lapses, the SNB also communicated effectively in its policy plans to the public. Its public announcements almost always matched its internal monetary analysis and its decisions. Moreover, the public generally understood what the SNB intended to do. These factors appear to account for the high degree of credibility the SNB has enjoyed to this day.

1. Introduction

The Swiss National Bank (SNB), Switzerland's central bank, adopted monetary targeting at the end of 1974. The switch to a "monetarist" policy strategy was motivated by the global surge in inflation setting in towards the end of the 1960s. Since Switzerland adhered to a fixed exchange rate at that time, the SNB was not able to shield the domestic economy from foreign inflation. Although it strove to curb the price increases by means of quantitative restrictions on domestic credit growth, its efforts to check inflation were of no avail. On the contrary, in as much as the SNB's tight monetary policy had some effects on domestic prices and production costs, it caused substantial surpluses in the balance of payments on current account. The favourable current-account developments in turn led financial market participants to believe that, sooner or later, Swiss monetary authorities would have to raise the exchange rate of the Swiss franc. The resulting inflows of speculative capital swelled the domestic monetary base and undermined the SNB's efforts to keep inflation under control.

In 1971 the inflows of speculative capital assumed alarming proportions. Within a few months, the monetary base increased by over 50 percent (Fig. 1).¹ The SNB was clearly aware of the inflationary dangers emanating from this Latin American type of explosion in the money supply. As a staunch supporter of the gold standard, it had always warned against the potential inflationary consequences of detaching domestic money creation from the scarce world supply of gold.² In an effort to reduce or contain the monetary overhang, Swiss monetary authorities accepted two revaluations of the Swiss franc in 1971, the second one in the context of the Smithsonian realignment of exchange rates. Moreover, they imposed restrictions on inflows of foreign capital and introduced various devices designed to sterilise part of the increase in the monetary base.³ However, these measures only provided a temporary respite from the speculative activity on the foreign exchange markets. When a new disruptive speculative attack loomed in January 1973, Swiss monetary authorities, reluctantly, decided to float the Swiss franc on the foreign exchange market.⁴

Thanks to the switch to a floating exchange rate, the SNB, in principle, gained full control of the money supply. It employed its new powers to fight inflation, which had already crept up to about 7 percent early in 1973. To this end, the SNB ceased intervening on the foreign exchange market and kept the monetary base more or less stable until the summer of 1974 (Schiltknecht, 1977, pp. 13-16). However, inflation, measured in terms of the CPI, continued to rise, peaking at over 10 percent in 1974 (Fig. 1). The Swiss public, on the whole, regarded inflation in excess of 10 percent as a major catastrophe, as the rate of

¹ The money stock M1 increased by over 20 percent. In the 1980s, the M1 series was adjusted to take account of new types of transactions accounts (see Section 4.2). The M1E series excludes these accounts.

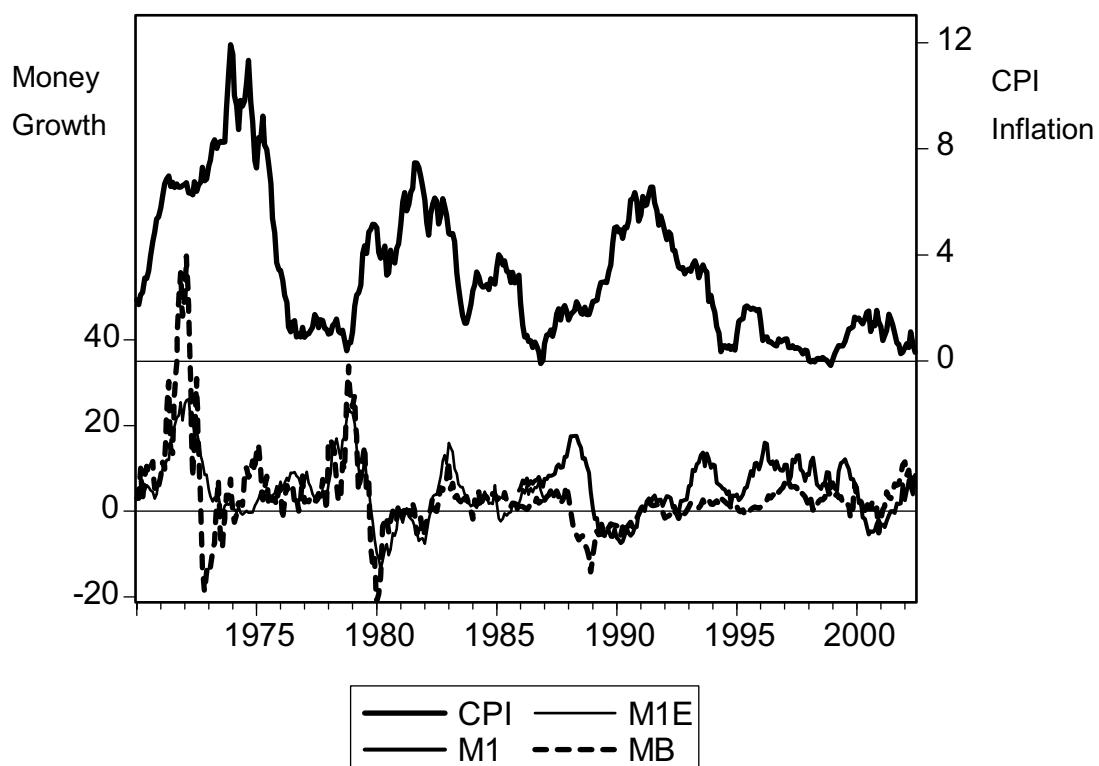
² See, for example, the speech by President Stopper to the 1971 annual meeting of the SNB.

³ SNB (1982, pp. 230-235) contains a good description of these measures.

⁴ Speech by President Stopper to the 1973 annual meeting of the SNB.

increase in the CPI had not normally reached such high levels, except during the two world wars.⁵ Of course, keeping the monetary base stable while inflation was running at over 10 percent implied an extremely restrictive monetary policy. The SNB knew that it could not maintain such a tight stance for long without inflicting undue hardship on the economy. In the summer of 1974, it began to increase the monetary base again. Moreover, it searched for a monetary policy approach that would guarantee price stability in the longer run and simultaneously allow the Swiss economy to exploit its growth potential.

Figure 1: Growth in the Monetary Base and in M1 and CPI Inflation (Percent)



Considering its views about money and inflation, the SNB, not surprisingly, opted for a monetarist approach to policy making. At the end of 1974, it announced that the following year it would increase the money stock M1 by 6 percent. From the growth target for M1, it derived and announced an analogous subsidiary target for the monetary base, which also amounted to 6 percent. It continued to fix annual growth targets for M1 until the end of 1977, but it soon ceased to publish the subsidiary targets for the monetary base. After a brief interlude of targeting the exchange rate in 1978/79, the SNB altered its monetary targeting approach at the end of 1979. It decided to bypass the aggregate M1 and to announce

⁵ During World War I, the Swiss CPI doubled because war expenditures were partly financed by printing additional bank notes. High inflation caused widespread poverty and serious social unrest. Therefore, during World War II, the authorities, as far as possible, strove to avoid inflationary financing of government expenditures. Inflation rose to a peak of about 18 percent in the summer of 1941.

annual growth targets directly for the monetary base. Although the monetary base remained the SNB's target variable until 1999, it modified its targeting approach again at the end of 1990. In lieu of announcing annual growth targets for the monetary base, the SNB introduced a medium-term targeting strategy. It began to publish five-year target paths for the monetary base. Since the medium-term strategy ran up against a number of difficulties, the SNB at the end of 1999 decided to abandon monetary targeting altogether and to switch to a policy approach based on inflation forecasts.

Due to the adoption of monetary targeting, the SNB was able to reduce inflation quickly. In the course of 1976, it managed to restore price stability as inflation fell to about 1 percent. However, while the SNB was able to keep the trend increase in the CPI at low levels, it was less successful in avoiding a temporary resurgence of inflation in 1980/81 and in 1989/90 (Fig. 1). For these reasons, until the early 1990s, the SNB's inflation performance, though good by comparison with most other central banks, was not spectacular by any means, as the annual increase of the CPI averaged 3.4 percent from 1977 to 1993. Since the beginning of 1994, the Swiss inflation record has become much better, with the average rate of increase in the CPI declining to as little as 0.8 percent per year.

The SNB's approach to monetary targeting has been analysed extensively (especially, SNB, 1982; Schiltknecht, 1983; Baltensperger, 1984; Rich, 1997; 2000; 2002; Laubach and Posen, 1997; Bernanke et al., 1999; Kugler and Rich, 2002). These studies examine the choice of monetary aggregates, as well as the reasons for switching to a medium-term targeting strategy and for abandoning monetary targeting. They also assess critically the SNB's record in achieving and maintaining price stability, and in communicating its policies to the public. Although they discuss the advantages and disadvantages of the various targeting approaches followed by the SNB, they only throw limited light on a crucial aspect of monetary targeting. They fail to provide a comprehensive analysis of the role played by the monetary aggregates in setting monetary policy and in communicating the SNB's policy decisions to the public.

The purpose of this study is to fill the gap in existing research. To identify the role played by the monetary aggregates, I examine critically the SNB's internal policy analysis. Moreover, I review the SNB's efforts in communicating its policy decisions to the public. In particular, I illustrate the difficulties of disseminating the essence of complex internal economic analysis.

My study demonstrates that the Swiss approach to monetary targeting rested on a coherent analytical framework, assigning a key role to money as a target variable and policy indicator. In a critical assessment of the approach followed by the Bundesbank, Bernanke and Mihov (1997) claim that German monetary targeting was largely inflation targeting in disguise. According to their analysis, the Bundesbank reacted directly to its inflation objective, rather than to its monetary target, when it altered interest rates. In the following, I do not address Bernanke and Mihov's critique of the Bundesbank. However, so far as Switzerland is concerned, there are both similarities and differences between the monetary targeting strategies followed until 1999 and the current approach based on inflation forecasts. I will return to this issue at the end of the paper.

I do not regard my study as a rigorous historical analysis of Swiss monetary targeting. Such an analysis will not be feasible so long as the SNB's internal records remain closed to the public.⁶ Therefore, the following analysis is based on my recollections as the SNB's chief economist from 1985 to 2001, and on numerous discussions with my predecessor, Kurt Schiltknecht, who not only served as chief economist until 1985 but was also instrumental in introducing monetary targeting to Switzerland. In addition, I rely on a variety of documents published by the SNB in order to communicate and justify its policy decisions to the public. Three categories of publications are particularly relevant:

- *Annual Policy Statement of the SNB*: This statement was normally presented at a press conference in December and summarised the SNB's policy intentions for the following year. It was subsequently published, until the end of 1983 in SNB, *Monatsbericht* (Monthly Report, in German and French)⁷ and thereafter in SNB, *Geld, Währung und Konjunktur* (Quarterly Review, in German and French, with the policy statement from 1989 onwards also in English and Italian).⁸
- *Speech by the President of the SNB to the Annual Meeting of Shareholders*:⁹ In this address, the SNB-president reviews monetary policy and the economic situation, and discusses other relevant topics (available in German and French, published as an insert to *Monatsbericht* until 1983, thereafter in the June issue of *Geld, Währung und Konjunktur*).
- *Annual Report of the SNB*: The Annual Report is used by the SNB to explain its monetary strategies and policies, and to account for its policy actions (available in German and French, for 1982 onwards also in English).
- *Quarterly Report on the Economic Situation*: This report is prepared by the economic staff and surveys economic conditions in Switzerland and abroad. It is published in *Geld, Währung und Konjunktur* or *Quartalsheft* (in German and French), and serves as input into the internal monetary policy debate. However, under annual monetary targeting, the quarterly report was not used much to inform the public about monetary policy. After the switch to the medium-term targeting strategy, it began to play a somewhat greater role in communicating policy.

Besides these publications, speeches delivered by the three members of the SNB's Governing Board and other top officials frequently offer supplementary information on Swiss monetary policy. Nevertheless, I largely restrict myself to the publications listed above. The policy pronouncements contained in these publications are approved by the Governing Board and, therefore, present the official views of the SNB.

Under monetary targeting, the SNB relied on the following procedure for setting monetary policy. In the autumn, the economic staff prepared its proposals for the policy course to be pursued the following year

⁶ Normally, the SNB will open its internal records only after 30 years.

⁷ *Monatsbericht* is now called *Statistisches Monatsheft*.

⁸ *Geld, Währung und Konjunktur* is now called *Quartalsheft*.

⁹ The SNB is structured as a public corporation listed on the Zurich stock exchange, but governed by a special law providing only limited powers to shareholders. In particular, the federal government appoints the top officials of the SNB. Moreover, only Swiss citizens may exercise their voting rights as shareholders.

and for the monetary target to be fixed. At a meeting normally held in November, the Governing Board discussed the economic staff's proposals, with representatives from the operational and press departments of the SNB also participating in the debate. After the Governing Board had decided about the prospective course, it prepared, in close collaboration with the press department and the economic staff, the policy statement to be distributed to the public. The SNB-President in turn announced the intended policy course at the December press conference already mentioned above. During the year, the Governing Board regularly reviewed its monetary policy. At a minimum, these reviews took place each quarter in the context of a discussion of the economic staff's quarterly report. While the economic staff played an important advisory role, it was the Governing Board that ultimately took the policy decisions and the responsibility for the SNB's actions.¹⁰

Of course, the readers may ask what insights will be gained from a study of Swiss monetary targeting. After all, monetary targeting has gone out of fashion, even in Switzerland. Nevertheless, Swiss experience offers at least two important lessons that may continue to remain pertinent in a world dominated by inflation targeting.

First, some central banks still accord considerable importance to money in setting monetary policy. Although the SNB no longer targets money, it continues to pay attention to the monetary aggregates, notably to the money stock M3, as they provide useful information on the future development of inflation, especially on the evolution of inflation in the longer run. In the two-pillar strategy of the European Central Bank, money also plays an important role. Therefore, the question of how to use monetary aggregates as a policy guide and of how to extract relevant information on future inflation from money remains of great concern to many central banks. Swiss experience shows that the SNB at first underestimated the difficulties of extracting reliable policy signals from the monetary aggregates. These signal-extraction problems also bore on the SNB's external communication efforts. In principle, the SNB's public pronouncements closely matched its policy deeds. Occasionally, though, the clarity of its pronouncements left something to be desired. The inadequacies in the SNB's external communication invariably reflected the difficulties of disseminating to the public complex policy decisions involving a great deal of uncertainty about the likely effects of the SNB's intended actions.

Second, the SNB has acquired strong credibility as a central bank committed to preserving price stability. The SNB's credibility probably explains why Swiss interest rates – in both nominal and real terms – tend to be lower than in any other European country. I am not sure whether I can explain fully the SNB's strong credibility. Nevertheless, my study identifies several factors that are likely to have fostered credibility: The SNB always endeavoured to disclose to the public its policy objectives, as well as the measures it would take to achieve these objectives. Moreover, the SNB accepted full responsibility for price developments, especially when inflation returned temporarily in 1980/81 and 1989/90. It admitted

¹⁰ The SNB is independent from the government. However, it informs the federal government in advance of major policy decisions.

that it was mainly to blame for these lapses from the path of virtue. It also promised to make every effort to restore price stability again.

The remainder of the paper is structured as follows. Section 2 provides an overview of the SNB's targeting approach. Section 3 covers the initial period of monetary targeting and shows how the SNB determined and communicated its growth targets for M1. In Section 4, I analyse the brief interlude of exchange rate targeting and the return to an approach centred on money growth. Sections 5 and 6 review the SNB's experience with targets for the monetary base, that is, with the annual growth targets fixed until the end of 1989 and with the medium-term approach adopted thereafter. The study ends with the year 1996, when the late Markus Lusser retired as President of the SNB. Section 7 offers a summary and conclusions.

2. The Swiss Approach to Monetary Targeting: An Overview

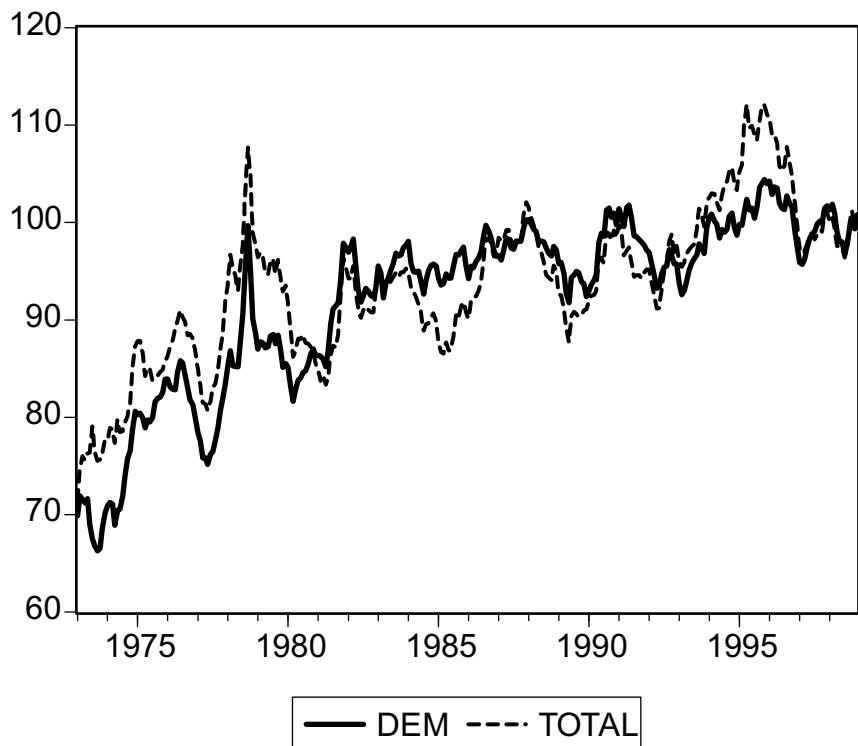
At the end of 1974, the SNB – along with the Bundesbank – was the first central bank to adopt monetary targeting. Contrary to the advice of leading monetarists, the SNB chose a flexible targeting approach that did not severely constrain its scope for discretion. It argued that a rigid monetarist framework would be unsuitable for a small open economy, strongly exposed to external shocks. The floating exchange rate of the Swiss franc, in particular, caused considerable headaches to Swiss policy makers. Its behaviour frequently defied economic fundamentals, as President Stopper noted at the SNB's annual meeting of 1974. For this reason, the SNB preferred a targeting framework that would allow for variations in M1 growth between 3 and 7 percent, depending on the level of the exchange rate. This range of variation was consistent with the observation that in the low-inflation environment of the 1950s and early 1960s, M1 growth had averaged roughly 5 percent (Schiltknecht, 1977, pp. 4-7). In other words, the SNB opted for a *state-contingent* monetary target, with the exchange rate serving as a crucial state variable to be considered in setting monetary policy. Subsequently, time and again, the SNB emphasised the state-contingent nature of its targeting approach.

