# PART I

# Introduction

**Abstract**

The purpose of this introduction to the three dissertation chapters about Swiss monetary policy is twofold. First, it sums up the main features of the Swiss National Bank's monetary policy and sketches the issues treated in the dissertation. Second, this introduction builds a context for the three parts and shows how they are related.

## 1 Subject

Monetary economics has been going through a tremendous evolutionary process since the collapse of the Bretton Woods system. It has evolved during the rational expectations and real-business-cycle (RBC) revolutions and arrived at its current rebirth, the new neoclassical synthesis (e.g. Goodfriend and King (1997)). The impact of these revolutions on the policymaking has been accordingly significant (McCallum, 1999b). It has rebounded, after an unstable decade following the breakdown of the fixed exchange rate system, into an area of low inflation, that emphasizes the concepts of central bank strategy, independence, transparency, and accountability. A massive interest in the conduct of monetary policy has been simultaneously developing, focusing in particular on monetary policy rules and indicators.

Because it has displayed a high degree of continuity, the Swiss National Bank (SNB) is sometimes considered as an exception in this evolution. Particularly since 1980, Switzerland has achieved a remarkable record of price stability. Based on a flexible and pragmatic monetary targeting strategy, the SNB has been able to restrain inflation in the long-term while considering other short-term macroeconomic goals. The Swiss monetary authority has successfully coped with overshootings of its monetary target as well. However, this high credibility has not prevented sudden and temporary increases in inflation.

Many outsiders have held up this positive record as an illustration of the benefits of monetary targeting regimes. Other have noticed its rule-like characteristics with its advantages over pure discretion. However, these positive claims have been called somewhat into question in recent years due to instabilities in the targeted aggregates and innovations on the money and financial markets. In short, as Laubach and Posen (1997) summarized, the good Swiss inflation performance is the result of a declared but not strictly followed monetary targeting strategy.

The use of monetary aggregates has been challenged both as policy instrument and indicator of monetary policy. This raises interesting questions that we discuss in the first two chapters of this dissertation. The first topic consists in discovering whether Swiss monetary policy can be captured by simple forward-looking rules depicting policy instruments other than monetary aggregates. The second subject of research analyzes monetary aggregates as indicators of monetary policy and applies modern methods, based on nonrecursive structural vector autoregressions (SVAR), to construct alternative measures of monetary policy. These issues are obviously related because they both focus on the role of monetary aggregates. In addition, they both highlight the dual function of any monetary policy variable as instrument and indicator. Finally, the third chapter concerns gross domestic product (GDP) interpolations and helps the empirical approach in the monetary chapters.

This introduction continues with a short overview of the monetary policy framework in Switzerland and the place of monetary aggregates within this framework. Section 3 reviews the Swiss and international empirical literature related to the estimation of rules and SVAR. Finally, a synopsis of the thesis closes this introduction.

# 2 Monetary Policy in Switzerland

## 2.1 Framework

Many authors have described Swiss monetary policy, so we only briefly review its main features[1]. Since the lifting of exchange rate constraints, the SNB has oriented its policy to money supply targets with the goals to establish a nominal anchor and to tie down the public's inflation expectations[2]. Hence, in the seventies, the SNB publicly announced targets for the average growth rate in the money stock $M1$. It altered its target variable in the beginning of the eighties by substituting the monetary base for $M1$. At the end of the eighties, it modified once again its targeting procedure by replacing the annual growth target by a medium-term objective for the monetary base. In the end of the nineties, the SNB has added a broader defined aggregate, namely $M3$, as an additional indicator to the growth path for $M0$.

In Switzerland, monetary aggregates fulfill two important related functions. They create an intermediate target for the precise conduct of monetary policy and also communicate an informative and transparent guideline to the public. With the help of this framework, the SNB has managed to lower inflation to sustainable levels. This good performance record, despite temporary increases in inflation, has led the SNB to pursue a simple and pragmatic strategy. The SNB, demonstrating strong commitment to the communication of its strategy to the public, has always explained that its monetary targeting, far from being an iron-clad policy rule, is in practice flexible. This pragmatism is the Swiss response to constantly evolving monetary conditions. This flexibility has led the SNB to follow simple rules with complicated explanations of outcomes rather than making the rules more complicated. This has of course come at a cost: the evaluation of targets is less transparent (Laubach and Posen, 1997).

Monetary aggregates are reliable intermediate targets and indicators, provided that they are easily manageable and that the link

[1] See the following studies for post-Bretton Woods descriptions of monetary policy in Switzerland: Bernanke, Laubach, Mishkin and Posen (1999), Dueker and Fischer (1994, 1996, 1998), Lambelet (1993), Laubach and Posen (1997), Peytrignet (1993), Peytrignet and Fischer (1991), Rich (1987, 1989, 1997), Von Furstenberg and Ulan (1998), and Wasserfallen and Kürsteiner (1994).

[2] See Argy, Brennan and Stevens (1990) for a survey about international experiences with monetary targeting.

between these aggregates and the ultimate central bank's objective - price stability - is stable over time. At the end of the eighties and during the nineties, these two conditions have been heavily challenged. The pragmatic SNB has certainly adapted its policy and fine tuned its rhetoric, but somehow not as transparently as the public - and researchers - expected. The indicator has been overshootings of the target in recent years, as well as changes in the targeted monetary aggregates after large velocity shocks that induced temporary increases in inflation. However, overshootings were surprisingly managed without a persistent rise in inflation expectations. This reveals genuine adaptation needs that defy the traditional use of monetary aggregates. At the end of 1999, the SNB has thus officially adjusted its monetary policy concept. Monetary policy decisions, in future, are based mainly on an inflation forecast that takes all relevant indicators into account. Money stock $M3$ continues nevertheless to play an important role as a monetary indicator. In implementing monetary policy, the SNB henceforth targets the interest rate level on the money market rather than the amount of liquidity. Accordingly, some authors speak of an hybrid strategy, linking inflation targeting with monetary intermediate targets, that characterizes now the SNB's strategy (Bernanke, Laubach, Mishkin and Posen, 1999). This new environment at the end of the century launches two interesting issues about SNB monetary policy.

## 2.2 Two Main Issues

These slow but indisputable mutations in SNB environment open two discussions which are the core of this dissertation. Both issues question the role of monetary aggregates in the SNB's monetary and communication policies.

- Is it possible to describe the systematic behavior of the SNB by a policy rule describing not only an aggregate, but also alternative monetary policy instruments as interest rates? We thus analyze how the SNB reacts and which policy instruments actually feed back in response to economic events.

- Is it possible to construct a new policy indicator for Swiss monetary policy, including systematic and non-systematic policy? We thus squeeze into a single indicator the overview of changing monetary conditions in Switzerland.

There does not exist much quantitative evidence for Switzerland on these questions. Moreover, the few existing empirical works provide conflicting results. Henceforth, we briefly review both national and international related literature references to build a context for the dissertation chapters.

# 3 Literature Overview

There exists a simple way to quantitatively represent the multiple interactions between an economy and a central bank[3]. Any monetary policy variable $\varkappa$ can be written as a univariate[4] equation separating the endogenous reactions of the central bank from its exogenous behavior: $\varkappa = f(\Omega') + \varepsilon(\Omega'')$. One can disaggregate the policy variable $\varkappa$ (i.e. growth rate of money stock or short-term interest rate) into a systematic portion $f(\Omega')$, based on the information set $\Omega'$ of the central bank, and an exogenous residual portion $\varepsilon$ function of $\Omega''$. On one hand, the central bank is expected, for example, to systematically respond to inflation, growth, unemployment, or exchange rate movements. This is the policy rule or reaction function of the central bank. On the other hand, the central bank has the power to non-systematically implement monetary policy that embodies the so-called monetary policy shocks. Based on such a representation, econometrics allows for the multiple use of data in order to test hypotheses and to quantify different aspects of monetary policy. This representation is used throughout the dissertation.