With hindsight, the SNB was well advised to opt for a flexible targeting approach. The exchange rate was not the only contingency impinging on its monetary targets. Another contingency arose from potential growth. Although the SNB, at least initially, did not pay much attention to this issue, estimating the growth potential of the Swiss economy ran up against considerable difficulties in the 1970s. Since the SNB was keen on restoring price stability, ideally, it should not have expanded the money stock M1 beyond the level required to accommodate potential growth in real Swiss output.¹¹ In practice, the SNB did not strive to keep the price level constant. Instead, it set price stability equal to a modest inflation trend of about 1 percent in order to take account of measurement problems in the CPI. While the SNB was not very explicit about its definition of price stability, it nevertheless made clear that it was willing to

¹¹ Until the middle of the 1980s, GNP normally served as the measure of domestic output, thereafter GDP.

accommodate potential real growth and a modest trend increase in the CPI.¹² Therefore, provided the SNB kept the increase in M1 in the middle of the proposed target range, it was able to accommodate potential output growth of about 4 percent, as the then available econometric estimates of demand for M1 pointed to a long-run income elasticity of slightly more than unity.¹³ While such a target might have been appropriate for the 1950s and early 1960s, it proved to be too high for the post-1974 period. In his 1977 speech at the annual meeting of the SNB, President Leutwiler discussed Switzerland's economic growth prospects after the oil price shock. He warned against the unrealistic belief that the Swiss economy in the foreseeable future would be able to return the high rates of real growth recorded in the 1950s and 1960s. In the context of its monetary policy discussion for 1981, the SNB reduced to 2-3 percent its estimate of M1 growth compatible with price stability.

Figure 2: Real Exchange Rate of the Swiss Franc



An immediate concern in 1974 was the speed at which the SNB should attempt to restore price stability. There was a broad consensus that the SNB should fight inflation gradually in order to minimise the effects of its policy actions on the real economy. In practice, the policy effects turned out to be less

¹² The SNB has spelled out explicitly its definition of price stability in its annual reports since 1995 (SNB, *Annual Report* for 1994, p. 8). Upon its switch to an approach based on inflation forecasts at the end of 1999, it adopted a new definition of price stability. Like the ECB, it now sets price stability equal to a rate of increase in the CPI of less than 2 percent. Before 1995, the SNB hesitated to commit itself to a specific definition of price stability. Occasionally, though, it defined price stability as an inflation rate of 0-1 percent (Laubach and Posen, 1997, p. 24). In the following, citations from the SNB's annual report always refer to the German version.

¹³ Derived from Schiltknecht (1974, p. 22).

gradual than the SNB had anticipated because a sharp nominal and real appreciation of the Swiss franc contributed to the quick reduction in the Swiss inflation rate (Fig. 2). However, the upsurge in the exchange rate was a mixed blessing. It played havoc with Swiss monetary policy and compelled the SNB in 1978 temporarily to abandon monetary targeting in favour of a target for the exchange rate.

After the return to monetary targeting at the end of 1979, the SNB refined its policy framework. In essence, it began to fix two types of growth targets for its new policy variable, the monetary base. The first type may be regarded as a benchmark and defined the rate of growth in the monetary base consistent with price stability and potential output growth of the Swiss economy. The second type specified the rate of growth in the monetary base to be achieved in a specific year and served as the binding objective to policy makers. In the first half of the 1980s, the SNB kept the annual target above the benchmark because of its stated desire to restore price stability gradually. However, from the end of 1985 onwards, the annual targets, on the whole, matched the benchmark rate of growth in the monetary base.

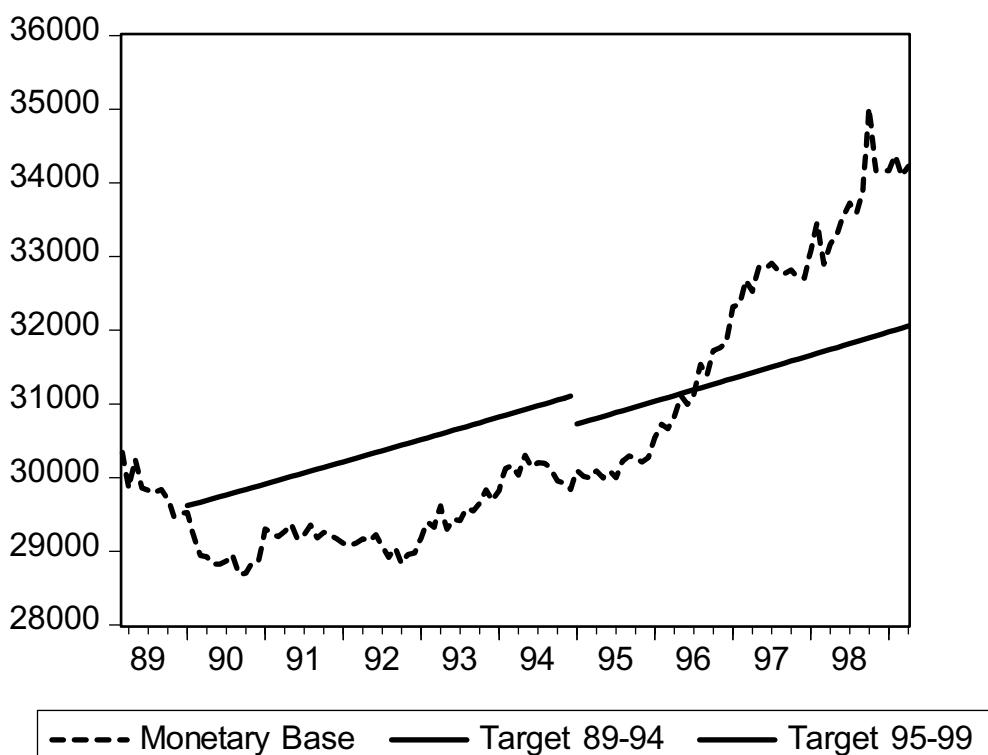
During the 1980s, the SNB realised that it had to allow for yet another contingency in its targeting approach. The new contingency concerned the stability of money demand. Although Swiss demand for base money has been reasonably stable, occasional instabilities did arise and complicated the SNB's task of gauging properly money growth. While these instabilities, for the most part, were little more than passing nuisances, the SNB faced a major problem at the beginning of 1988, when an important financial innovation led to a massive reduction in the demand for base money. At that time, the domestic banks, in collaboration with the SNB, introduced Swiss Interbank Clearing (SIC), the world's first real-time gross settlement system for interbank payments. SIC enabled domestic banks to curtail their holdings of base money. To allow banks to exploit fully the advantages of SIC, Swiss authorities agreed to cut banks' minimum reserve requirements, which had been placed at an excessively high level in the 1970s.¹⁴ Although the money-demand shift resulted from a clearly-defined and foreseeable event, the SNB was unable to forecast accurately the size of the reduction in bank holdings of base money. The regulatory change did not involve a mere cut the reserve ratio, but a drastic simplification of a highly complex system of minimum reserves. Nevertheless, as I show in Section 5, the SNB was still able to judge the degree of ease or tightness of its policy stance, despite the massive demand shift.

While the demand shift of 1988 did not undermine the SNB's ability to properly gauge its policy actions, it called into question the usefulness of annual growth targets for the money stock. The state-contingent nature of its approach precluded slavish adherence to annual monetary targets. As may be seen from Table 1, the SNB indeed frequently deviated from the annual targets set until the end of 1989. However, annual targets – if missed frequently – possessed limited informational value because they failed to capture all the factors the SNB considered in setting monetary policy. Thus, they did not serve as an effective means of communicating the SNB's intention to the public and of enhancing the SNB's credibility.

¹⁴ In Switzerland these requirements are known as liquidity requirements. In the 1970s they served as one of several instruments designed to absorb the monetary overhang created by speculative inflows of foreign capital. The reserve ratio is fixed by federal government ordinance and has not been changed since 1988.

For this reason, the SNB shifted to a medium-term targeting strategy at the end of 1990. Under the new strategy, the monetary base preserved its role as a medium- and long-term anchor for monetary policy. The SNB fixed five-year target lines for the level of monetary base. The target lines described the evolution of the monetary base that the SNB considered to be consistent with price stability and the growth potential of the Swiss economy (Fig. 3). However, the policy course to be pursued in a particular year was not determined on the basis of the five-year target lines alone. The SNB also took account of other factors such as the exchange rate and shifts in money demand.

Figure 3: Medium-Term Target Line and Actual Development of the Monetary Base (Millions of Swiss Francs)



With hindsight, money growth indeed performed an effective anchor role. In another paper (Rich, 2000, pp. 444-452), I show that over periods of several years, the evolution of the monetary base largely matched the benchmark established in the 1980s and the five-year target lines fixed after the shift to the medium-term strategy. Fig. 3 describes the evolution of the monetary base during the 1990s. It shows that the monetary base – though fluctuating substantially about the target line – displayed some mean-reverting behaviour. The substantial overshoot of the target line after 1996 did not signal an overly

expansionary monetary policy, but was due, at least in part, to an unexpected upward shift in base-money demand.¹⁵

While the existence of an effective monetary anchor helped the SNB to keep the inflation trend at a relatively low level, the Swiss central bank was less successful in shielding the economy from unexpected shocks temporarily disturbing price stability. Although the openness of the Swiss economy called for a flexible approach to monetary targeting, the SNB, in practice, preferred a strategy of steadily increasing the money supply. Clearly, such strategy was easier to explain to the public than frequent adjustments in the annual target.¹⁶ However, steady money growth was not an optimum strategy in the presence of major exchange-rate and money-demand shocks.¹⁷ Steady money growth also turned out to be deficient in another respect. As I indicated earlier, the SNB could not prevent a temporary surge in the inflation rate in 1980/81 and 1989/90 to over 7 and 6 percent respectively (Fig. 1). Both episodes of rising inflation occurred during business-cycle expansions resulting in high capacity utilisation and substantial overheating of the economy. As monetarists had often emphasised, steady money growth, in principle, should have acted as an automatic stabiliser of cyclical fluctuations in economic activity and the inflation rate, besides keeping the inflation trend at low levels. Therefore, during the cyclical expansions of the early and late 1980s, steady money growth should have triggered a rise in the demand for money, pushing up interest rates. The increase in interest rates in turn should have restrained the surge in economic activity and inflation. Even though steady money growth normally elicited procyclical fluctuations in interest rates, the amplitude of these movements was too small to exert a sufficiently powerful stabilising effect on economic activity and inflation.

The reason for the only weak stabilising role of steady money growth lay in the interest sensitivity of money demand. In Switzerland, both the demand for M1 and for base money are negatively related to interest rates. The interest elasticity of M1 is particularly high. The higher the interest elasticity of money demand, the weaker is the response in interest rates to cyclical movements in economic activity and the inflation rate provided the SNB pursues a strategy of steady money growth.¹⁸ Since the SNB chose interest-elastic monetary aggregates as its target variables, it could not help accepting cyclical movements in inflation unless it was prepared to modify its strategy of steady money growth. It had to undershoot its

¹⁵ The upward shift reflected an unexpected increase in the circulation of large-denomination bank notes. The reasons for this shift are unclear. It is possible that it was related to the impending introduction of the euro. Circumstantial evidence suggests that some holders of DM-notes strove to avoid direct conversion into the new common European currency by using the Swiss franc as an entrepôt.

¹⁶ The SNB in its *Annual Report* for 1979 (p. 10) pointed out that it had returned to a strategy of increasing the monetary base at a steady pace after its brief experiment with exchange rate targeting (in German: “*Verstetigung des Geldmengenwachstums*”). President Leutwiler in his 1981 speech at the SNB’s annual meeting once again emphasised the importance of steady money growth. The term “*Verstetigung*” appeared for the first time in the SNB’s policy announcement of December 1975 (SNB, *Monatsbericht*, January 1976, p. 3).

¹⁷ Even monetarists today argue that steady monetary growth is not an optimum strategy in all circumstances (see Meltzer, 1998).

¹⁸ In the 1970s, Benjamin Friedman (1977) already pointed to the consequences of interest-elastic money demand for monetary targeting.

target during cyclical expansions and take analogous actions in the opposite direction during cyclical contractions.

During the cyclical expansion of 1980/81, in particular, the SNB did not realise early enough that the increase in interest rates, triggered by its strategy of steady money growth, was too muted to quell the incipient inflationary pressures. When it finally acted by pushing money growth below the target, it had missed the chance to do much about the price increase. However, as the SNB itself had repeatedly emphasised, pre-emptive behaviour was crucial in setting monetary policy because of the long lags in the effects of its actions.¹⁹ Clearly, the SNB's predilection for steady money growth precluded effective pre-emptive behaviour. Provided the SNB continued to fix monetary targets, it could strengthen pre-emption only if it was prepared to give up its strategy of steady money growth and to take account of the business cycle in setting monetary policy. As I show in Section 5, the shift to a medium-term targeting procedure too was motivated by a desire to strengthen the SNB's pre-emptive stance.

3. The Inception of Monetary Targeting: 1974-1978

When the SNB adopted monetary targeting at the end of 1974, it assumed that inflation had reached its peak and was set to decline the following year. Since inflation was still running at about 10 percent per year, the SNB realised that it would have to fix a relatively high growth target for its policy variable. Such a target was required to accommodate, at least in part, the increase in money demand resulting from high inflation. As indicated earlier, the SNB did not wish to apply a shock therapy to the Swiss economy, but was determined to fight inflation gradually. For this reason, it chose a target of 6 percent for 1975 (Table 1), implying that M1 growth would lie in the upper part of the desirable range of 3-7 percent.²⁰

To derive the target for 1975, the SNB relied on two methods. The first one involved a forecast of the change in demand for M1 on the assumption that interest rates would remain unchanged. To this end, the SNB relied on the available econometric estimates of money demand equations. Furthermore, it needed forecasts of two other important determinants of money demand, that is, inflation and real output growth. The forecasts of inflation and output growth underlying the SNB's analysis are shown in Table 2. I should note that the SNB for a long time did not devote major resources to macroeconomic forecasting. Instead, it drew extensively on the services of external forecasting institutes.

¹⁹ In Switzerland, it takes up to three years for a change in monetary policy to affect fully the inflation rate. Therefore, the SNB from the beginning of monetary targeting stressed that monetary policy makers should not be swayed unduly by short-run events but should adopt a medium-run outlook (see President Leutwiler's speech to the SNB's 1981 annual meeting for example).

²⁰ The SNB always fixed point targets. Considering the state-contingent nature of its targets, the SNB was concerned that a target range would mislead the public into believing that the Swiss central bank possessed ample knowledge about the contingencies likely to afflict monetary policy (Schiltknecht, 1983, p. 73).

Table 1: Annual Monetary Targets of the SNB

Target for	Target Variable	Target (%) [#]	Out-come (%) [#]	Comments
1975	M1*	6	4.4	Also subsidiary monetary-base target
1976	M1*	6	7.7	Also subsidiary monetary-base target
1977	M1*	5	5.5	
1978	M1*	5	16.2	
1979	—	—	—	Temporary exchange rate target
1980	MBA	4	-0.6	Average of annualised monthly rates of change over November 1979 level
			-2.0	November 1980 over November 1979
1981	MBA	4	-0.5	
1982	MBA	3	2.6	
1983	MBA	3	3.6	
1984	MBA	3	2.5	
1985	MBA	3	2.2	
1986	MBA	2	2.0	
1987	MBA	2	2.9	
1988	MBA	3	-3.9	
1989	MBS	2	-1.9	Average of annualised monthly rates of change over the level in the fourth quarter of 1988
1990	MBS	2	-2.6	Year-on-year rate of change in the fourth-quarter level

*M1 according to the definition of 1975. In 1985 the M1 data were adjusted to include new types of transactions accounts bearing a somewhat higher rate of interest than traditional demand deposits.

[#]Unless otherwise indicated in the “Comments” column, the target and the outcome represent annual averages of year-on-year monthly rates of change.

Table 2: SNB-Forecasts of Inflation and Output Growth

As of End of	Forecast for Year	Pub- lished	CPI Inflation* (%)		Growth in real GNP/GDP* (%)	
			Forecast	Effective	Forecast	Effective
1974	1975	No	7.5	6.7	0	-7.5
1975	1976	No	3.8*	1.7	1	-0.6
1976	1977	No	— [#]	1.3	— [#]	2.8
1977	1978	No	— [#]	1.0	— [#]	0.4
1978	1979		—	3.6	—	2.8
1979	1980	No	— [#]	4.0	— [#]	4.2
1980	1981	No	3-4	6.4	0	2.4
1981	1982	No	4-5	5.7	1-2	-0.9
1982	1983	No	3-4	3.0	-1	1.4
1983	1984	No	2.6*	2.9	1.7	3.0
1984	1985	Yes	2.5	3.4	Less than 2	3.7
1985	1986	No	2	0.8	2.4	2.9
1986	1987	Yes	Less than 2	1.4	More than 2	2.0
1987	1988	Yes	2	1.9	More than 1	2.9
1988	1989	Yes	3	3.2	2	3.9
1989	1990	Yes	No less than 3	5.9	More than 2	1.9
1990	1991	Yes	4	5.3	0	-1.9
1991	1992	Yes	3-4	3.4	1	-0.9
1992	1993	Yes	2.5	2.7	0	0.5
1993	1994	Yes	2	0.9	Just over 1	0.5
1994	1995	Yes	Just under 3	1.8	2	0.5
1995	1996	Yes	1.5	0.8	1.5	0.3

*1975-80: GNP at 1970 prices, 1981-84: GNP at 1980 prices, 1985-90: GDP at 1980 prices, 1991-96: GDP at 1990 prices. For prices and output, the forecasts pertain to the percentage changes in annual averages, except for the years 1990-1993, for which the SNB forecasted the change from the fourth quarter of the current to the fourth quarter of the subsequent year. For 1994 onwards, the SNB provided forecasts for both the average and the fourth-quarter to fourth-quarter changes.