With empirical monetary economics, we touch a field which has internationally produced a large number of publications. As a consequence, a comprehensive literature review is beyond the scope of this dissertation. However, a brief overview of relevant publications about rule estimation and indicator construction is presented hereafter.

## 3.1 Estimation of Feedback Rules

Feedback rules focus on the systematic interactions between the monetary policy instrument $\varkappa$ and the reaction function $f(\Omega')$. We split

[3] We only sketch the intuition without focusing on the features and problems linked to such a representation.

[4] Several monetary policy variables can be represented in a multivariate setup enabling a similar separation between endogenous and exogenous behaviors.

the related literature into a normative and a descriptive side.

The normative literature engulfs all attempts to find the best systematic reactions a central bank can display with respect to economic events. We speak of policy design. The issue of designing the best rule consists in optimizing the central bank's behavior given an assumed model of the economy. Facing this optimized model, the central bank minimizes a loss function including traditional goals as inflation and growth. Then, it builds together the optimal targeting rule by incorporating the first-order conditions into the assumed model of the economy. This optimal control exercise thus reveals how the central bank has to best respond in order to minimize its loss. More precisely, it gives the best combination and form of targets and policy instruments for the central bank to apply. This approach is extensively surveyed for a closed economy in Clarida, Gali and Gertler (1999)[5].

Completing this policy design, the normative analysis goes further in carrying out robustness tests across various models due to the imperfect knowledge of the true economic model (e.g. McCallum (1999a, 1999c) and Taylor (1998)). This also serves to some extent as a protection against failures of the Lucas-critique (1977) type. In addition to the optimal control exercise, these tests are made up of impulse response functions (IRF) to investigate whether the considered rule displays desirable stabilizing features or not.

Finally, some authors (Ball (1999b), Batini and Haldane (1998, 1999), and Walsh (1998)) have extended this normative analysis to open economies. However, both the optimal control exercise and the robustness screening are controversial due to ad hoc features of the assumed models. They are thus criticized as having insufficient microeconomic foundations.

The descriptive approach explains the central bank's behavior by a rule or a reaction function. These estimations consist in searching whether the observed path of policy instruments, as monetary aggregates or interest rates, may be accurately described by an instrument rule. Various policy instruments are thus explained by some elements of $\Omega'$, as past inflation or output, and appraised in terms of root-mean-squared performance in out-of-sample simulations. The most famous examples are McCallum (1988) and Taylor (1993) rules. McCallum and Taylor further explain that central banks which follow their rule achieve a better stability and economic performance than

[5] See Ball (1999a) and Fischer (1990) for further contributions.

central banks relying only on discretion. The Taylor rule implies an interest rate reaction to inflation and output gaps, while the McCallum rule uses a growth rate of money stock corrected for changing circulation velocity of money. Some authors have extended the estimation of McCallum and Taylor rules either with additional explanatory variables or with improved estimation processes[6]. Finally, other authors, as Clarida and Gertler (1998a, 1998b), have improved these estimations using forward-looking rules where the information set $\Omega'$ contains expected variables in addition to lagged variables. All these extensions attempt to explain the observed path of monetary instruments when traditional McCallum and Taylor rules are not able to accurately describe them.

In Switzerland, many reaction function studies are backward-looking and essentially use monetary aggregates as policy instruments (e.g. Burdekin and Langdana (1990), Jeitziner (1999), Parkin (1987), and Sheehan (1992)). On the other hand, Hviding (1999) and Landmann and Jerger (1997) have focused on the Taylor-rule class. All these studies show nevertheless that it is possible to represent with some accuracy the behavior of the SNB by such instrument rules.