*GNP-Deflator.

#Forecast of growth in nominal final demand. For simplicity, the forecasts for nominal final demand are not indicated in the table because they cannot be compared to the data on actual GNP growth.

Considering the long policy lags, the SNB assumed that its actions to be taken in 1975 would not exert more than a negligible effect on output growth and inflation in the same year. Thus, output growth and inflation in 1975 could be treated as exogenous variables. However, as time went on, the policy measures taken in 1975 would impinge on output growth and inflation. The SNB also assumed that in the long run, money growth would be neutral and influence exclusively the inflation rate. In the short run, however, changes in monetary policy would also likely affect output and employment, though only temporarily. On these assumptions demand for M1 was expected to rise by close to 8 percent. Since forecasts of money demand remained an important feature of the SNB's analysis, I will henceforth speak of an "activity-induced change in money demand" in order to describe a demand change induced by a movement in real output and prices at given interest rates.

The second method relied on the quantity equation of money, that is, $MV=PY$, where M denotes the money supply M1, V velocity, P the GNP deflator and Y real GNP respectively. The target for the growth in M1 was derived by inserting forecasts for the rates of change in P and Y, as well as in the velocity of M1 expected to occur in 1975.²¹ This method yielded a somewhat lower forecast of the increase in M1. All in all, a target for M1 of 6 percent seemed to be a reasonable proposal.

From the growth target for M1, the SNB derived the subsidiary target for the monetary base by forecasting the multiplier linking the two monetary aggregates.²² It came to the conclusion that the monetary base would likely rise at about the same rate as the aggregate M1. Finally, from the forecast of base-money growth, the SNB established an operational target for bank reserves, that is, the banks' deposits with the SNB. The Swiss central bank preferred to operate on bank reserves, rather than on short-term interest rates, in order to manage money growth. By operating on bank reserves, both the SNB and market participants could elicit the changes in interest rates required to achieve the monetary target.

In principle, the SNB was able to control the monetary base with a reasonable degree of precision. At least until the introduction of SIC in the late 1980s, bank reserves were negatively related to short-term interest rates (Rich and Béguin, 1985, p. 92).²³ The paper-based interbank payments system obliged banks to hold ample reserves. Since it was a gross settlement system too, payments flows between banks could result in substantial variations of reserves at individual institutions. In determining their optimum level of reserves, banks took into account short-term interest rates, among other factors. Thus, if the SNB wished to increase the monetary base, it supplied additional reserves to the banks. To prompt them to absorb the additional reserves, short-term interest rates had to fall. After about half a year, lower interest rates began to stimulate demand for bank notes, notably demand for the large denominations. The lagged

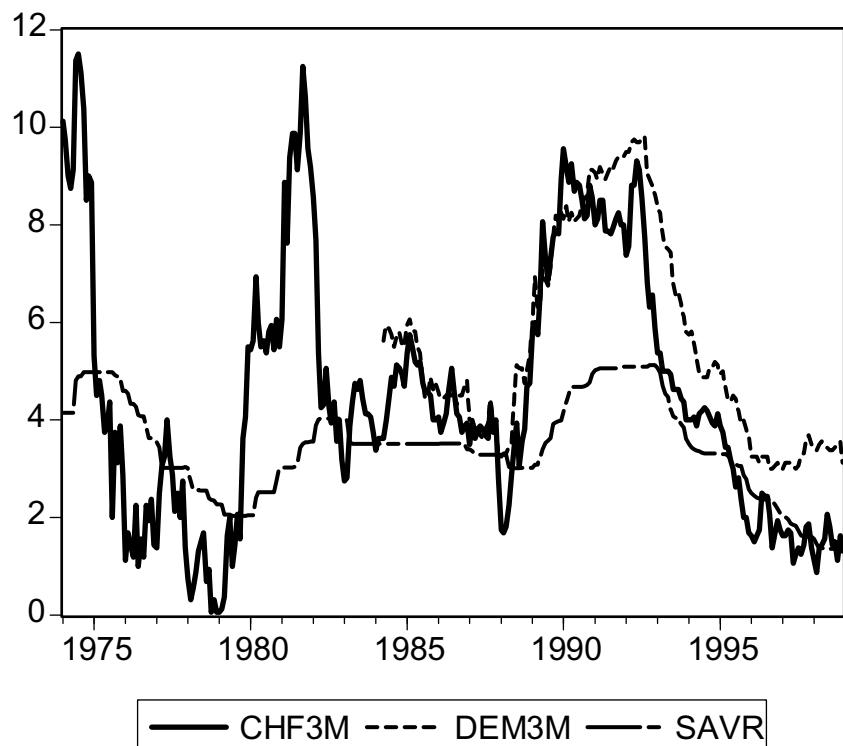
²¹ Alternatively, PY was set equal to nominal final demand (see below).

²² See Büttler et al. (1979) and Schiltknecht (1983) for the money-multiplier model employed by the SNB. In the 1980s, the SNB began to forecast the activity-induced change in the demand for base money directly, without reference to the aggregate M1. As I show below, the demand for Swiss bank notes is negatively related to changes in interest rates with a lag of several months. For this reason, in forecasting the activity-induced change in the demand for bank notes for, say, 1990, the SNB took account of the increase in interest rates in 1989. However, it assumed interest rates in 1990 to remain constant. Thus, the adjective "activity-induced" is somewhat of a misnomer.

²³ Bank reserves lost their interest sensitivity after 1988 (see Section 5).

response in the circulation of large-denomination bank notes to changes in interest rates can still be observed today. It derives from the fact that note demand reacts to changes in interest rates on savings deposits, which in turn adjust sluggishly to variations in short-term interest rates.²⁴ The relationship between the average interest rate on three-month time deposits (CHF3M) and savings deposits (SAVR) is shown in Fig. 4.

Figure 4: Interest Rates on Three-Month Euro-Swiss-Franc and Euro-Deutsche-Mark Deposits, and Domestic Savings Deposit Rate



The banks could adjust their reserves to their transactions needs and to interest rates despite the stiff minimum reserve requirements in force until 1987. To lighten the burden imposed by minimum reserves, the requirement, if at all, was only enforced at the end of the month. For this reason, the banks' demand for base money regularly rose at month ends. Window-dressing activities of banks, notably at the end of the quarter, further enhanced these intra-month movements in reserve demand. The SNB partly accommodated the month-end increase in reserve demand by adjusting the supply of base money.²⁵ For this reason, the SNB also fixed targets for the level of bank reserves at month ends. The well-known – and many would say grotesque – Swiss month-end problem largely disappeared in at the beginning of 1988, when Swiss authorities modified the regulations on minimum reserve requirements.

²⁴ See Schiltknecht (1974) and Ettlin (1989) for econometric studies of the demand for bank notes. For various reasons, Swiss large-denomination bank notes, which account for over half of the aggregate note circulation, play an important role as a store of value.

²⁵ Since the accommodation was only partial, the overnight lending rate regularly rose, often substantially, at month ends.

In its press release of December 1974,²⁶ the SNB announced its intention to increase the monetary base by 6 percent the following year. On the assumption of an unchanged money multiplier, the aggregate M1 would rise by a similar order of magnitude. The SNB stressed that the money multiplier was hard to forecast as it depended on interest rates and other variables. The wording of the press release implied that the SNB planned to fix multiple targets. It did not explicitly state that the objective for the monetary base only played a subsidiary role. However, in the *Annual Report* for 1975 the SNB made clear that the primary target referred to M1. In its policy announcement for 1976, the SNB again mentioned a target for the monetary base, but in subsequent press releases it dropped any reference to this aggregate.

The economic developments of 1975 confirmed the virtues of monetary targeting. As may be seen from Table 2, the SNB correctly predicted a further decline in the inflation rate, but its forecast of output growth was far off the mark. The oil price shock, combined with the SNB's restrictive monetary policy, caused output to drop by 7.5 percent in 1975, by far the sharpest decline recorded after World War II. Due to the severe recession, the expected activity-induced increase in money demand did not materialise. To keep M1 growth on track, the SNB was compelled to boost bank reserves and the monetary base, resulting in a sharp drop in interest rates (Fig. 4). While M1 growth fell somewhat short of the target (Table 1), the monetary base expanded by 10 percent. Thus, the monetary target acted as an automatic stabiliser of the cyclical contraction in output.

A major concern of the SNB was the continued nominal and real appreciation of the Swiss franc. The President's speech at the 1975 annual meeting and the *Annual Report* for 1975 both addressed this concern. The SNB felt it was waging a war at two fronts. On the one hand, it tried to curb the rise in the exchange rate through elaborate controls on inflows of foreign capital and through extensive interventions on the foreign exchange market. On the other hand, it was determined to reduce inflation through a controlled expansion in the money supply. Of course, as the SNB had discovered earlier, a controlled expansion in the money supply was inconsistent with unlimited purchases of foreign currencies against Swiss francs. The SNB resolved this conflict by according priority to the monetary target. It treated the planned expansion in the monetary base as the ceiling on its purchases of foreign currencies. In its *Annual Report* for 1975 the SNB provided a detailed review of its attempts to slow the Swiss franc's appreciation and of its efforts to boost base-money growth. It also stressed the state-contingent nature of its monetary target. However, it did not mention the role of the monetary target as an automatic stabiliser of cyclical movements in economic activity.

The following three years, the SNB continued to employ the analytical procedure established at the end of 1974, except that it relied on forecasts for growth in nominal final demand (defined as GNP plus imports), rather than for output growth and inflation (Table 2). Final demand was considered to be a better predictor of activity-induced changes in M1 demand than real GNP and prices. At the end of 1975, SNB decided to keep the targets for M1 and base-money growth unchanged at 6 percent. However, in its press

²⁶ SNB, *Monatsbericht*, January 1975, p. 3.

release of December 1975²⁷ the SNB explicitly pointed out that money growth would not only depend on the target but also on the state of the economy. Expecting a modest recovery of the Swiss economy, the SNB²⁸ emphasised that it would not hesitate to tighten monetary policy, should the strength of the recovery exceed expectations. It also stressed that it would not buy foreign exchange beyond the limits imposed by the monetary target. Finally, it stated categorically that financing government budget deficits through the note printing press was out of question.²⁹ At the end of 1976, the SNB, reduced the growth target for M1 to 5 percent. Even though by the summer of 1976 inflation had fallen to very low levels, the SNB still undertook to keep money growth in the middle of the desirable range in order to discourage a further appreciation of the Swiss franc on the foreign exchange market.³⁰

As indicated by Table 1, the SNB largely met its targets, except in 1978, for reasons to be discussed in Section 4. In its *Annual Report* for 1977 (pp. 10-11), the SNB portrayed its monetary policy concept. It first described the key principles enunciated by monetarists. It then argued that monetarists had developed these principles for large closed economies. Therefore, they were not applicable to Switzerland without major modifications. The Swiss concept entailed a medium-run approach to monetary targeting with two aims: Achieving and maintaining price stability, and stabilising the real economy through a strategy of steady money growth. The monetary target pertained to the aggregate M1. It was derived by taking account of forecasts for output growth and inflation, and for changes in velocity. However, in managing money growth, the SNB was prepared to react flexibly to developments on the foreign exchange market in order to curb undesirable movements in the Swiss franc exchange rate.

Consequently, the SNB in the late 1970s developed a coherent and transparent policy framework based on monetary targeting. While the internal policy analysis played a crucial role in establishing monetary targeting, it was not free of flaws. In particular, the forecasts of activity-induced changes in money demand were marred by two problems. First, it was unclear how potential output growth bore on the monetary targets set by the SNB. In its official publications, at least after 1976,³¹ the SNB stressed that its monetary target pertained to potential, rather than actual, output growth. Nevertheless, in deriving the monetary target, the SNB did not appear to consider potential output growth. Second, the monetary targets did not take account of expected movements in interest rates. In principle, they matched the anticipated activity-induced change in money demand. This procedure implied that once the targets had been fixed, interest rates would remain unchanged provided the SNB's macroeconomic forecasts materialised. Therefore, the internal analysis ignored an important issue. It failed to address the question of whether the SNB should adapt the money supply to the expected activity-induced change in demand. If the SNB failed to accommodate fully the anticipated demand change, interest rates had to move. A similar problem arose from the quantity-theory method of determining the target because the velocity of

²⁷ SNB, *Monatsbericht*, January 1976, p. 3.

²⁸ This statement was consistent with its forecast (Table 2).

²⁹ Substantial budget deficits had emerged in the wake of the sharp recession.

³⁰ SNB, *Monatsbericht*, December 1976, p. 3.

³¹ SNB, *Monatsbericht*, December 1977, p. 3.

M1 was (and still is today) highly sensitive to changes in interest rates. In forecasting M1 velocity, the SNB merely extrapolated past movements into the future, without taking account of possible changes in interest rates. However, in practice, the SNB did not necessarily accommodate the expected activity-induced changes in money demand.

4. Exchange Rate Targeting and the Return to Money: 1978-1981

4.1 Temporary Target for the Exchange Rate

In the middle of 1977 the real exchange rate of the Swiss franc began to rise again after the earlier appreciation had been partly corrected the year before (Fig. 2). The SNB and the public were both concerned about the renewed upsurge of the exchange rate as it threatened to undermine seriously the competitive position of domestic industry on the world market. Therefore, towards the end of 1977, the SNB began to intervene heavily on the foreign exchange market and continued to purchase foreign currencies the following months. The interventions led to a substantial increase in the monetary base and the aggregate M1. Moreover, the three-month rate of interest fell to less than 1 percent (Fig. 4). In addition, the authorities tightened further the restrictions on inflows of foreign capital to Switzerland. However, these measures checked the upsurge in the Swiss franc only to a limited extent. In the spring of 1978 the SNB realised that it would overshoot its monetary target by a wide margin unless it was prepared to take offsetting action. To avoid a serious target miss, it cautiously began to remove excess liquidity from the money market.³² Considering the conflict between the SNB's desire for a more stable exchange rate and the commitment to its target, market participants became convinced that the Swiss central bank would remain loyal to its monetarist beliefs. As a result, they descended on the foreign exchange market with a vengeance and pushed up the exchange rate of the Swiss franc to levels never seen before. The spectre of a drastic slump in economic activity forced the SNB to act.³³ In September 1978, the SNB contemplated introducing an exchange rate target zone for the Swiss-franc price of the DM.³⁴ The idea was to conduct non-sterilised purchases of foreign currencies until the exchange rate had reached the lower bound of the target zone. Once the situation on the foreign exchange market had calmed down, the SNB should remove again the overhang of base money that was bound to result from these interventions. However, the SNB did not adopt a target zone. Instead, at the beginning of October 1978, it announced that it would fix a temporary exchange rate target with the aim of keeping the Swiss-franc price of the DM "clearly" above 80.

³² The movements in base-money growth in 1978 reflected the SNB's actions (Fig. 1). See the *Annual Report* for 1978 (pp. 8-13) for a more detailed description of the SNB's measures.

³³ The SNB was under enormous pressure from the export sector, the federal government and the general public to halt the upsurge of the Swiss franc. The government threatened to introduce a dual foreign exchange market, under which it would have applied a fixed exchange rate to most current-account transactions and a floating exchange rate to all the other balance-of-payments flows. This was an anathema to the liberally-minded Swiss central bank. In his speech at the 1976 annual meeting of the SNB, President Leutwiler had already discussed the drawbacks of a dual foreign exchange market. This speech examined critically various possible measures the SNB could take to curb the appreciation of the Swiss franc.

³⁴ The target zone considered by the SNB was 84 to 100 CHF/100DEM.

The interventions required for defending the exchange rate target led to an explosive expansion in the monetary base and the aggregate M1. Not surprisingly, the SNB exceeded the target for 1978 by over 10 percentage points. Thanks to the policy shift, the Swiss franc began to depreciate again to more realistic levels.³⁵ At the end of 1978, the SNB did not fix a monetary target for the following year because it was uncertain about the future development of the monetary aggregates. In its press release of December 1978,³⁶ the SNB stated that it was willing to accept the monetary expansion resulting from the exchange rate target. However, in the medium term, its aim was to return to monetary targeting. At the beginning of 1979, the SNB started to reduce the monetary base again. At the annual meeting in April, President Leutwiler pointed out that the SNB was well on its way of removing the monetary overhang created by the interventions. Due to the lower exchange rate of the Swiss franc, the SNB was also able to relax the restrictions on inflows of foreign capital.

4.2 Annual Target for Monetary Base

At the end of 1979, the SNB was ready to reintroduce a monetary target. It was convinced that the overhang had been completely eliminated, both in terms of the monetary base and M1, an assessment confirmed by subsequent research (Kugler and Rich, 2002). However, the SNB decided to adopt a new target variable by substituting the monetary base for the aggregate M1. This modification was motivated by the assertion that exchange rate expectations influenced the demand for M1. In 1978, the expectation of a stronger Swiss franc had prompted the public to demand additional money in the form of M1. Had the SNB not accommodated the rise in demand for M1, it would have pushed up short-term interest rates and exacerbated the currency appreciation. By targeting the monetary base, the SNB would allow the supply of M1 to respond to shifts in exchange rate expectations and thus to play a stabilising role. Another advantage of the change in target variable lay in the SNB's ability to control directly the monetary base.

However, the switch to a base target raised two tricky problems. The first one was related to the fact that the SNB had always defined its target as an annual average of monthly year-on-year rates of change.³⁷ Since the monetary base had fallen drastically in the first months of 1979, the year-on-year rates of change were bound to be strongly negative in the early part of 1980. Therefore, the target likely to be set by the SNB would also be negative. It would be hard to explain to the public why the SNB saw a need to fix a negative target. A second problem stemmed from the available data on the monetary base. Due to the month-end bulge in bank reserves, the monetary base could not be used as sensible target variable unless the data were adjusted for this bulge. Unfortunately, satisfactory data on the monetary base - adjusted in this way - did not exist upon the target switch, as the SNB did not start to publish such a series

³⁵ In November 1978, US monetary authorities decided to take measures to fight inflation and to strengthen the dollar. This also contributed to weakening the Swiss franc.

³⁶ SNB, *Monatsbericht*, January 1979, p. 3.