## 3.2 Measurement of Monetary Policy

The construction of indicators essentially focuses on methods analyzing the exogenous part $\varepsilon(\Omega'')$ of the instrument representation given in the previous section. Focusing on this element enables to isolate the exogenous component of monetary policy (i.e. to identify monetary policy) in order to understand how central banks may affect the economy. The transmission mechanism enlightens as to the effects of monetary policy and also gives hints about the applied monetary policy instruments[7]. Based on the identification, it is further possible to construct indicators either of these exogenous shocks or alternatively of the overall monetary policy stance. Isolated monetary shocks ($\varepsilon(\Omega'')$) and the systematic reaction function ($f(\Omega')$), both calculated by the same model or by separate ones, build together

[6] Extensions can be found in Gerlach and Schnabel (1999), Goodhart (1999), Peersman and Smets (1999), and Stark and Croushore (1996).

[7] See Favero (1999) for a survey about VAR models of the monetary transmission mechanism.

the overall indicator[8]. Henceforth, we review various methods to identify monetary policy and to construct policy indicators.

Historically, these issues are not new[9]. The Classics already tried to explain these phenomena in a literal way taking 'monetary policy' of the United Kingdom as an example. More recently, the identification of monetary policy and the construction of indicators, or more precisely, the effort to qualify and quantify monetary policy and its effects, have gained attention again. Recent attempts to provide measures of monetary policy fall into two categories: the so-called narrative and quantitative approaches. This major separation shows that the discussion concerning monetary indicators is mainly conducted by methodological choices and not by economic considerations.

The narrative approach includes all the attempts to qualitatively identify monetary policy as restrictive or expansionary and to analyze responses of economic agents to policy disentangled from regular responses of policy behavior to the economy. Friedman and Schwarz (1963) wrote 'A Monetary History of the United States' outlining the principal of the history of US money stock and its effects on the business cycle, describing a complete macroeconomic history over a century. They found that every depression is accounted for by prior and contemporary contractions in money. This same spirit, a search for qualitative restrictive shocks, was re-introduced by the analysis of Romer and Romer (1989). They reviewed the Federal Open Market Committee (FOMC) minutes to extract dates at which policymakers appeared to restrict the stance of monetary policy. Romer and Romer (1994) utilized these 'Romer dates' as dummy variables in different regressions to assess the transmission mechanism in America. Boschen and Mills (1991) further extended this narrative approach in building up an index of the stance of US monetary policy. They did not quantify their index, but rather provided various qualitative ranks for each turning point they identified.

In spite of certain improvements over the decades, disadvantages of this approach remain. Subjectivity and approximation in solving the circularity problem are still obstacles in separating between endogenous and exogenous monetary policy components. Moreover,

[8] An overall indicator is for example $\varkappa$, a function of $\varkappa$, or a combination of various policy instruments in case of a multivariate representation.

[9] See Walsh (1998) for an overview about identification and indicator discussions.

the assessment is only qualitative and not quantitative. It is also easier to isolate restrictive shocks than expansionary ones[10]. Finally, in a study from Leeper (1997), the exogeneity of 'Romer dates' has been heavily challenged by the evidence that they were actually influenced by past variables.

The alternative identification is the quantitative approach. The motivation is similar with the intention of quantifying qualitative directions. We now have access to sophisticated econometric techniques to identify monetary shocks and produce indicators. Our concerns center on three important directions.

First, an index-based approach using for example Monetary Conditions Index (MCI) was initiated by Hostland, Poloz and Storer (1987). MCI is a weighted average of monetary policy variables as interest rate and exchange rate. In addition to the evolution of different aggregates, searching for an alternative indicator, Lengwiler (1997) applied a MCI to Switzerland following the model used by the Bank of Canada. He discovered that this MCI could not outperform the monetary base as an indicator. For European countries, Gerlach and Smets (1996) found similar results. MCI solutions do not solve the endogeneity-versus-exogeneity problem, nor do they suppress subjective influences. This is also true for all constructions of Divisia index where weights are exogenously determined[11]. Divisia aggregates show the same flaws with their circularity problem as money stocks and MCI.