³⁷ The SNB used year-on-year growth rates as a method of seasonal adjustment.

until 1981. From the end of 1980 onwards, the target referred to the adjusted monetary base (MBA), which excluded the month-end bulge in bank reserves.³⁸

Considering these difficulties, the SNB decided to increase the monetary base by 4 percent from the middle of November 1979 to the middle of November 1980. In this way, it could avoid the awkwardness of having to announce a negative target. It determined the target indirectly by deriving first an implicit objective for M1. In its press release of December 1979,³⁹ the SNB announced its plan to increase the monetary base by 4 percent, while M1 would largely remain unchanged. However, it failed to mention that the base target would rest on November 1979 as a starting point, while the increase in M1 was calculated from year-on-year rates of change. Moreover, the public was unaware that the target would refer to provisional internal data on MBA, rather than to the published unadjusted series. This was one among very few instances in which the press release omitted information that was crucial for understanding the SNB's planned policy course. Table 1 shows that the SNB in 1980 did not increase MBA as it had anticipated.⁴⁰ Two factors explain the target miss. First, inflation, fuelled by the second oil price shock, was on the rise again. For this reason, the SNB decided to pursue a more restrictive course than it had intended. Second, the demand for bank notes declined unexpectedly. This demand shift was related to the fact that the SNB at the beginning of 1980 had lifted all the remaining restrictions on inflows of foreign capital. Apparently, foreign investors had circumvented these restrictions by acquiring Swiss bank notes.⁴¹

For 1981, the SNB again fixed a growth target for MBA of 4 percent. In its press release of December 1980, the SNB stated that the target of 4 percent was a bit higher than was warranted in the medium term.⁴² It justified the relatively generous target by the uncertain prospects of the world economy. As in the preceding year, the SNB soon realised that its intended course was too easy. In his speech to the annual meeting of April 1981, President Leutwiler admitted that the SNB should have fixed a lower target as it had underestimated the inflationary pressures in the Swiss economy. He attributed the rise in inflation mainly to the monetary policy the SNB had pursued late in 1978, but he also pointed out that an unexpectedly sharp depreciation of the Swiss franc was exacerbating the upsurge in the CPI. Therefore, the SNB had decided to tighten monetary policy and to undershoot the target. Since the SNB could not halt the drop in the value of the Swiss franc, the SNB in the autumn of 1981 tightened its reins once more. As a result, interest rates rose sharply (Fig. 4). While it now succeeded in reversing the decline in the exchange rate (Fig. 2), it could not help accepting another substantial target miss (Table 1), which reflected mainly the switch to a more restrictive course, rather than renewed instabilities in money

³⁸ The SNB employed a pragmatic procedure for adjusting the monetary base. The data on MBA are available back to 1962.

³⁹ SNB, *Annual Report* for 1979, p. 10.

⁴⁰ I used two methods to calculate the effective increase in the monetary base. These calculations rely on the data for MBA that the SNB began to publish in 1981. Interestingly, the SNB in its *Annual Report* for 1980 (p. 8) did not provide a figure for the effective increase in the monetary base. It merely stated that the increase in the monetary base had been below target.

⁴¹ SNB, *Annual Report* for 1979, pp. 7-9.

⁴² SNB, *Annual Report* for 1980, p. 9.

demand. As may be seen from Table 2, the SNB underestimated significantly both inflation and output growth for 1981.

The events of 1978-81 influenced strongly the SNB's attitudes about the exchange rate. Many SNB-officials were led to conclude that central banks endeavouring to halt and reverse an excessive appreciation of the domestic currency would be penalised by a subsequent surge in inflation. President Leutwiler, after his retirement from the SNB in 1985, went as far as to assert that that the policy switch of 1978 had been a big mistake (Schiltknecht, 1989, p. 253). However, Leutwiler's harsh verdict is untenable. In principle, the SNB was well advised to ease monetary policy in response to a massive appreciation of the Swiss franc, raising the spectre of a slump in economic activity and deflation. Why did the temporary shift to an expansionary stance, though fundamentally correct, re-ignite inflation? Existing studies offer two possible answers to this question.

First, Schiltknecht (1989) argues that the SNB was too tardy in eliminating the monetary overhang created by the interventions of late 1978 and thus allowed the inflationary forces to take root again. Second, Kugler and Rich (2002) point to the flaws in the SNB's strategy of steady money growth as another possible source of inflation. The SNB may have failed to adopt a sufficiently pre-emptive stance when the economy in 1979 embarked on a cyclical expansion. Kugler and Rich test empirically these two explanations for the SNB's failure to contain inflation. They ask how the SNB would have managed M1 growth had it relied on three-year-ahead inflation forecasts, as it is doing today, rather than on monetary targets. Moreover, they assume that the aim of the SNB was to prevent an increase in the inflation rate above 3 percent.⁴³ They employ a structural vector-autoregressive model to derive the path of M1 consistent with expected inflation of 3 percent three years ahead. They conclude that both factors – tardy elimination of the monetary overhang and insufficiently strong pre-emptive behaviour – account for the surge of inflation early in the 1980s. The SNB should have reduced M1 more decisively in 1979 and pursued a much tighter course in 1980 than it actually did.

The Kugler and Rich study is not meant to imply that the SNB would likely have achieved superior results had it relied on inflation forecasts, rather than monetary targets. Their SVAR model is estimated from data for the period 1974-2001 and, therefore, uses information that was unavailable to the SNB in 1979. The SNB – in 1979 – would have encountered serious difficulties had it attempted to set monetary policy on the basis of inflation forecasts because the available data still largely pertained to the period of fixed exchange rates. Forecasting inflation under floating exchange rates with models estimated from such data would have invited a severe Lucas critique. The only realistic alternative for the SNB would have been to pay more attention to the business cycle in fixing its monetary targets. I will return to this issue in Sections 6 and 7.

The SNB's analysis of the 1978 exchange rate appreciation was not adequate for identifying the flaws in its strategy of steady money growth. It was strongly coloured by the then popular literature on currency

⁴³ This assumption seems to be consistent with the SNB's actual behaviour. As I indicated above, its aim was to lower inflation gradually.

substitution. As I indicated earlier, the SNB assumed that market expectations of a strong appreciation of the Swiss franc had prompted investors to substitute domestic for foreign money. In its view, demand for the aggregate M1 was particularly susceptible to currency substitution. Since the then available econometric studies of demand for M1 did not take account of exchange rate expectations, the error terms in the estimated demand equations were thought to provide information on the extent to which the SNB should respond to the exchange rate shock. Although in 1978 actual money demand seemed to exceed the estimated values, subsequent research by the SNB failed to uncover any statistically significant evidence of currency substitution.⁴⁴ Therefore, the attempts to extract useful information for monetary policy from the error terms in money demand equations turned out to be an exercise in futility.⁴⁵

Since there was little evidence of exchange rate expectations affecting directly the demand for M1, the SNB's decision to adopt a target for the monetary base rested on shaky foundations. Nevertheless, the switch to a base target was sensible for other reasons. The demand for M1 tends to be more sensitive to changes in interest rates than the demand for base money. Therefore, the powers of steady money growth in stabilising cyclical fluctuations of economic activity and inflation were strengthened by the decision to adopt a base target. Furthermore, demand for M1 became temporarily unstable (Belongia, 1988), due to the introduction of new types of transaction accounts. These instabilities disappeared again when the SNB adjusted the M1 series for these innovations.

In other respects, the events of the late 1970s had a salutatory effect on the SNB. Reviewing the exchange rate policies it had pursued in the 1970s, the SNB concluded that sterilised interventions on the foreign exchange market were useless in managing the exchange rate (Schiltknecht, 1983). The SNB could not really affect the exchange rate unless it was willing to change monetary policy.⁴⁶ However, in aiming monetary policy at the exchange rate, the SNB had to exercise caution because of possible conflicts between its overriding objective of price stability and the desire for a stable exchange rate. Moreover, the SNB lost its faith in the effectiveness of capital controls in influencing the exchange rate. From the early 1980s onwards, sterilised interventions became rare events indeed⁴⁷ and capital controls were never used again.

5. Tranquillity before the Storm, 1982-1990

5.1 Tranquil Period up to the Summer of 1987

The period from 1982 to the summer of 1987 did not see major events impinging on monetary policy. The renewed decline in inflation after 1981 was preceded by a cyclical contraction, starting in the summer of

⁴⁴ The SNB never published this research.

⁴⁵ The SNB was aware of McKinnon's (1982; 1984) distinction between direct and indirect currency substitution. It focused entirely on direct currency substitution (see Kugler and Rich, 2002).

⁴⁶ President Leutwiler stressed these points in his speech at the 1984 annual meeting of the SNB.

⁴⁷ In principle, the SNB no longer intervened on the foreign exchange market, except in the context of internationally co-ordinated actions. Often, its participation in such actions was only half-hearted.

1981 and lasting until the end of 1983. As a result of a strong recovery in the United States, the Swiss economy began to pick up again in 1984. Aside from a temporary slowdown in real growth in 1987, the cyclical expansion continued until 1989. Inflation declined from over 7 percent in 1981 to about 3 percent in 1982. However, the SNB was not able to reduce inflation further to the range that it had defined as price stability. Even in the second half of the 1980s, the inflation trend never fell below 2 percent, for reasons to be discussed later. The temporary drop in inflation in 1986 was due entirely to the then sharp decrease in the oil price.

The SNB used the relatively tranquil period to complete and refine the analytical framework developed for establishing its monetary policy. In particular, it fixed the flaws mentioned at the end of Section 3. From the end of 1982 onwards, it relied on a four-step procedure for determining the monetary target to be set for the following year. The first step involved establishing a benchmark for the growth in the monetary base. As indicated earlier, the benchmark equalled the average annual rate of growth in the monetary base that, over extended periods of time, the SNB thought to be consistent with potential output growth and its “objective” of low inflation. The second step featured the forecast of the activity-induced change in the demand for base money for the following year, that is, the procedure developed in the 1970s. However, in contrast to its earlier approach, the SNB now undertook to forecast base-money demand directly, rather than indirectly by way of the aggregate M1. In a third step, the SNB determined the target to be set for the following year. In determining the annual target, the SNB compared the expected activity-induced change in base-money demand with the benchmark. In particular, it explored the question of whether the annual target should differ from the benchmark. The fourth step entailed a *conditional* forecast of the movements in interest rates likely to be elicited by the policy course planned for the following year. If the expected activity-induced change in the demand for base money did not match the annual target, interest rates were bound to adjust in order to keep the growth in demand in line with the target.⁴⁸ The forecast of interest rates, of course, was conditional on the SNB’s forecast of output growth and inflation. If the macroeconomic forecasts did not materialise, movements in interest rates would also deviate from the SNB’s original expectations.⁴⁹

In principle, the SNB’s internal policy debate was structured along the lines of this analytical framework. However, in applying the framework to concrete policy decisions, the SNB faced a number of obstacles. They involved determining an appropriate benchmark, establishing and interpreting the forecasts of activity-induced changes in money demand, and the continuing problem of dealing with the exchange

⁴⁸ This point may be illustrated with an example. Suppose that the Swiss economy suffered from a cyclical contraction, with output expected to fall and the CPI expected to remain unchanged the following year. Considering the expected drop in nominal income, the SNB forecasted the activity-induced demand for base money to decrease too. Assume further that the SNB planned to increase the supply of base money by 2 percent the following year because it regarded this expansion to be consistent with potential output growth and price stability in the longer run. In this case, it had to allow interest rates to fall. The decline in interest rates served to stimulate money demand and to keep it in line with the planned increase in the supply of 2 percent. This example once again demonstrates that the monetary target elicited stabilising movements in interest rates, designed to raise output.

⁴⁹ Take the example of the preceding note. If, contrary to expectations, an increase in output caused the activity-induced demand for base money to rise by 2 percent, interest rates did not fall, but remained unchanged. Needless to say, the interest rate forecast was also conditional on a stable money demand function.

rate. A further issue concerned the question of how best to communicate to the public the economic analysis underlying the SNB's policy decisions.

As regards the benchmark, the SNB in the early 1980s considered an average increase in MBA and M1 of 2-3 percent per year to be consistent with price stability and potential output growth. At first, the benchmark did not rest on rigorous analysis. The SNB merely conjectured that potential output would grow by about 2 percent per year. Moreover, it assumed an inflation "objective" of 0-1 percent per year. This yielded an annual increase in nominal potential output of 2-3 percent. Drawing on the then available econometric research, the SNB postulated a unitary long-run elasticity of money demand with respect to output and the price level.⁵⁰ Therefore, it expected demand for both MBA and M1 to rise at the same pace as nominal potential output. In other words, it believed that the trends in the income velocities of MBA and M1 would remain constant. In 1986, the SNB investigated thoroughly the evolution of potential output, as it did not wish to depend entirely on internal conjectures and the advice of external researchers. It concluded that its earlier assumption had been realistic.⁵¹ Later reviews of its estimates did not yield significantly different results.

While the SNB was reasonably certain about potential output growth, it was less sure about the trend in the income velocity of money. As time went on, it realised that the income velocity of the monetary base followed an upward trend, as its models tended to overestimate the activity-induced increase in the demand for base money. Therefore, the SNB reduced the benchmark to 2-2.5 percent at the end of 1983 and again to 2 percent at the end of 1986. In debating the policy course to be pursued in 1988, the SNB noticed that over the period 1980-86, average annual growth in real GDP had matched closely the potential of 2 percent, while the increase in MBA had averaged only 1.7 percent. In these circumstances, inflation would have dropped to about zero percent had the income velocity remained constant. Since the CPI still tended to rise by about 2 percent per year, this implied an upward trend in velocity of the same order of magnitude, reflecting the declining importance of cash as a means of payment. Thus, even a benchmark of 2 percent was still too high. With an annual trend increase in velocity of 2 percent and nominal potential output growth of 2-3 percent, a benchmark of about 1 percent would have been more appropriate. As a matter of fact, the SNB reduced its benchmark to 1 percent upon the switch to the medium-term targeting approach at the end of 1990. Consequently, its tendency to overestimate the benchmark explains why the SNB did not succeed in lowering trend inflation below 2 percent in the course of the 1980s.

The policy announcements were coloured by the difficulties of determining an appropriate benchmark. In its press release of December 1982, the SNB disclosed for the first time a benchmark of 2-3 percent for

⁵⁰ See note 12 and Vital (1978) for the then available econometric studies of demand for M1. The SNB also assumed a constant long-run multiplier of M1 with respect to MBA. At the end of 1982, the SNB ceased to derive the target for the monetary base by way of M1 because the multiplier model no longer provided reliable forecasts. Moreover, as indicated above, the aggregate M1 became temporarily unstable. Instead, the SNB directly estimated the income elasticity of MBA and its components (Rich and Béguin, 1985; Kohli, 1985, and Ettlin, 1989).

⁵¹ This research was later published (Büttler, Ettlin and Ruoss, 1987) and yielded an estimate of potential output growth of 1.8-1.9 percent per year.

the growth in the monetary base. At the end of 1984, it reduced the benchmark to 2-2.5 percent and a year later to 2 percent.⁵² While the SNB was prepared to publish a benchmark, it was more reluctant to quantify its definition of price stability. At the 1984 annual meeting, President Leutwiler defined price stability as a rate of increase in the CPI of *close to zero* (italics mine). Because of the uncertainties about the official definition of price stability, the SNB had to resort to somewhat opaque language to explain the assumptions underlying the benchmark. At the end of 1985, it stated that MBA growth of 2 percent was consistent with potential output growth of about 2 percent in real terms and slightly more than 2 percent in nominal terms, given its assumption about the inflation trend.⁵³ Only in its *Annual Report* for 1986 (p. 7), did the SNB decide to clarify this issue and to quantify its definition of price stability.⁵⁴ Nevertheless, the public knew what the SNB was up to in the medium and long runs.

By contrast, the derivation of the annual monetary targets, for the most part, did not raise major difficulties. Until 1985, the SNB kept the annual targets somewhat above the benchmark because of its stated aim to reduce inflation gradually (Table 1). In 1983 the SNB allowed MBA growth to exceed the target in order to accommodate a decline in interest rates, elicited by the cyclical contraction of 1981-83 (Fig. 4). In this way, the SNB enhanced the stabilising powers of interest rates.⁵⁵ As a matter of fact, it had already announced at the end of May 1983 that it would increase MBA somewhat more strongly than it had anticipated. It justified its decision with a renewed real appreciation of the Swiss franc.⁵⁶ In 1985 the SNB kept MBA growth below the target. Due to a massive increase in exports, attributable to the strong appreciation of the US dollar in 1983-84, output growth far exceeded the SNB's forecast (Table 2). The SNB seized the opportunity, offered by the excellent performance of the Swiss economy, to reduce MBA growth towards the new benchmark of 2 percent that it was to announce at the end of the year.⁵⁷ However, on the whole, the SNB achieved the targets fixed for the years 1982 to 1986 (Table 1).

As far as the exchange rate was concerned, the fluctuations in the external value of the Swiss franc observed between 1982 and the summer of 1987 were more moderate than the variations recorded in the preceding decade. Nevertheless, as already indicated, the SNB continued to take account of the exchange rate, especially in 1983 and 1985. Moreover, it undertook to devise various schemes for combining monetary targeting with target zones for the exchange rate of the Swiss franc, notably against the DM. However, the internal discussions of these schemes revealed the pitfalls of a target zone. If the SNB were

⁵² SNB, *Monatsbericht*, December 1982, p. 3; SNB, *Geld, Währung und Konjunktur*, December 1984, p. 7, and December 1985, p. 247. Interestingly, in its *Annual Report* for 1985 (p. 7), the SNB stated that the benchmark had amounted to 2 percent, in contrast the figure of 2-2.5 percent announced at the end of 1984.

⁵³ SNB, *Geld, Währung und Konjunktur*, December 1985, p. 247. The SNB also pointed out that demand for base money, in particular for small-denomination bank notes, would rise less than nominal output.

⁵⁴ The quantitative definition appeared again in the *Annual Report* for 1987, p. 7. From 1988 to 1995, the SNB once again failed to provide a definition of price stability.

⁵⁵ Recall that the demand for bank notes depends on the savings deposit rate and, therefore, responds to changes in market interest rates with a lag. This explains why demand for base money still grew relatively strongly in 1983 even though the cyclical contraction was about to end.

⁵⁶ SNB, *Monatsbericht*, December 1983, p. 3; *Annual Report* for 1983, p. 7.

⁵⁷ SNB, *Annual Report* for 1985, pp. 7-8.

to adopt a narrow zone, it would de facto return to a fixed exchange rate, while a wide one would not add much to the status quo. Furthermore, a target zone not disclosed to the public would probably be counterproductive, as it might enhance exchange rate volatility. Foreign exchange traders suspecting a modification in the monetary regime might test the SNB by driving up or down the exchange rate in order to force it to reveal the upper or lower bound of the target zone. For these reasons, the SNB did not warm up to the idea of a target zone. Since 1979, the SNB has not fixed – either formally or informally – targets for the exchange rate.

Communicating to the public the analytical framework underlying the benchmark and the annual targets raised a number of problems. Since the policy announcements were addressed to the general public, rather than to economic specialists, the SNB refrained from encumbering its policy statements with complicated technical details. Therefore, the SNB's December press releases did not cover the full internal analysis, but only contained the core required for understanding its intentions. Nevertheless, from the end of 1984 onwards, the press releases became more substantial and, in general, embraced the following points:

- Statements about the annual target for the following year and the benchmark growth in the monetary base.
- The SNB's quantitative forecasts of output growth and inflation for the following year.⁵⁸
- A statement about the expected activity-induced change in the demand for base money.
- A statement about the extent to which the annual target fixed by the SNB would serve to accommodate the expected activity-induced change in the monetary base.
- A statement about the state-contingent nature of the target.

More controversial was the question of whether the SNB, at least in qualitative terms, should also disclose its conditional forecasts of interest rates, as the public might misunderstand such forecasts and mistakenly treat them as operational targets. While the SNB at first remained silent on this issue, the press releases published between December 1986 and December 1989 contained statements on expected movements in interest rates.⁵⁹

Aside from announcing regularly its monetary targets, the SNB continued to expend considerable efforts in explaining to the public the key features of its policy approach. In his speeches at the annual meetings of 1982, 1983 and 1984, President Leutwiler dealt extensively with monetary policy. He pointed out why price stability was important for the economy. He also reviewed the costs and benefits of a monetary policy aimed at achieving and preserving price stability. He stressed that everybody perceived the costs of fighting inflation, while the benefits were less easy to see. The asymmetries in recognising these costs and benefits had contributed to the world-wide surge in inflation in the 1960s and 1970s. Moreover, during

⁵⁸ Table 2 shows that the SNB began to publish its macroeconomic forecasts at the end of 1984. For reasons escaping my memory, it failed to publish forecasts for 1986.

⁵⁹ SNB, *Geld, Währung und Konjunktur*, December 1986, p. 297; December 1987, p. 231; December 1988, p. 271, and December 1989, p. 292.

the recession of 1981-83, Leutwiler admonished the SNB's critics, who were calling for an easier monetary policy in order to stimulate employment. Although a loose monetary policy might relieve temporarily the unemployment problem, he maintained, the SNB would run the risk of fuelling inflation in the longer run. Central banks performing their tasks properly could not help becoming unpopular at times. The SNB would lose its credibility if it were to depart from its stability-oriented course in an effort to gain short-term popularity. Finally, he replied to demands for low interest rates. He emphasised that a painless route to low interest rates did not exist. Instead, low interest rates were a reward to countries prepared to follow sensible monetary and fiscal policies.

5.2 The storm of 1987-1990

In 1987, the real exchange rate of the Swiss franc once again reached levels (Fig. 2) that created difficulties for the domestic economy. A slowdown in real growth (Table 2) suggested that the cyclical expansion was coming to an end. Internal demand remained the only source of growth in the Swiss economy, while exports were stagnating. In the summer of 1987, the SNB realised that it would overshoot its monetary target unless it was prepared to curtail bank reserves and raise interest rates. In normal circumstances, the SNB would have stuck to its target and allowed interest rates to go up. However, it decided against curbing money growth because it was concerned that a rise in interest rates would magnify the upward pressures on the real exchange rate. Furthermore, after the stock market crash of October 1987, Swiss banks, like their counterparts in the United States, endeavoured to augment their liquidity. As a result, short-term interest rates began to rise sharply. In an effort to avert a liquidity squeeze, the SNB supplied additional base money to the banks. For these reasons, the SNB exceeded the target for 1987 by about one percentage point (Table 1).⁶⁰

The discussions about the policy course to be pursued in 1988 were overshadowed by the dire forecasts of world economic growth that began to appear after the stock market crash. Analysts argued that central banks should avoid the mistakes committed after 1929, when overly restrictive monetary policies had contributed to turning another major stock market crash into a severe depression. In addition to world economic developments, the launch of SIC complicated the SNB's task of setting monetary policy. As indicated earlier, the introduction of SIC was coupled with a simplification and relaxation of minimum reserve requirements, causing considerable uncertainty about the future development of base-money demand.

In these difficult circumstances, the SNB decided to rely on two scenarios for setting its policy course. The first scenario abstracted from the impending financial innovations and rested on the assumption that demand for base money would continue to evolve along past patterns. Considering its forecasts of output growth and inflation (Table 2), the SNB expected the activity-induced demand for base money to increase by 3 percent. If it were to keep the target a 2 percent, interest rates would have to rise. The uncertain prospects of the world economy and the high real exchange rate of the Swiss franc ruled out an increase

⁶⁰ SNB, *Annual Report* for 1987, p. 8.

in interest rates. In addition, data collected by the SNB indicated that ownership of equity among Swiss non-banks was more widespread than in other Continental European countries. This implied that the reduction in household wealth, resulting from the stock market crash, might exert a detrimental effect on consumption.⁶¹ Therefore, the first scenario called for a rise in the target to 3 percent. In the second scenario the SNB took account of the expected downward shift in money demand that was likely to arise from the impending financial innovations. Unfortunately, it was impossible to estimate reliably the extent of this shift. Internal research suggested that in 1988 demand for base money might drop by as much as 3 percent in response to the financial innovations.

Because of these uncertainties, the SNB decided to lift the target to 3 percent. In its press release of December 1987, the SNB pointed to the possibility of a fall in base-money demand that might call for undershooting the target. However, due to the brevity of the press release,⁶² the public did not fully grasp the complexities of the analysis underlying the SNB's policy decision. In particular, the SNB failed to spell out fully the meaning of an annual monetary target in the presence of major financial shocks.⁶³

Immediately after the new reserve requirement regime had entered into force, the banks began to cut their holdings of base money. Bank reserves fell more quickly and more strongly than had been anticipated. As may be seen from Table 1, the demand shift assumed such proportions that the SNB was compelled to undershoot its target by about 7 percentage points. Furthermore, the banks' preference for a rapid reduction in their reserve holdings caused short-term interest rates temporarily to fall to very low levels. Nevertheless, the SNB was slow in adjusting the supply of base money to the fast drop in demand. At the SNB's annual meeting of April 1988, President Languetin justified this procedure with a desire to ease the banks' adjustment to the new financial environment.

In the spring and summer of 1988, it became increasingly clear that the expected slump in the world economy would not materialise. On the contrary, a strong global recovery began to stimulate economic activity in Switzerland and elsewhere in Europe.⁶⁴ Since the Swiss economy was already operating near full employment, the signs of a strong recovery conjured up the prospects of inflationary overheating.⁶⁵ Obviously, the SNB should not have shifted to an easy monetary policy at the end of 1987. For this reason, the SNB in the summer of 1988 decided to switch back to a restrictive stance. Due to the SNB's sluggish response to the drop in base-money demand, however, short-term interest rates continued to stay relatively low. Only in November 1988 did they start to rise above the levels they had attained before the

⁶¹ See Rich (1988). Data collected by the SNB suggested that Swiss non-banks held about 20 percent of their financial wealth in the form of equity, as compared with a share of 6 percent in Germany. The Swiss share was similar to those recorded for the United States and Canada.

⁶² SNB, *Geld, Währung und Konjunktur*, December 1987, p. 231. The 1987 statement was shorter than any other press release published in the SNB's Quarterly Review after 1983.

⁶³ As a matter of fact, the SNB in its press release of December 1986 had already discussed the consequences of SIC for monetary policy, but it did not take up this analysis in its policy statement for 1988 (SNB, *Geld, Währung und Konjunktur*, December 1986, pp. 208-209).

⁶⁴ Note that real GDP increased by 2.9 percent in 1988 as compared with a forecast of 1 percent by the SNB (Table 2).

⁶⁵ The boom setting in during the spring and summer of 1988 also triggered a bubble in real estate and housing prices that burst early in the 1990s and caused severe problems among Swiss mortgage banks.

stock market crash (Fig. 4). Therefore, partly against the SNB's intentions, monetary policy remained expansionary during much of the rest of 1988. The OECD (1989, p. 44) argued that MBA would have attained a growth rate of 4 percent in 1988 in the absence of any financial innovations.⁶⁶ Monetary policy turned out to be even easier than the SNB had foreseen at the end of 1987.

In December 1988, the SNB reduced the target again to 2 percent. Since activity-induced money demand was expected to increase by 4 percent, the SNB in its press release of December 1988 explicitly stated that it foresaw a rise in interest rates. It also stressed the continuing uncertainties with regard to the banks' reserve behaviour.⁶⁷ However, the SNB once again underestimated the cyclical expansion in the Swiss economy (Table 2), as the booming world economy continued to buttress domestic growth. Furthermore, Swiss franc strength gave way to a pronounced weakness pushing up the prices of imported goods (Fig. 2). In all likelihood, the decline in the Swiss franc exchange rate stemmed from the fact that the Bundesbank too was compelled to tighten severely monetary policy, as indicated by the sharp increase in German interest rates (Fig. 4). The SNB became concerned that the dangerous mix of continuing strong growth and domestic currency weakness might elicit a new bout of inflation. Therefore, early in 1989, it tightened further its monetary reins. In his speech to the annual meeting of April 1989, President Lusser emphasised that with hindsight, the industrialised countries, including Switzerland, had pursued overly expansionary monetary policies in the past three years. Since the course originally fixed for 1989 was still too easy, the SNB would undershoot its target of 2 percent. As a matter of fact, the SNB, once again, missed its target by a substantial margin (Table 1). In its *Annual Report* for 1989 (p. 9), the SNB attributed about half of the deviation from the target to its tighter course and the remainder to a further decline in bank demand for base money. As a result of the SNB's restrictive stance, short-term interest rates rose from about 5 percent at the end of 1988 to close to 9 percent a year later (Fig. 4).

In its press release of December 1989, the SNB announced that it would keep the target at 2 percent. It would stick to a restrictive course, as the expected evolution of activity-induced money demand would call for interest rates to stay at their currently high levels or to rise even a bit further. The SNB would not be willing to reduce interest rates before receiving signs of a slowdown in real growth and inflation.⁶⁸ While the SNB correctly forecasted a decline in output growth, it grossly underestimated the inflationary pressures afflicting the Swiss economy (Table 2). Ushered in by a sharp increase in the oil price at the end of 1989, inflation soared to over 6 percent in the summer of 1990. In these uncomfortable circumstances, the SNB reluctantly decided once again to adopt a tighter course than it had intended at the end of the preceding year. In the summer of 1990, first indications of a slowdown in real growth appeared on the scene. Therefore, the SNB cautiously tried to relax monetary policy.⁶⁹ As a result, the monetary base began to increase again (Fig. 3). However, the economic effects of German reunification upset the SNB's

⁶⁶ Internal calculations by the SNB yielded similar results (Rich, 1997, p. 122).

⁶⁷ SNB, *Geld, Währung und Konjunktur*, December 1988, pp. 271-272.

⁶⁸ SNB, *Geld, Währung und Konjunktur*, December 1989, p. 292.

⁶⁹ The Gulf War of 1990 led to an inflow of safe-haven funds to Switzerland, temporarily pushing up the exchange rate of the Swiss franc. This provided additional scope for easing monetary policy (SNB, *Annual Report* for 1990, p. 9).

calculations. Towards the end of 1990, German interest rates began to increase again. As a result, the Swiss franc remained weak and continued to put upward pressure on the price level. Since the SNB had little choice but to return to a restrictive policy course, the monetary base did not increase any further. At the end of 1990, base-money growth for the third time in three years fell short of the SNB's target. However, the 1990 target miss no longer reflected shifts in demand for base money. It was due mainly to the necessity of pursuing a tighter course than the SNB had anticipated at the end of 1989.⁷⁰

The SNB's inability to contain inflation prompted a flood of criticism from various observers of Swiss monetary policy. Several commentators (e.g., Capitelli and Buomberger, 1990) wondered whether the SNB had really grasped the policy implications of the financial innovations introduced earlier. Since the SNB had continued to fix a monetary target for 1988, these critics maintained, it had disregarded entirely an important conclusion from monetary theory. As Poole (1970) had argued, in the presence of massive money demand shocks, a monetary target was inappropriate. In these circumstances, the monetary aggregates were liable to emit highly misleading policy signals. Not comprehending the consequences of the money demand shock, the SNB unintentionally had pursued an excessively expansionary policy course fuelling inflation in due course.

The bland press release of December 1987 indeed conveyed the impression that the SNB was unaware of the policy challenges arising from the impending financial innovations. Even so, it is wrong to argue that the SNB ignored fundamental economic analysis. In his speech to the annual meeting of April 1988, President Languetin clarified the meaning of the monetary target announced at the end of the preceding year. He pointed out that due to the demand shift, MBA growth would fall short considerably of its target. The SNB, he stressed, was in the midst of adjusting the supply of base money to the drop in demand. The slip in short-term interest rates at the beginning of 1988 would remain temporary; a correction was already under way. President Languetin reminded the audience that the SNB had deliberately opted for an expansionary course. While the economic outlook remained uncertain, though, he could detect first indications of the Swiss economy holding up better than the SNB had anticipated at the end of 1987. Subsequently, the SNB reiterated its position at several occasions. Despite these efforts to elucidate a complex policy situation, however, it never managed to free itself completely from the mistaken notion that its expansionary stance had reflected an inability to comprehend quickly enough the full consequences of SIC and the modifications in the liquidity regime.⁷¹

Another criticism addressed at the SNB concerned the causes of the surge in inflation at the end of 1989. Many analysts claimed that the SNB's easy stance of 1988 – whether deliberate or not – had triggered the subsequent increase in inflation. I should emphasise that the SNB itself delivered these arguments to its critics. As President Leutwiler had done almost a decade earlier, President Lusser in his speech at the annual meeting of April 1990 accepted responsibility for the re-emergence of inflation. The rise in

⁷⁰ SNB, *Annual Report* for 1990, pp. 9-10.

⁷¹ This criticism is all the more absurd as the SNB had been closely involved in developing SIC and had played a key role in modifying the liquidity regime. Therefore, it had studied thoroughly the policy implications of these innovations.

inflation, he stated, was attributable, at least in part, to the expansionary course the SNB, rightly or wrongly, had pursued in 1988. Despite President Lusser's admission of guilt, the reasons for the renewed surge in inflation are not as evident as one might believe at first sight.

The SNB had clearly learnt a lesson from the unfortunate episode of 1978-81. At the end of the 1980s, it endeavoured to react pre-emptively to the inflation threat, in contrast to its behaviour a decade earlier. The SNB undertook to tighten monetary policy in the autumn of 1988, about a year before inflation began to soar. Needless to say, the SNB's course would have been even more pre-emptive had it tightened already in the spring or summer of 1988. I do not know to what extent an earlier switch to monetary restriction would have moderated the price increases of late 1989 and 1990. However, there is little doubt that monetary policy in this period was complicated by at least three factors.

First, the SNB was forced to pay a price for the cautious approach it had followed in the 1980s. To minimise the output effects of its anti-inflationary monetary policy, it had attempted to achieve price stability gradually. As we saw earlier, the SNB's behaviour had been too gradual since it had not really succeeded in restoring price stability. Therefore, when the expansionary external shocks hit the Swiss economy in the late 1980s, inflation was already above the level consistent with price stability. This made it all the more difficult for the SNB to ward off the expansionary forces and to contain the price increases. Clearly, the SNB's half-hearted fight against inflation – though soothing the short-term pressures on the real economy – did not facilitate its task of preserving price stability in the longer run. As I show below, the SNB in the 1990s adopted a more determined approach to achieving and maintaining price stability.

Second, the inflationary impulses stemming from the external sector of the Swiss economy were reinforced by a variety of domestic indexing schemes that had taken root in the 1980s.⁷² A particularly pernicious scheme – still in existence today – involves the Swiss practice of linking housing rents to mortgage rates. In Switzerland rental housing plays an important role. For this reason, there is strong political pressure to prevent landlords from demanding increases in housing rents that tenants perceive to be unfair. To protect tenants, Swiss legislation features a procedure for reviewing housing rents. If tenants regard a rent increase as unfair, they may approach a court for a review of their higher rental payments. To judge the fairness of the rent increase, the court must consider the landlord's housing costs, including interest payments on mortgage debts. If mortgage rates rise, the courts will normally allow landlords to lift housing rents. Since housing rents loom large in the Swiss CPI,⁷³ inflation, at least in the short run, tends to increase if the SNB tightens monetary policy.⁷⁴ In 1989 and 1990, the SNB's anti-inflationary

⁷² One of the most important schemes – linking nominal wages to the increase in the CPI – largely disappeared in the 1990s.

⁷³ Currently, housing rents command a share of about 21 percent in the Swiss CPI basket.

⁷⁴ The short-term positive effect of interest rates on inflation is a feature of a large structural macroeconomic model (see below), used by the SNB for forecasting purposes.

monetary policy was severely hampered by the temporary stimulating effect on inflation of high interest rates.⁷⁵

Third, it is unclear whether the SNB in the late 1980s would have achieved better policy outcomes had it set its course on the basis of inflation forecasts, rather than monetary aggregates. At present, the SNB employs a variety of models for forecasting inflation and output growth (Jordan and Peytrignet, 2001). One of these is a large-scale structural model developed by Stalder (2001). Performing dynamic simulations for the 1980s and 1990s, Stalder finds that the forecasting properties of his model are satisfactory. Nonetheless, his simulations fail to account for a major portion of the pronounced increase in inflation in 1990 and 1991.⁷⁶ Interestingly, his forecasts closely match those actually published by the SNB. Thus, regardless of the type of policy strategy followed, the SNB would likely have underestimated the rise in inflation in the late 1980s and early 1990s. Even with hindsight, I cannot help feeling puzzled by the strength of the inflationary forces at that time.

The repeated and massive deviations in base-money growth from the SNB's objectives discredited entirely the practice of setting annual monetary targets. Clearly, annual monetary targets ceased to be an effective device of informing the public about the SNB's intentions.