Second, the analysis of alternative monetary policies has traditionally been carried out using large-scale structural econometric models. As a result of the critique of Lucas (1977), these models fell out of favor in the eighties. Therefore, new general equilibrium (GE) models have appeared as small-scale rational expectations models, represented by RBC models or RBC-like models incorporating sluggish price adjustments and giving thus a role to monetary policy[12]. These models are typically used after calibration to examine the effects of monetary policy. However, they cannot be used to construct monetary policy indicators, because it is difficult to estimate

[10] This could be plausibly explained by an asymmetrical response of certain sectors of the economy to positive or negative money supply shocks: a sharper and more visible response to restrictive shocks and a more diluted response to expansionary shocks. See Cover (1992) for more details and Lenz (1997) for an application to Switzerland.

[11] See Yue and Fluri (1991) for an application to Switzerland.

[12] See Bryant, Hooper and Mann (1993) for an overview.

them[13]. Moreover, they do not always perform well and mainly focus on cross-correlations between macroeconomic variables to mimic stylized facts.

Third, an econometric approach using SVAR represents a strong alternative in order to look at monetary influences and build policy indicators[14]. Since the seminal proposal of Sims (1980), VAR models have met widespread success in several research fields including monetary economics. They have proved to be very flexible statistical tools, but not without ambiguities related to their interpretation (i.e. coefficients, implied dynamics, and robustness) and their structuralization (i.e. identification of SVAR from reduced-form (RF) expressions)[15,16]. A classification of VAR models is complex and subjective. Henceforth, we consider three groups according to their identification restrictions: recursive SVAR, long-term restricted SVAR, and nonrecursive SVAR.

In order to illustrate these three categories, we use the following SVAR($p$) explaining $\mathbf{x}_t$, such as $\mathbf{x}_t = \mathbf{A}_0^{-1}\mathbf{A}_1\mathbf{x}_{t-1}+\ldots+\mathbf{A}_0^{-1}\mathbf{A}_p\mathbf{x}_{t-p}+\mathbf{A}_0^{-1}\boldsymbol{\varepsilon}_t$ or expressed as an infinite moving average $\mathbf{x}_t = \mathbf{C}(L)\boldsymbol{\varepsilon}_t$ where $\mathbf{C}(L) = (\mathbf{A}_0 - \mathbf{A}_1 L - \ldots - \mathbf{A}_p L^p)^{-1}$ or $\left(\mathbf{C}_0 + \mathbf{C}_1 L + \mathbf{C}_2 L^2 + \ldots\right)$. A particular equation of this SVAR or a combination of several equations may be interpreted as $\varkappa = f(\Omega') + \varepsilon(\Omega'')$.

Recursive SVAR identification focuses the structural effort onto the organization of instantaneous covariances between the structural innovations. A Cholesky decomposition of the variance-covariance matrix of $\mathbf{A}_0^{-1}\boldsymbol{\varepsilon}_t$ allows isolating $\mathbf{A}_0$ that represents the contempo-

[13] See Bernanke and Woodford (1997), Canzoneri and Dellas (1998), King and Watson (1996), and King and Wolman (1996) for new promising directions in these sticky-prices-GE models. See also a survey about the new neoclassical synthesis by Goodfriend and King (1997).

[14] See Hamilton (1994) for an introduction about VAR. For a more detailed description, see Lütkepohl (1993). For comprehensive surveys of theoretical and empirical literature about VAR, see Canova (1995a, 1995b), Christiano, Eichenbaum and Evans (1999), and Cochrane (1994). Further detailed contributions are the survey of Watson (1994) and the book of Amisano and Giannini (1997).

[15] VAR were heavily criticized by Rudebusch (1998a, 1998b) despite Sims' comments (1998).

[16] Identification of VAR and identification of monetary policy are two separate concepts. VAR or econometric identification consists in recovering a structural system from a RF expression. We cannot directly estimate SVAR, we only estimate RF. The difficulty is that there exists an infinity of SVAR for a single RF. In order to recover a particular SVAR, we identify it in putting restrictions on the coefficient matrices. After this econometric identification, SVAR can be used to identify monetary policy shocks, so to isolate exogenous monetary policy.

raneous structure within $\mathbf{x}_t$. This matrix is lower triangular meaning that the ordering within $\mathbf{x}_t$ is crucial. Different orderings produce different $\mathbf{A}_0$. Hence, this triangular (recursive) structure is not always suitable to applied cases. The Cholesky identification is indeed an offspring of mathematicians and is not a priori founded by any economic model. Besides, typical Cholesky VAR (e.g. Cochrane (1994)) do not always perform well, in the sense they generally display puzzling IRF of $\mathbf{x}_t$ after some exogenous shocks.

The most famous puzzle is the price puzzle where the price level increases during many periods after a restrictive monetary policy shock. Second, the liquidity puzzle is a decrease in the nominal medium-term interest rate following the same restrictive shock. Finally, a depreciation of national currency following a tight monetary policy represents an exchange rate puzzle[17]. Swiss and international illustrations of these puzzles can be found in Bacchetta and Ballabriga (2000), Jordan (1998), and Sims (1992). Economists have either explained these puzzles (Sims, 1992) or have added other variables in the VAR, in particular a commodity price index, to remove the puzzles (Bagliano and Favero (1998) and Sims (1992)). In order to relax the Cholesky straitjacket, macroeconomists rather like to focus on long-term identification schemes or on nonrecursive SVAR. They still analyze these puzzles when they show up.

Long-term identification (e.g. Blanchard and Quah (1989), Gali (1992), King and Watson (1997), and Weber (1994)) was first used to test neutrality of money. This method can also be used for the construction of indicators[18]. Restrictions are thus imposed on matrix $\mathbf{C}(1) = \sum_{i=0}^{\infty} \mathbf{C}_i = \Xi$, where certain elements of $\Xi$ take on a specific value or 0. In Switzerland, Jordan (1998) showed the improvement of this identification compared to the recursive model in eliminating the liquidity puzzle and discovering a liquidity effect. Smets (1997a, 1997b) followed a similar way for the G7 countries, improving his results relative to previously used recursive models.

[17] In addition to these traditional puzzles and sometimes using other than Cholesky identifications, Bagliano, Favero and Franco (1999), Cushman and Zha (1997), and Kumah (1996) illustrate the forward discount premium puzzle typical for the empirical VAR literature on monetary transmission in open economies. This puzzle is the violation of interest rate parities.

[18] Long-term identification mixed with short-term restrictions is also included in this category (Gerlach and Smets, 1995). For long-term identification and cointegration, see Jacobson, Jansson, Vredin and Warne (1999) and King, Plosser, Stock and Watson (1991).

Finally, nonrecursive restrictions represent an improvement in the VAR literature (e.g. Canova (1995a, 1995b)). First, we are free to put restrictions on $\mathbf{A}_0$ where we want to and especially according to an economic theory. Second, the choice of model that backs up this SVAR identification is wide and flexible. For example, Bernanke (1986), Bernanke and Blinder (1992), Bernanke and Mihov (1998), Clarida and Gertler (1997), Cushman and Zha (1997), Gordon and Leeper (1994), and Kim (1998) used operating procedures to model and to constrain their nonrecursive SVAR in both closed and open economies[19]. They thus avoided an unfounded econometric identification that is one of the main criticisms against VAR. However, these nonrecursively identified models suffer like their predecessors from robustness problems relative to assumption and sample changes.