6. Medium-Term Targets after 1990

6.1 Trial and Error: 1990-1993

At the end of 1990, the SNB announced a new policy strategy. It abandoned annual monetary targets and switched to a medium-term approach. In its press release of December 1990,⁷⁷ it stated that its aim was "to increase the monetary base to approach a medium-term expansion path." This expansion path would define the evolution of the monetary base that the SNB considered being consistent with price stability and potential output growth of the Swiss economy. In the past, the SNB had argued that average growth in the monetary base of 2 percent would suffice to guarantee price stability in the medium run. After re-examining the analysis underlying its benchmark for the monetary base, the SNB decided to fix the medium-term target at 1 percent per year. The reduction in the benchmark, the SNB pointed out, was motivated by two factors. First, ongoing innovations in the payments system had increased somewhat the trend growth in the income velocity of the monetary base. Second, and more important, the introduction

⁷⁵ This explains why mortgage rates frequently give rise to fervent political debates. In 1990, the federal government went so far as to suggest a temporary ceiling on mortgage rates. Due to strong opposition from the SNB, this unwise populist proposal was not implemented (SNB, *Annual Report* for 1990, p. 9).

⁷⁶ See Stalder, 2001, Chart 3b. The numerical values of the forecasts for CPI inflation underlying Chart 3b, on average, are 3.2 percent for 1990 and 4.2 percent for 1991. They are derived from within-sample dynamic simulations and represent one-year-ahead quarterly forecasts (information obtained from Stalder by e-mail on 18 November 2002). The effective inflation rates amounted to 5.9 and 5.3 percent respectively (Table 2). Stalder models Swiss monetary policy with the help of a Taylor rule. This does not imply that the SNB actually followed a Taylor rule. As I show elsewhere (Rich, 2002, especially Fig. 6), the SNB's approach to monetary targeting yielded a path for short-term interest rates that frequently agreed with that derived from a Taylor rule.

⁷⁷ SNB, *Geld, Währung und Konjunktur*, December 1990, pp. 273-74.

of SIC and the modification of reserve requirements had altered substantially the composition of the monetary base. Bank notes now accounted for the lion's share of the monetary base.⁷⁸ Since the trend increase in income velocity was more pronounced for bank notes than for bank reserves, the compositional change had pushed up trend growth in velocity for the monetary base as a whole.

The SNB stressed that it had decided to retain monetary targeting because of the strong leading-indicator role of money. In Switzerland, growth in the monetary base provided reliable information on the evolution of inflation in the medium and long runs. However, money growth was not a good predictor of short-term movements in the inflation rate. To stabilise inflation both in the short and long runs, the SNB would have to look at other indicators, besides money. Depending on the signals emitted by these additional indicators, the SNB might have to push money growth temporarily above or below the medium-term target. In particular, if a weak Swiss franc and/or a vigorous cyclical expansion abroad were to fuel domestic inflation, the increase in interest rates, triggered by a strategy of steady expansion in the monetary base, might not be sufficiently large to stabilise the price level. Therefore, to strengthen the stabilising role of monetary policy, the SNB would have to lower temporarily base-money growth below the medium-term target of 1 percent.

The SNB also pointed out that it would continue to rely on the monetary base as its target variable. After examining various alternatives, it had not found a better target variable than the monetary base. The money stock M1 was also a good predictor of medium- and long-term movements in the inflation rate. However, due to its high interest sensitivity, the aggregate M1 was even less effective in stabilising short-term fluctuations in the inflation rate than the monetary base. Moreover, the SNB ruled out a target for the aggregate M3 because of its poor quality as a predictor of future inflation.⁷⁹

Although the SNB retained the monetary base as a target variable, it ceased to rely on MBA. Instead, it set its medium-term target for a new version of the monetary base, that is, the seasonally adjusted monetary base (MBSA). The introduction of SIC and the modification of minimum reserve requirements had altered the attributes of the monetary base in another respect: The infamous month-end peaks in bank reserves had largely vanished. Therefore, the SNB decided to apply standard seasonal adjustment procedures to the monetary base. The annual targets for 1989 and 1990 had already been based on MBSA. Contrary to past practice, the target for 1990 had been defined as the percentage change in MBSA between the fourth quarter of 1989 and the fourth quarter of 1990.⁸⁰ After 1990, the annual percentage

⁷⁸ The share of bank notes in the monetary base rose from about 70 to 90 percent and more after 1988.

⁷⁹ These comments on alternative aggregates were based on research conducted by two staff members of the SNB (Fischer and Peytrignet, 1990). In the meantime, M3 has become a much better predictor of future inflation.

⁸⁰ The target for 1989 also referred to the increase over the level recorded in the fourth quarter of the previous year. However, the SNB decided to compare the target with the average annualised monthly rates of change in MBSA relative to the fourth quarter of 1988 (Table 1). The rate of change in MBSA, therefore, did not depend on the level reached in the fourth quarter of 1989 alone. The SNB dropped this complicated procedure for calculating the annual rate of change in MBSA the following year because it was incomprehensible to the public.

change in MBSA, as reported by the SNB, always referred to the level in the fourth quarter over the level in the same period the year before.⁸¹

As a more general point, the SNB emphasised that strict monetary targeting was unsuitable in the current environment, which was characterised by considerable uncertainty, arising particularly from German reunification. Since German monetary authorities would probably be compelled to keep interest rates at a high level, the SNB was unsure about how fast it could achieve its goal of increasing the monetary base to approach the medium-term expansion path. The SNB did not expect domestic interest rates to fall quickly because a rapid decrease would have weakened further the Swiss franc and exacerbated the upward pressures on the domestic price level.

The public welcomed the SNB's willingness to give up strict monetary targeting and to take account of other indicators besides money. It understood that in the current uncertain environment the SNB had little choice but to follow a flexible approach. However, the press release of December 1990 also raised various concerns among the public. Some observers of Swiss monetary policy believed that the SNB was about to shift to a discretionary policy approach. They bemoaned the vagueness of the press release, which did not commit the SNB to a precise policy framework. It is indeed true that the SNB's policy announcement of 1990 was not exemplary for its precision and clarity. Although the press release provided a comprehensive general explanation of the SNB's medium-term strategy, it omitted three elements that were essential for understanding the new approach. These omissions were attributable to the fact that the SNB had not managed to tie up all the loose ends of the new medium-term strategy before the announcement of December 1990.

The first omission concerned the length of the target period. The medium-term nature of the new approach implied that the length of the target period depended on the business cycle. Over a full cycle, the SNB would undertake to expand MBSA at an average rate of 1 percent per year. However, within the cycle, the SNB, if necessary, would push money growth above or below the medium-term target. In general, it would keep money growth below 1 percent during the expansion phase and above 1 percent during the contraction phase of the business cycle. Even so, the SNB considered a target period of 3 to 5 years, which was shorter than the length of a typical business cycle. It was concerned that a period exceeding 3 to 5 years would fail to limit effectively its discretion in managing money growth. Because of these uncertainties, the SNB at first did not specify the length of the target period. In response to media complaints about the vagueness of the policy announcement, it subsequently explained that it was thinking in terms of a target period lasting 3 to 5 years.

The second omission concerned the "medium-term expansion path" envisaged by the SNB – a far trickier issue than the length of the target period. Observers of Swiss monetary policy generally assumed that the SNB would strive to keep the monetary base on a trend line starting at the level of MBSA recorded in the

⁸¹ To estimate the activity-induced change in money demand, therefore, the SNB began to forecast the fourth-quarter-over-fourth-quarter change in the CPI and output. Later, it provided forecasts for both the fourth-quarter-over-fourth-quarter and the year-over-year changes in these variables (Table 2).

fourth quarter of 1990 and implying average annual growth of 1 percent. However, this interpretation of the SNB's intentions did not accord with the logic of the medium-term approach. On the contrary, strict application of the new approach called for a starting point of the expansion path that would lie substantially above the level of MBSA recorded in the fourth quarter of 1990. As may be gleaned from Fig. 3, MBSA at the end of 1990 was at a very low level, due to the restrictive course the SNB had pursued since the autumn of 1988. Once the SNB was ready to ease monetary policy again, short-term interest rates, which were still at roughly 8 percent, would have to fall drastically. Therefore, the SNB would have to raise money growth, at least for a while, above the medium-term target of 1 percent in order to accommodate the drop in interest rates. If the SNB were to prevent base-money growth from rising temporarily above 1 percent, the decline in interest rates would not be sufficiently large and monetary policy would be far too restrictive. The slowdown in real growth that had started in the summer of 1990 was about to develop into a veritable recession. Thus, since an overly restrictive course would prolong unnecessarily the impending recession, it was imperative to choose a strategy allowing for a temporary surge in money growth.

While the logic of the medium-term approach was clear, the SNB was less certain about the best way of communicating this idea to the public. Obviously, the SNB – at the end of 1990 – could not simply announce that it intended to keep money growth at an average of 1 percent over the next 3 to 5 years. Because the SNB, sooner or later, would be obliged to boost money growth, it would likely overshoot the medium-term target. By setting an unrealistic medium-term objective prone to be missed, the SNB would needlessly discredit monetary targeting. For this reason, the SNB adopted another solution. It derived a medium-term target line for the *level* of MBSA, which it considered being in sympathy with price stability in the medium and long runs. Such a line could be obtained if the SNB extended the target period back to the end of 1989, with the fourth-quarter level of MBSA in that year serving as the starting point for the medium-term target line. The slope of the target line of course equalled the medium-term target of 1 percent. The medium-term target line derived in this way is exhibited in Fig. 3.

Once the target line was fixed, it was easy to describe the SNB's intentions. Its aim was to push MBSA up to the target line over the next 3 to 5 years. However, for the end-of-1990 to the end-of-1994 segment of the target period, this was not equivalent to stating that average growth in MBSA would amount to 1 percent. Over this subperiod, growth in MBSA – by the laws of mathematics – would have to exceed 1 percent if the SNB was to reach the target line. Of course, the SNB could not determine the target line with scientific precision. For this reason, it was reluctant to disclose to the public the exact location of the target line. Only at the end of 1992 did the SNB clarify this issue when it revealed that the starting point for calculating the medium-term target of 1 percent matched the actual level of MBSA recorded in the fourth quarter of 1989.⁸² In the *Annual Report* for 1992 (p. 9) the SNB also published a chart showing the target line.

⁸² SNB, *Geld, Währung und Konjunktur*, December 1992, p. 312.

The third element missing in the press release of December 1990 was a statement about the SNB's intentions for the immediate future. While the press release informed the public about the indicators guiding monetary policy, it was silent about the policy course the SNB planned to pursue in the coming months. The press and other observers of monetary policy quickly realised that in the absence of an annual target, they did not really know what the SNB was up to in the immediate future. To fill this void, President Lusser, in his speech at the annual meeting of April 1991, announced that in the future the Swiss central bank would publish – at the beginning of each quarter – a forecast of the average level of MBSA in the subsequent three months.⁸³ In addition, he confirmed that the targeting period would equal 3 to 5 years.

Another, albeit less burning, issue concerned the controllability of MBSA. The financial innovations of the late 1980s had not only altered the composition of the monetary base. They had also eliminated to a large extent the interest sensitivity of the demand for bank reserves. This affected the SNB's ability to control MBSA. Before 1988, a decision to ease monetary policy had lead to an instantaneous increase in the monetary base because the decline in short-term interest rates, resulting from the easier monetary policy, had caused the demand for bank reserves to rise. After 1988, an easing of monetary policy no longer worked in this way. MBSA only began to increase a few months later, after a reduction in the rate on savings deposits had prompted the demand for bank notes to expand. In principle, the SNB could still control MBSA. However, it could no longer look at MBSA in order to judge the degree of monetary ease or tightness emanating from its current policy stance, as current movements in MBSA reflected the policy measures taken a few months earlier. Instead, the SNB increasingly relied on short-term interest rates as a barometer of monetary ease or tightness.⁸⁴ To facilitate judging the SNB's policy stance, the Governing Board in September 1993 instructed the economic staff to furnish regularly internal guidelines on the evolution of interest rates considered to be consistent with its planned course of action. These guidelines were not disclosed to the public but used by the SNB's operational department in managing bank liquidity.

As the SNB had feared at the end of 1990, the international environment complicated considerably its task of fighting inflation without inflicting undue hardship on the real sectors of the domestic economy. In 1991 the SNB continued to pursue the course initiated the year before and tried to expand cautiously MBSA. In effect, the SNB's course was a bit more expansionary than indicated by the recorded growth in MBSA because of a further downward shift in the demand for bank reserves. To the SNB's dismay, inflation remained stubbornly high in 1991. Therefore, the inflation figure of 5.3 percent attained in the fourth quarter of 1991 once again exceeded the SNB's forecast (Table 2).

In its press release of December 1991,⁸⁵ the SNB stressed that the international environment severely limited its room for manoeuvre. The high level of interest rates in Europe, reflecting the tight monetary

⁸³ See SNB, *Monatsbericht*, April 1991, p. 3, and *Geld, Währung und Konjunktur*, March 1991, p. 31, for the first such statements.

⁸⁴ The SNB discussed the problems arising from the control of MBSA in its *Annual Report* for 1991, p. 9.

⁸⁵ SNB, *Geld, Währung und Konjunktur*, December 1991, p. 318.

policy pursued by the Bundesbank, continued to put downward pressure on the Swiss franc, which in turn kept domestic inflation relatively high. Nonetheless, inflation, the SNB maintained, would decline gradually, while real growth would recover hesitantly, at best. The evolution of domestic interest rates would depend on the future development of the domestic economy. Considering the uncertainties arising from the international environment, the SNB could not help issuing a relatively vague press release even though it made clear that it would continue to pay a great deal of attention to the exchange rate. As a matter of fact, the SNB in March 1992 was confronted with a sharp depreciation of the Swiss franc (Fig. 2), resulting from euphoria about the proposed new common European currency, elicited by the passage of the Maastricht Treaty. The SNB, reluctantly, decided to tighten monetary policy because it was afraid that the turmoil on the foreign exchange market would undermine its anti-inflationary policy course. After all, inflation, though declining, still amounted to almost 5 percent. As a result, interest rates rose again, causing MBSA to contract (Fig. 3). Fortunately, the SNB did not maintain its tight stance for long. The crisis in the European Monetary System breaking out in the summer of 1992 reversed the trend in the Swiss franc exchange rate (Fig. 2). The much-awaited appreciation of the Swiss franc allowed the SNB to reduce significantly domestic interest rates even though German rates remained high until well into 1993 (Fig. 4). Because of the decline in domestic interest rates, MBSA began to rise again near the end of 1992.

In December 1992 the SNB announced that the fall in interest rates would be associated with a renewed increase in MBSA. Growth in MBSA in 1993 would probably exceed the SNB's medium-term target of 1 percent. The overshoot would be necessary if the SNB was to attain its medium-term objective.⁸⁶ As may be seen from Fig. 3, the SNB managed to push up MBSA towards the medium-term target line. Short-term domestic interest rates fell further and reached roughly 4 percent at the end of 1993. Inflation also dropped and stood at 2.5 percent in the fourth quarter of 1993, in line with the SNB's forecast. Real output remained depressed, but near the end of 1993, first signs of a recovery could be detected. The SNB admitted that it was partly responsible for the recession or stagnation in the Swiss economy that had begun in 1991 (Table 2). However, it stressed that no central bank could fight inflation without imposing real costs on the economy in the form of temporary output and employment losses.⁸⁷

The dire state of the Swiss economy prompted critics of Swiss monetary policy to argue that the SNB was following an excessively restrictive policy course. For example, at the end of 1990, Kurt Schiltknecht, the former chief economist of the SNB, complained that Swiss monetary policy makers were about to engineer an "overkill", should they continue with the tight course they had pursued in the past two years. Comparing the patterns for M1 growth and inflation recorded during the difficult period 1987-1990 with those observed during the similarly difficult period 1977-1981, Schiltknecht predicted that the rate of increase in the CPI would drop to 1 percent by the end of 1992. This implied that the SNB had effectively

⁸⁶ SNB, *Geld, Währung und Konjunktur*, December 1992, pp. 311-312. As indicated above, in its 1992 press release, the SNB also disclosed the basis for calculating the average of 1 percent. Since, by the end of 1992, the first three years of the target period had already elapsed and since the SNB did not fix a new medium-term target, the public, implicitly, was made to understand that the target period would last longer than three years.

⁸⁷ Speech by President Lusser at the 1993 annual meeting of the SNB.

conquered inflation and could now return to a substantially easier stance. Needless to say, Schiltknecht's forecast was not borne out by subsequent developments, as inflation at the end of 1992 still hovered about 3.5 percent. Like other forecasters, including the SNB, Schiltknecht underestimated the stubbornness of Swiss inflation in 1991 and 1992. I do not know what else the SNB could have done at the end of 1990 than to stick to a tight course if it was to restore price stability. Schiltknecht once again raised his critical voice in March 1992 when the SNB countered the attack on the Swiss franc by tightening monetary policy. Admittedly, one may debate whether the SNB in 1992 was well advised to tighten its course. Whatever the merits of this policy shift, one should not forget that the SNB soon began to relax monetary policy again. Therefore, I doubt that, aside from stabilising the exchange rate, the temporary move to a tighter stance exerted a major effect on economic activity.

6.2 Money as a Useful Indicator: 1994-1996

When the SNB set its policy course for 1994, the economic environment had brightened up considerably. Inflation had fallen to slightly more than 2 percent and was expected to drop further. After a painful period of protracted inflation, the SNB was about to restore price stability. Furthermore, forecasters, including the SNB, anticipated a modest recovery of the Swiss economy in 1994 (Table 2). In these circumstances, the SNB decided to increase MBSA further towards the medium-term target line, but at a slower rate than in 1993. Considering its forecasts (Table 2), the SNB expected the activity-induced increase in base-money demand to fall short of the planned expansion in supply. Therefore, the efforts to take MBSA closer to the target line would imply a further modest fall in short-term interest rates. However, a sharp drop in interest rates was not desirable because inflation had not been completely defeated yet. The SNB was also aware of the uncertainties arising from the forecasts of output growth in 1994. If output growth were to stay behind its forecast, the SNB's intention to take MBSA near the target line would call for a more substantial decline in short-term interest rates.

The press release of December 1993⁸⁸ did not mention a figure for the planned increase in MBSA for 1994. It merely stated that the SNB intended to augment MBSA by more than 1 percent, but by less than in 1993. Furthermore, the press release stated that short-term interest rates would probably decline slightly in 1994. However, a sharp drop in interest rates was not desirable, as this would conjure up the danger of a renewed surge in inflation.