## 4 Organization of the Dissertation

The core of this dissertation is two chapters, part II and III, which are directly related to this introduction. Both chapters embody empirical evidence for Switzerland on the sketched questions in section 'Two Main Issues'. Part II concerns the description of several potential monetary policy instruments by forward-looking monetary policy rules. Using operating procedures, part III is an attempt to qualify and quantify Swiss monetary policy with an alternative indicator based on nonrecursive SVAR.

Both parts reveal a changing monetary environment in Switzerland during these last twenty years. They show that, in terms of both policy instruments and indicators, the SNB has not waited for the end of the century to adapt its policy. During the nineties, alternative variables such as short-term interest rates have de facto replaced the aggregates as monetary policy instruments and indicators. On the other hand, the applied statistical methods confirm the eighties as the golden age of monetary targeting in Switzerland.

This introduction does not frame the last chapter because it involves a technical survey of interpolation methods of monthly GDP[20].

[19] See Blanchard and Watson (1986), Christiano, Eichenbaum and Evans (1996, 1999), Sims (1986), and Strongin (1995) for other applied contributions.

[20] Part IV is essentially based on a working paper written with Martin K. Hess (Cuche and Hess, 1999b). See Cuche and Hess (1999a) for a non-technical summary focusing on 'dynamic' and 'static' models only, in the sense correcting or not the GDP nonstationarity.

The motivation for part IV is twofold. First, it creates a time series necessary for the two monetary policy chapters that principally use data at monthly level. Second, there is a need among Swiss practitioners and researchers for a monthly business cycle indicator and a monthly time series.

This introduction and the three parts are conceived as papers and simultaneously form a whole study. They still can be read separately. Each chapter contains a brief introduction, an exposition of a theoretical model, an empirical study, and a short conclusion. Besides, each paper includes a short refresher of main references which are sometimes intentionally replicated in this introduction. An attempt has been made to keep the notation consistent over the different chapters. All symbols, parameters, and functions we used are summarized in the beginning of this dissertation. In the next sections, we summarize the three chapters.

## 4.1 Part II Monetary Policy Rule

We estimate various forward-looking monetary policy rules in Switzerland for the period 1981-1997. In addition to an inflation gap, we find that rules with an output gap and an exchange rate gap nicely fit monetary aggregates as well as the call rate. We split the sample in 1990 when the Swiss National Bank replaced annual targets by medium-term targets for its official policy instrument, the monetary base. We find then that the same rule best describes $M0$ and $M1$ before 1990 and only the call rate after 1990. We also show that the exchange rate element in the rule does not necessarily imply exchange rate targeting per se. It mainly allows pursuing growth and price stability goals.

## 4.2 Part III Monetary Policy Indicator

We analyze different identification frameworks based on the Swiss National Bank's operating procedures in order to measure monetary policy since the breakdown of the Bretton Woods system. We use a two-stage VAR methodology to identify monetary shocks built either on monetary and nonmonetary residuals (without extraction) or only on the orthogonal portion of monetary residuals relative to nonmonetary residuals (with extraction). Based on these models, we construct various monetary policy indicators. We report them as weighted sums of monetary policy variables. Our main indicator

reveals that the exchange rate was the dominant variable at the end of the seventies. During the eighties, aggregates had their golden age, while in the nineties, the call rate showed up as an indicator. In addition to the comparison of different models and their dynamics, we focus on econometric problems arising with such a VAR methodology.

### 4.3 Part IV Monthly GDP Interpolation

We estimate deseasonalized monthly series for Swiss GDP at constant prices of 1990 for the period 1980-1997. They are consistent with the quarterly figures estimated by the State Secretariat for Economic Affairs and obtained by including information contained in related series, in particular following the expenditure definition of GDP. We present a general approach using the Kalman filter technique nesting a great variety of interpolation setups. We evaluate competing models and provide a time series that can be used by other researchers.

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