Even though MBSA was on a clear upward path at the beginning of 1994 and there were also signs of output growth picking up, doubts about the robustness of the recovery lingered on. The real exchange rate of the Swiss franc continued to increase, notably against the Italian lira, which had been allowed to float after the outbreak of the EMS crisis. The real appreciation undermined the competitive position of domestic industry on the world market. Nevertheless, the Swiss economy continued to recover. MBSA, by contrast, ceased to increase in the summer of 1994 and even began to decline again. The renewed fall in MBSA was worrying in view of the still fragile state of the economy. Despite the adverse signals from

⁸⁸ SNB, *Geld, Währung und Konjunktur*, December 1993, pp. 265-266.

MBSA, the SNB decided to keep interest rates at the level attained at the end of 1993. It was concerned that the nascent cyclical recovery, combined with an impending major reform of indirect taxation, would push up inflation if it were to lower interest rates. At the beginning of 1995, Switzerland was set to introduce a value-added tax that was expected to lead to a temporary jump in inflation.⁸⁹

At the end of 1994, the SNB conducted an extensive internal debate about its policy approach. Since the starting point of the medium-term target line had been predicated to the fourth quarter of 1989, the target period of 3 to 5 years definitively came to an end. The SNB decided to stick to the medium-term approach and to set a new target line covering the five-year period from the end of 1994 to the end of 1999. It fixed the initial point of the new target line below the terminal point of the old one (Fig. 3). The downward shift in the target line was motivated mainly by two factors: First, as already indicated above, banks in 1991 had once more reduced their reserves. A further slight decline had occurred in 1994. Second, the new target line was to accommodate the one-shot increase in the CPI, triggered by the introduction of VAT and estimated to amount to 1.3 percent. Of course, the first factor implied a downward and the second an upward shift in the target line. The net effect of these two factors caused the target line to move down.⁹⁰

In the context of the debate on the medium-term strategy, the SNB also decided to lower short-term interest rates. In its *Annual Report* for 1994 (pp. 9-10), it admitted that contrary to its intentions, it had failed to reduce the negative gap between the actual level of MBSA and the medium-term target line in 1994. It attributed this failure to the downward shift in the demand for bank reserves and the lower than expected increase in the CPI. It also stressed that the shortfall in the activity-induced increase in money demand had required a monetary policy response. Although, towards the end of 1994, it had allowed short-term interest rates to decline, this corrective action had come too late to boost MBSA growth already in that year.

As to the course to be pursued in 1995, the SNB departed from relatively optimistic forecasts on output growth. Forecasters inside and outside the SNB generally expected the major European economies to pick up in 1995 and to help sustain output growth in Switzerland. It was clear that the SNB should again make every effort to push MBSA up near the medium-term target line. However, since the Swiss recovery appeared to gain momentum, the SNB did not see a need for aggressive easing of monetary policy and for reaching the target line already by the end of 1995, especially in view of the impending VAT-induced price increases. Considering its estimates of the activity-induced increase in money demand, the SNB expected short-term interest rates to fall further at first and to rise again towards the end of 1995. Of course, SNB was aware that its rosy scenario involved a significant dose of downward risk. It was determined to stick to its plans for expanding MBSA regardless of the economic situation. If real

⁸⁹ VAT replaced an old-fashioned turnover tax that involved multiple taxation of a wide range of goods, but did not cover services.

⁹⁰ SNB, *Geld, Währung und Konjunktur*, December 1994, pp. 273-274. The press release of December 1994 contained a detailed discussion of the various factors prompting the shift in the target line. It also mentioned a third and minor factor arising from a redefinition of bank reserves.

growth should turn out to be weaker than expected, the SNB's intended course of action would cause interest rates to drop more strongly than expected and act as a cyclical stabiliser. The press release of December 1994⁹¹ summarised this analysis, without providing a conditional forecast for interest rates. The SNB stressed that it was only willing to accommodate the first-round effects of VAT on the price level, but no second-round effects by way of higher nominal wages and other production costs.⁹²

As may be seen from Table 2, the SNB, along with the other forecasters, overestimated the strength of the recovery in the Swiss economy. Contrary to the wishes of the SNB, MBSA in the first months of 1995 did not return to an expansion path. For this reason, the SNB – from the spring of 1995 onwards – began to cut drastically interest rates. As a result, the three-month deposit rate fell from 4 percent in January 1995 to about 2 percent in November (Fig. 4). Fortunately, the SNB was now taking seriously the disturbing signals coming in from money growth and was allowing interest rates to deploy their stabilising function. In the first months of 1995, the outlook still seemed favourable,⁹³ but as the year wore on, dark clouds appeared on the economic horizon. Even though the neighbouring European countries continued to grow modestly, the Swiss recovery began to stall. The main reason for the new bout of anaemia afflicting the Swiss economy lay in the massive real appreciation of the Swiss franc.⁹⁴ The sharp drop in short-term interest rates helped to relieve the upward pressure on the domestic currency. After the real exchange rate of the Swiss franc had reached a high plateau in April 1995, it began to decline again towards the end of the year (Fig. 2). Moreover, growth in MBSA started to accelerate towards the end of 1995 (Fig. 3).⁹⁵ However, the easier monetary policy did not start to make an imprint on real growth until the beginning of 1997. The year 1996 saw continued stagnation of the Swiss economy, chiefly because of an unexpected slowdown in German real growth. This prompted the SNB to relax monetary policy once more in December 1995. For this reason, the three-month deposit rate fell to a low of 1.8 percent. In the summer of 1996, the SNB finally attained its objective of lifting MBSA up to the medium-term target line. Inflation remained low and fell to less than 1 percent in 1996. The VAT-induced temporary increase in the CPI turned out to be smaller than expected. Due to weak aggregate demand, firms were not able to pass on fully the new tax to consumers, at least not right away.

Even though in 1995 it had relaxed drastically monetary policy, the SNB under Markus Lusser's presidency was blamed for having prolonged the economic stagnation of the 1990s through an overly restrictive course. Certainly, had the SNB allowed short-term interest rates to fall already in the summer

⁹¹ SNB, *Geld, Währung und Konjunktur*, December 1994, p. 274.

⁹² It had explained its reaction to VAT already at earlier occasions. See, for example, the speech by President Lusser at the annual meeting of April 1994, Section 3.

⁹³ See the still relatively optimistic assessment of the Swiss economy provided by President Lusser in his speech at the annual meeting of April 1995.

⁹⁴ The SNB (*Geld, Währung und Konjunktur*, December 1995, p. 305) mentioned two other reasons for the recovery not gaining momentum in Switzerland: (1) Due to the burst of the housing bubble and the resulting emergence of a serious non-performing-loans problem, the banks had become reluctant to grant new credit. (2) During the cyclical expansion of the 1980s, the public sector had amassed high structural deficits that required correction.

⁹⁵ The SNB repeatedly stressed that it was monitoring the other monetary aggregates too (see, for example, SNB, *Geld, Währung und Konjunktur*, December 1993, p. 266). Growth in M1 had already begun to pick up at the beginning of 1995 (Fig. 1).

of 1994, it would likely have been able to ease the upward pressure on the real exchange rate of the Swiss franc. However, it is also true that the SNB began to ease monetary policy at the end of 1994. Furthermore, when in the spring of 1995 it realised that the recovery would stall again, it relaxed monetary policy decisively. Perhaps, the public did not sufficiently appreciate these efforts of counteracting the downturn in economic activity because the SNB was reluctant to emphasise its shift to monetary ease. Remembering its difficulties in the earlier period 1978-1981, it repeatedly pointed to possible conflicts between its primary task of preserving price stability and public demands for a lower real exchange rate of the Swiss franc. The obligation to preserve price stability, the SNB maintained, precluded activist measures designed to weaken the Swiss franc.⁹⁶ It was clearly the SNB's task to stress the importance of preserving price stability. However, with hindsight, the SNB would have described more accurately its actual policy course if it had admitted that it was taking account of the exchange rate in setting monetary policy and that it had eased decisively monetary policy.

7. Summary and Conclusions

After the switch to a floating exchange rate early in 1973, the SNB adopted a policy strategy based on monetary targets. From the end of 1974 to the end of 1977, it set annual growth targets for the money stock M1 and after 1979 for the monetary base. In 1991 it shifted to a medium-term targeting strategy for the monetary base. At the end of 1999, the SNB abandoned monetary targeting altogether in favour of an approach resting on inflation forecasts.

Since Swiss experience with monetary targeting has been researched extensively, my study focuses on an aspect that has not received much attention. I show how the SNB used its internal policy analysis in setting monetary policy and in communicating its decisions to the public. An examination of these issues is interesting because it sheds light on the problems the SNB encountered in trying to extract useful policy signals from money growth.

Monetary targets acted as an effective anchor prompting the SNB not to lose sight of its ultimate policy objective – price stability. Under the annual monetary targeting regime in force until the end of the 1980s, the SNB was able to develop a coherent and effective framework for analysing and communicating monetary policy. Under this framework, the SNB – relying on forecasts for real GDP growth and inflation for the following year – predicted activity-induced changes in money demand. Moreover, it compared the expected demand changes with a benchmark for money growth. The benchmark defined the trend rate of money growth that the SNB thought to be consistent with price stability and potential real growth in the Swiss economy. Until the mid-1980s, the SNB set its annual targets somewhat above the benchmark because of a desire to curb inflation gradually. From the end of 1985 onwards, it normally fixed its targets at the benchmark level. On the whole, this framework provided for a highly transparent monetary policy.

⁹⁶ See the statements to this effect in SNB, *Geld, Währung und Konjunktur*, December 1995, p. 306, and SNB, *Annual Report for 1995*, p. 9. However, in his – last – speech delivered at the annual meeting of April 1996, President Lusser explicitly stated that the SNB had exploited fully its room for manoeuvre and had attempted to soothe the pains of domestic industry by lowering short-term interest rates.

Nevertheless, annual monetary targets suffered from a number of drawbacks lessening their usefulness as a policy device. Even though the SNB stressed the state-contingent nature of its targeting approach, it preferred to pursue a strategy of steady money growth in practice. While steady money growth was normally an appropriate strategy, it was unsuitable in the presence of major unexpected shocks bound to harm the domestic economy. Such shocks included money-demand shifts and excessive movements in the exchange-rate of the Swiss franc. For this reason, annual targets did not always prompt the SNB to react appropriately to unexpected shocks. Another problem arose from cyclical fluctuations in output growth and inflation. Due to the annual targeting framework, the SNB failed to adopt a sufficiently pre-emptive stance in countering cyclical threats to price stability. Unexpected shocks also complicated the SNB's communication efforts. In difficult economic circumstances, the annual targeting framework did not necessarily prompt the SNB to choose optimum procedures for explaining its policy decisions to the public.

With the switch to the medium-term targeting approach, the SNB undertook to rectify the flaws of its annual targeting framework. The idea was to fix a medium-term target line for the monetary base, matching the trend growth in this aggregate consistent with price stability and potential growth. In the presence of major shocks threatening to disturb price stability, the SNB, if necessary, was prepared to deviate from its medium-term target line. While the medium-term strategy was superior to annual targeting, it was fraught with a variety of difficulties too.

At least initially, the SNB's efforts of explaining to the public its new and rather complex approach left something to be desired. Another difficulty arose from the question of how the SNB should take account of cyclical movements in aggregate demand. The need of recognising the cyclical state of the economy bore both on the SNB's communication efforts and its internal analysis. As to its public pronouncements, the SNB was reluctant to admit that – among other indicators – it was considering the business cycle in ascertaining the need for deviations in money growth from the medium-term target line. Its reluctance to talk about the business cycle was understandable. It had consistently emphasised that price stability should serve as the primordial objective of monetary policy. It had also warned against an activist policy approach aimed at achieving multiple objectives of high employment and price stability. In particular, it had taken great pains to convince the public of a simple point: Central banks paying too much attention to employment and output were liable to miss the overriding objective of price stability. Considering its past pronouncements, the SNB was worried that the public might mistake references to the indicator role of the business cycle for a shift to an activist policy approach. However, despite these concerns, the SNB, in practice, could not help taking account of the business cycle if it was to react pre-emptively to threats of inflation or deflation.

Recognising the business cycle also raised a tricky analytical question. The SNB realised that the required deviations from the medium-term target line could be determined only on the basis of inflation forecasts over horizons long enough to capture the full effects of destabilising shocks and of the policy reactions to such shocks. The need for longer-horizon forecasts posed a dilemma for Swiss policy makers: The SNB could either continue to stick to its medium-term target and supplement it by appropriate inflation

forecasts. Due to the instabilities in base-money demand that had popped up towards the end of 1996 (see Section 2), the SNB would have to choose a new target variable such as the aggregate M3, which had become a fairly reliable advance indicator of longer-run movements in the inflation rate. Or the SNB could move in the direction of inflation targeting and place inflation forecasts at the centre of its policy decisions, with the analysis supplemented by a discussion of the role played by money in its inflation forecasts. At the end of 1999, the SNB resolved this dilemma. It decided to abandon monetary targeting and to switch to an approach centred on inflation forecasts. It believed that inflation forecasts were easier to communicate to the public than its medium-term strategy. Moreover, the SNB harboured doubts about its ability of forecasting short-run developments in the aggregate M3.⁹⁷

The new approach is similar to monetary targeting in the sense that price stability continues to serve as the main objective of Swiss monetary policy. The monetary target was never an end in itself. It always played a subordinate role to the SNB's ultimate objective, as it served as an instrument for achieving and preserving price stability. In case of doubts about the indicator function of money, the SNB was prepared to deviate from its monetary target in order not to miss its ultimate objective. Therefore, I would not be surprised if an application of the Bernanke and Mihov (1997) analysis to the SNB were to yield similar results as for the Bundesbank.

Nevertheless, it would be misleading to characterise the SNB's monetary targeting strategy as inflation targeting in disguise. Monetary targeting and the SNB's current approach differ in a crucial respect: Under monetary targeting, the SNB centred its analysis and communication on a comparison of the activity-induced growth in money demand with an appropriate benchmark. Even though it did predict real growth and inflation, it did not base its policy decisions on inflation forecasts. These forecasts were needed only to estimate the expected activity-induced change in money demand. Upon the switch to the new approach, the nature of the SNB's forecasts altered fundamentally. They became the pivot of Swiss monetary policy. However, placing the inflation forecasts at centre stage required an extension of the forecast horizon to three years, that is, a period long enough to match the lags in the effects of monetary policy. In this way, the SNB is now able to capture all the information relevant for forecasting future inflation although money growth, in practice, still plays an important role in predicting price movements over periods exceeding two years.

In summary, despite the flaws in the SNB's monetary targeting strategy, money, for the most part, turned out to be a highly useful guide to policy makers, as it helped to keep the trend increase in the CPI at low levels. For this reason, over the last quarter of the twentieth century, the SNB managed to achieve a lower inflation rate than virtually all the other central banks. Aside from a few lapses, the SNB was also effective in communicating its policy plans to the public. Its public announcements almost always matched its internal analysis and its decisions. Moreover, the public generally understood what the SNB

⁹⁷ See Rich (2000) for a full discussion of the reasons for abandoning monetary targeting. The relationship between Swiss M3 growth and the inflation rate is complex (Jordan, et. al., 2001).

intended to do. These factors appear to account for the high degree of credibility the SNB has enjoyed to this day.

8. References

- Baltensperger, Ernst, 1984, *Geldmengenpolitik und Inflationskontrolle. Möglichkeiten, Kosten, flankierende Massnahmen*, Diessenhofen: Rüegger.
- Bernanke, Ben S., Thomas Laubach, Frederic S. Mishkin, and Adam S. Posen, 1999, *Inflation Targeting: Lessons from the International Experience*, Princeton, NJ: Princeton University Press.
- Bernanke, Ben S., and Ilian Mihov, 1997, "What does the Bundesbank target?" *European Economic Review* 41, June, pp. 1025-1053.
- Büttler, H.-J., J.-F. Gogerat, H. Schiltknecht, and K. Schiltknecht, 1979, "A multiplier model for controlling the money stock", *Journal for Monetary Economics* 5, pp. 327-341.
- Büttler, Hans-Jörg, Franz Ettlin, and Eveline Ruoss, 1987, "Empirische Schätzungen des Wachstums der potentiellen Produktion in der Schweiz", *Geld, Währung und Konjunktur* 5, March, pp. 61-71.
- Capitelli, René, and Peter Buomberger, 1990, "Zur Geldpolitik der achtziger Jahre: Einige grundsätzliche Überlegungen", *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* 126, December, pp. 535-551.
- Ettlin, Franz, 1989, "Der schweizerische Notenumlauf 1962-1988: Eine ökonometrische Untersuchung aufgrund des Cointegrations- und Fehler-Korrektur-Ansatzes", *Geld, Währung und Konjunktur* 7, September, pp. 257-268.
- Fischer, Andreas M., and Michel Peytrignet, 1990, "Are larger monetary aggregates interesting? Some exploratory evidence for Switzerland using feedback models", *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* 126, December, pp. 505-520.
- Friedman, Benjamin M., 1977, "The inefficiency of short-run monetary targets for monetary policy", *Brookings Papers on Economic Activity*, Vol. 2, pp. 293-346.
- Jordan, Thomas J., and Michel Peytrignet, 2001, "Die Inflationsprognose der Schweizerischen Nationalbank", *Quartalsheft* 19, June, pp. 54-61.
- Jordan, Thomas J., Michel Peytrignet, and Georg Rich, 2001, "The Role of M3 in the Policy Analysis of the Swiss National Bank", In: Klöckers, Hans-Joachim, and Caroline Willeke (Eds.), *Monetary Analysis: Tools and Applications*, Frankfurt am Main: European Central Bank, August, pp. 47-62.
- Kohli, Ulrich, 1985, "La demande de monnaie en Suisse: Aspects divers", *Geld, Währung und Konjunktur* 3, June, pp. 150-164.

- Kugler, Peter, and Georg Rich, 2002, "Monetary policy under low interest rates: The experience of Switzerland in the late 1970s", *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* 138, September, pp. 241-269.
- Laubach, Thomas, and Adam S. Posen, 1997, "Disciplined discretion: Monetary targeting in Germany and Switzerland", *Essays in International Finance*, No. 206, Princeton, NJ: International Finance Section, December.
- McKinnon, Ronald I., 1982, "Currency substitution and instability in the world dollar standard", *American Economic Review* 72, June, pp. 320-333.
- McKinnon, Ronald I., 1984, *An international standard for monetary stabilization*, Washington, DC: International Institute for Economics.
- Meltzer, Alan H., 1998, "Monetarism: The issues and the outcome", *Atlantic Economic Journal* 26, March, pp. 8-31.
- OECD, 1989, *Economic Surveys. Switzerland*, Paris.
- Peytrignet, Michel, and Christof Stahel, 1998, "Stability of money demand in Switzerland: A comparison of the M2 and M3 cases", *Empirical Economics* 23, pp. 437-454.
- Poole, William, 1970, "Optimal choice of monetary policy instruments in a simple stochastic macro model", *Quarterly Journal of Economics* 84, May, pp. 197-216.
- Rich, Georg, 1988, "Die Entwicklung auf den Finanzmärkten", Presentation at a panel organised by the Swiss Association of Foreign Banks, Zurich, 22 January.
- Rich, Georg, 1997, "Monetary targets as a policy rule: Lessons from the Swiss experience", *Journal of Monetary Economics* 39, June, pp. 113-141.
- Rich, Georg, 2000, "Monetary policy without central bank money: A Swiss perspective", *International Finance* 3, November, pp. 439-469.
- Rich, Georg, 2002, "Inflation and money stock targets: Is there really a difference?" In: Dwyer Gerald P., Jin-Lung Lin, Jia-Dong Shea and Chung-Shu Wu (eds.), *Monetary Policy and Taiwan's Economy*, Cheltenham: Edward Elgar, pp. 13-47.
- Rich, Georg, and Jean-Pierre Béguelin, 1985, "Swiss monetary policy in the 1970s and 1980s: An experiment in pragmatic monetarism", In: *Monetary policy and monetary regimes*, Rochester: Center for Research in Government Policy & Business, Graduate School of Management, University of Rochester, pp. 76-111.
- Schiltknecht, Kurt, 1974, "An econometric model for the financial sector of Switzerland", Economics Research Unit, University of Pennsylvania, 5/28/1974 (mimeo).
- Schiltknecht, Kurt, 1977, "Die Geldpolitik der Schweiz unter dem System flexibler Wechselkurse", *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* 113, March, pp. 1-26.

- Schiltknecht, Kurt, 1983, "Switzerland – The pursuit of monetary objectives", In: Meek, Paul (Ed.), *Central bank views on monetary targeting*, New York: Federal Reserve Bank, pp. 72-79.
- Schiltknecht, Kurt, 1989, "Geldmengenpolitik und Wechselkurs – der schweizerische Weg", In: Bub, Norbert, Dieter Duwedag, and Rudolf Richter (Eds.), *Geldwertsicherung und Wirtschaftsstabilität*, Essays in honour of Helmut Schlesinger, Frankfurt am Main: F. Knapp.
- Schiltknecht, Kurt, 1990, "Zur aktuellen Geldpolitik der Schweizerischen Nationalbank - Ein Overkill?" BZ Trust, Aktiengesellschaft, Zurich, 20 November.
- Stalder, Peter, 2001, "Ein ökonometrisches Makromodell für die Schweiz", *Quartalsheft* 19, June, pp. 62-89.
- Swiss National Bank, 1982, *75 Jahre Schweizerische Nationalbank*, Zurich: SNB, May.
- Swiss National Bank, *Annual Report*, various issues.
- Swiss National Bank, *Geld, Währung und Konjunktur*, various issues.
- Swiss National Bank, *Monatsbericht*, various issues.
- Vital, Christian, 1978, *Geldnachfragegleichungen für die Schweiz*, Zurich: Verlag Industrielle Organisation.

European Central Bank working paper series

For a complete list of Working Papers published by the ECB, please visit the ECB's website (<http://www.ecb.int>).

- 113 "Financial frictions and the monetary transmission mechanism: theory, evidence and policy implications" by C. Bean, J. Larsen and K. Nikolov, January 2002.
- 114 "Monetary transmission in the euro area: where do we stand?" by I. Angeloni, A. Kashyap, B. Mojon, D. Terlizzese, January 2002.
- 115 "Monetary policy rules, macroeconomic stability and inflation: a view from the trenches" by A. Orphanides, December 2001.
- 116 "Rent indices for housing in West Germany 1985 to 1998" by J. Hoffmann and C. Kurz., January 2002.
- 117 "Hedonic house prices without characteristics: the case of new multiunit housing" by O. Bover and P. Velilla, January 2002.
- 118 "Durable goods, price indexes and quality change: an application to automobile prices in Italy, 1988-98" by G. M. Tomat, January 2002.
- 119 "Monetary policy and the stock market in the euro area" by N. Cassola and C. Morana, January 2002.
- 120 "Learning stability in economics with heterogeneous agents" by S. Honkapohja and K. Mitra, January 2002.
- 121 "Natural rate doubts" by A. Beyer and R. E. A. Farmer, February 2002.
- 122 "New technologies and productivity growth in the euro area" by F. Visselaar and R. Albers, February 2002.
- 123 "Analysing and combining multiple credit assessments of financial institutions" by E. Tabakis and A. Vinci, February 2002.
- 124 "Monetary policy, expectations and commitment" by G. W. Evans and S. Honkapohja, February 2002.
- 125 "Duration, volume and volatility impact of trades" by S. Manganelli, February 2002.
- 126 "Optimal contracts in a dynamic costly state verification model" by C. Monnet and E. Quintin, February 2002.
- 127 "Performance of monetary policy with internal central bank forecasting" by S. Honkapohja and K. Mitra, February 2002.
- 128 "Openness, imperfect exchange rate pass-through and monetary policy" by F. Smets and R. Wouters, February 2002.

- |129 "Non-standard central bank loss functions, skewed risks, and certainty equivalence" by A. al-Nowaihi and L. Stracca, March 2002.
- |130 "Harmonized indexes of consumer prices: their conceptual foundations" by E. Diewert, March 2002.
- |131 "Measurement bias in the HICP: what do we know, and what do we need to know?" by M. A. Wynne and D. Rodríguez-Palenzuela, March 2002.
- |132 "Inflation dynamics and dual inflation in accession countries: a "new Keynesian" perspective" by O. Arratibel, D. Rodríguez-Palenzuela and C. Thimann, March 2002.
- |133 "Can confidence indicators be useful to predict short-term real GDP growth?" by A. Mourougane and M. Roma, March 2002.
- |134 "The cost of private transportation in the Netherlands, 1992-99" by B. Bode and J. Van Dalen, March 2002.
- |135 "The optimal mix of taxes on money, consumption and income" by F. De Fiore and P. Teles, April 2002.
- |136 "Retail bank interest rate pass-through: the new evidence at the euro area level" by G. de Bondt, April 2002.
- |137 "Equilibrium bidding in the eurosystem's open market operations" by U. Bindseil, April 2002.
- |138 "New" views on the optimum currency area theory: what is EMU telling us?" by F. P. Mongelli, April 2002.
- |139 "On currency crises and contagion" by M. Fratzscher, April 2002.
- |140 "Price setting and the steady-state effects of inflation" by M. Casares, May 2002.
- |141 "Asset prices and fiscal balances" by F. Eschenbach and L. Schuknecht, May 2002.
- |142 "Modelling the daily banknotes in circulation in the context of the liquidity management of the European Central Bank", by A. Cabrero, G. Camba-Mendez, A. Hirsch and F. Nieto, May 2002.
- |143 "A non-parametric method for valuing new goods", by I. Crawford, May 2002.
- |144 "A failure in the measurement of inflation: results from a hedonic and matched experiment using scanner data", by M. Silver and S. Heravi, May 2002.
- |145 "Towards a new early warning system of financial crises", by M. Fratzscher and M. Bussiere, May 2002.
- |146 "Competition and stability – what's special about banking?", by E. Carletti and P. Hartmann, May 2002.

- 147 "Time-to-build approach in a sticky price, sticky wage optimising monetary model, by M. Casares, May 2002.
- 148 "The functional form of yield curves" by V. Brousseau, May 2002.
- 149 "The Spanish block of the ESCB multi-country model" by A. Estrada and A. Willman, May 2002.
- 150 "Equity and bond market signals as leading indicators of bank fragility" by R. Gropp, J. Vesala and G. Vulpes, June 2002.
- 151 "G7 inflation forecasts" by F. Canova, June 2002.
- 152 "Short-term monitoring of fiscal policy discipline" by G. Camba-Mendez and A. Lamo, June 2002.
- 153 "Euro area production function and potential output: a supply side system approach" by A. Willman, June 2002.
- 154 "The euro bloc, the dollar bloc and the yen bloc: how much monetary policy independence can exchange rate flexibility buy in an interdependent world?" by M. Fratzscher, June 2002.
- 155 "Youth unemployment in the OECD: demographic shifts, labour market institutions, and macroeconomic shocks" by J. F. Jimeno and D. Rodriguez-Palenzuela, June 2002.
- 156 "Identifying endogenous fiscal policy rules for macroeconomic models" by J. J. Perez, and P. Hiebert, July 2002.
- 157 "Bidding and performance in repo auctions: evidence from ECB open market operations" by K. G. Nyborg, U. Bindseil and I. A. Strebulaev, July 2002.
- 158 "Quantifying Embodied Technological Change" by P. Sakellaris and D. J. Wilson, July 2002.
- 159 "Optimal public money" by C. Monnet, July 2002.
- 160 "Model uncertainty and the equilibrium value of the real effective euro exchange rate" by C. Detken, A. Dieppe, J. Henry, C. Marin and F. Smets, July 2002.
- 161 "The optimal allocation of risks under prospect theory" by L. Stracca, July 2002.
- 162 "Public debt asymmetries: the effect on taxes and spending in the European Union" by S. Krogstrup, August 2002.
- 163 "The rationality of consumers' inflation expectations: survey-based evidence for the euro area" by M. Forsells and G. Kenny, August 2002.
- 164 "Euro area corporate debt securities market: first empirical evidence" by G. de Bondt, August 2002.

- 165 "The industry effects of monetary policy in the euro area" by G. Peersman and F. Smets, August 2002.
- 166 "Monetary and fiscal policy interactions in a micro-founded model of a monetary union" by R. M.W.J. Beetsma and H. Jensen, August 2002.
- 167 "Identifying the effects of monetary policy shocks on exchange rates using high frequency data" by J. Faust, J.H. Rogers, E. Swanson and J.H. Wright, August 2002.
- 168 "Estimating the effects of fiscal policy in OECD countries" by R. Perotti, August 2002.
- 169 "Modelling model uncertainty" by A. Onatski and N. Williams, August 2002.
- 170 "What measure of inflation should a central bank target?" by G. Mankiw and R. Reis, August 2002.
- 171 "An estimated stochastic dynamic general equilibrium model of the euro area" by F. Smets and R. Wouters, August 2002.
- 172 "Constructing quality-adjusted price indices: a comparison of hedonic and discrete choice models" by N. Jonker, September 2002.
- 173 "Openness and equilibrium determinacy under interest rate rules" by F. de Fiore and Z. Liu, September 2002.
- 174 "International monetary policy co-ordination and financial market integration" by A. Sutherland, September 2002.
- 175 "Monetary policy and the financial accelerator in a monetary union" by S. Gilchrist, J.O. Hairault and H. Kempf, September 2002.
- 176 "Macroeconomics of international price discrimination" by G. Corsetti and L. Dedola, September 2002.
- 177 "A theory of the currency denomination of international trade" by P. Bacchetta and E. van Wincoop, September 2002.
- 178 "Inflation persistence and optimal monetary policy in the euro area" by P. Benigno and J.D. López-Salido, September 2002.
- 179 "Optimal monetary policy with durable and non-durable goods" by C.J. Erceg and A.T. Levin, September 2002.
- 180 "Regional inflation in a currency union: fiscal policy versus fundamentals" by M. Duarte and A.L. Wolman, September 2002.
- 181 "Inflation dynamics and international linkages: a model of the United States, the euro area and Japan" by G. Coenen and V. Wieland, September 2002.
- 182 "The information content of real-time output gap estimates: an application to the euro area" by G. Rünstler, September 2002.

- 183 "Monetary policy in a world with different financial systems" by E. Faia, October 2002.
- 184 "Efficient pricing of large-value interbank payment systems" by C. Holthausen and J.-C. Rochet, October 2002.
- 185 "European integration: what lessons for other regions? The case of Latin America" by E. Dorrucci, S. Firpo, M. Fratzscher and F. P. Mongelli, October 2002.
- 186 "Using money market rates to assess the alternatives of fixed versus variable rate tenders: the lesson from 1989-98 data for Germany" by M. Manna, October 2002.
- 187 "A fiscal theory of sovereign risk" by M. Uribe, October 2002.
- 188 "Should central banks really be flexible?" by H. P. Grüner, October 2002.
- 189 "Debt reduction and automatic stabilisation" by P. Hiebert, J. J. Pérez and M. Rostagno, October 2002.
- 190 "Monetary policy and the zero bound to interest rates: a review" by T. Yates, October 2002.
- 191 "The fiscal costs of financial instability revisited" by L. Schuknecht and F. Eschenbach, November 2002.
- 192 "Is the European Central Bank (and the United States Federal Reserve) predictable?" by G. Perez-Quiros and J. Sicilia, November 2002.
- 193 "Sustainability of public finances and automatic stabilisation under a rule of budgetary discipline" by J. Marín, November 2002.
- 194 "Sensitivity analysis of volatility: a new tool for risk management" by S. Manganelli, V. Ceci and W. Vecchiato, November 2002.
- 195 "In-sample or out-of-sample tests of predictability: which one should we use?" by A. Inoue and L. Kilian, November 2002.
- 196 "Bootstrapping autoregressions with conditional heteroskedasticity of unknown form" by S. Gonçalves and L. Kilian, November 2002.
- 197 "A model of the Eurosystem's operational framework for monetary policy implementation" by C. Ewerhart, November 2002.
- 198 "Extracting risk-neutral probability densities by fitting implied volatility smiles: some methodological points and an application to the 3M EURIBOR futures option prices" by A. B. Andersen and T. Wagener, December 2002.
- 199 "Time variation in the tail behaviour of bund futures returns" by T. Werner and C. Uppen, December 2002.

- 200 "Interdependence between the euro area and the United States: what role for EMU?" by M. Ehrmann and M. Fratzscher, December 2002.
- 201 "Euro area inflation persistence" by N. Batini, December 2002.
- 202 "Aggregate loans to the euro area private sector" by A. Calza, M. Manrique and J. Sousa, January 2003.
- 203 "Myopic loss aversion, disappointment aversion and the equity premium puzzle" by D. Fielding and L. Stracca, January 2003.
- 204 "Asymmetric dynamics in the correlations of global equity and bond returns" by L. Cappiello, R.F. Engle and K. Sheppard, January 2003.
- 205 "Real exchange rate in an inter-temporal n-country-model with incomplete markets" by B. Mercereau, January 2003.
- 206 "Empirical estimates of reaction functions for the euro area" by D. Gerdesmeier and B. Roffia, January 2003.
- 207 "A comprehensive model on the euro overnight rate" by F. R. Würtz, January 2003.
- 208 "Do demographic changes affect risk premiums? Evidence from international data" by A. Ang and A. Maddaloni, January 2003.
- 209 "A framework for collateral risk control determination" by D. Cossin, Z. Huang, D. Aunon-Nerin and F. González, January 2003.
- 210 "Anticipated Ramsey reforms and the uniform taxation principle: the role of international financial markets" by S. Schmitt-Grohé and M. Uribe, January 2003.
- 211 "Self-control and savings" by P. Michel and J.P. Vidal, January 2003.
- 212 "Modelling the implied probability of stock market movements" by E. Glatzer and M. Scheicher, January 2003.
- 213 "Aggregation and euro area Phillips curves" by S. Fabiani and J. Morgan, February 2003.
- 214 "On the selection of forecasting models" by A. Inoue and L. Kilian, February 2003.
- 215 "Budget institutions and fiscal performance in Central and Eastern European countries" by H. Gleich, February 2003.
- 216 "The admission of accession countries to an enlarged monetary union: a tentative assessment" by M. Ca'Zorzi and R. A. De Santis, February 2003.
- 217 "The role of product market regulations in the process of structural change" by J. Messina, March 2003.
- 218 "The zero-interest-rate bound and the role of the exchange rate for monetary policy in Japan" by G. Coenen and V. Wieland, March 2003.

- 219 "Extra-euro area manufacturing import prices and exchange rate pass-through" by B. Anderton, March 2003.
- 220 "The allocation of competencies in an international union: a positive analysis" by M. Ruta, April 2003.
- 221 "Estimating risk premia in money market rates" by A. Durré, S. Evjen and R. Pilegaard, April 2003.
- 222 "Inflation dynamics and subjective expectations in the United States" by K. Adam and M. Padula, April 2003.
- 223 "Optimal monetary policy with imperfect common knowledge" by K. Adam, April 2003.
- 224 "The rise of the yen vis-à-vis the ("synthetic") euro: is it supported by economic fundamentals?" by C. Osbat, R. Rüffer and B. Schnatz, April 2003.
- 225 "Productivity and the ("synthetic") euro-dollar exchange rate" by C. Osbat, F. Vijselaar and B. Schnatz, April 2003.
- 226 "The central banker as a risk manager: quantifying and forecasting inflation risks" by L. Kilian and S. Manganelli, April 2003.
- 227 "Monetary policy in a low pass-through environment" by T. Monacelli, April 2003.
- 228 "Monetary policy shocks – a nonfundamental look at the data" by M. Klaepping, May 2003.
- 229 "How does the ECB target inflation?" by P. Surico, May 2003.
- 230 "The euro area financial system: structure, integration and policy initiatives" by P. Hartmann, A. Maddaloni and S. Manganelli, May 2003.
- 231 "Price stability and monetary policy effectiveness when nominal interest rates are bounded at zero" by G. Coenen, A. Orphanides and V. Wieland, May 2003.
- 232 "Describing the Fed's conduct with Taylor rules: is interest rate smoothing important?" by E. Castelnuovo, May 2003.
- 233 "The natural real rate of interest in the euro area" by N. Giannetti and N. Valla, May 2003.
- 234 "Unemployment, hysteresis and transition" by M. León-Ledesma and P. McAdam, May 2003.
- 235 "Volatility of interest rates in the euro area: evidence from high frequency data" by N. Cassola and C. Morana, June 2003.
- 236 "Swiss monetary targeting 1974-1996: the role of internal policy analysis" by G. Rich, June 2003.