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Shock Identification of Macroeconomic Forecasts Based on Daily Panels

Marlene Amstad
Andreas M. Fischer

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Abstract

This paper proposes a new procedure for shock identification of macroeconomic forecasts based on factor analysis. Our identification scheme for information shocks relies on data reduction techniques for daily panels and the recognition that macroeconomic releases exhibit a high level of clustering. A large number of data releases on a single day is of considerable practical interest not only for the estimation but also for the identification of the factor model. The clustering of cross-sectional information facilitates the interpretation of the forecast innovations as real or as nominal information shocks.
An empirical application is provided for Swiss inflation. We show that (i) the monetary policy shocks generate an asymmetric response to inflation, (ii) the pass-through for consumer price index inflation is weak, and (iii) the information shocks to inflation are not synchronized.

Key words: common factors, daily panels, inflation forecasting

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Amstad: Federal Reserve Bank of New York (e-mail: marlene.amstad@ ny.frb.org).
Fischer: Swiss National Bank and CEPR (e-mail: andreas.fischer@snb.ch). The authors thank Michael Dueker, Domenico Giannone, Simon Potter, Lucrezia Reichlin, and Robert Rich for valuable discussion. The authors also acknowledge the software from www.dynfactors.org. Tobias Grässli provided valuable assistance in data support.

'Forecasts are like newspapers. Just as last week's newspaper is of little value in understanding today's news, last month's forecast is of little value in determining today's policy stance.'

William Poole, President of the the Federal Reserve Bank of St. Louis[1]

Introduction

Differences in the frequency interval of forecasts often mirror differences in the forecasting horizon. For short-run forecasts, the standard procedure is to use high frequency data; similarly quarterly data is typically used for long-term forecasts. Examples of the the former are event studies, volatility or nonlinear models used to forecast a host of financial variables, while vector autoregressive (VAR) models are seen as a standard tool for forecasting macroeconomic variables at the quarterly frequency. The presumption is that daily estimates of long-term forecasts, say two-years ahead, will not change considerably as a result of today's news.

We argue that even if the changes are minor in scale, the policymaker may still learn from long-term forecasts based on high frequency information in at least two ways. First, they provide policymakers the most up-to-date estimate available. Instead of waiting for the release date for variables that provide definitive information, such as for revised GDP, it is possible to work

[1] See, Poole (2004) page 7.

with provisional data. In the same vein, it can be argued that instead of waiting three months to rerun a quarterly model it is useful to run it with daily updated information.

A second motive is that through the evaluation of long-term forecasts on a daily basis, it is possible to identify the information source linked to data releases that generated the change in the forecast. As in event studies that work with elaborate real-time data sets (i.e., Anderson *et al.* 2003, Alemeida *et al.* (1998), and Balduzzi *et al.* (2001)) to understand how fundamentals are incorporated in asset prices, our interest is similar in that we seek to identify as narrowly as possible the information shocks driving key macroeconomic variables. We recognize that not each individual event defined through data releases will be informative, however by seeking to examine the average relative influence between nominal and real shocks on long-term forecasts we hope to learn more about macroeconomic forecasting in real time.

This paper offers a new strategy for (information) shock identification that attempts to bridge the gap between event studies examining micro effects of macro announcements for financial variables and conventional VAR procedures that embody a range of macroeconomic information. The proposed procedure relies on generating valid forecast innovations for the macroeconomic series based on daily real-time panels using factor analysis following Stock and Watson (2002) and Forni *et al.* (2000). The forecast innovations are generated from new information stemming from the daily releases of macroeconomic variables. The narrow event window defined by the post and pre-release date of macroeconomic releases allows the practitioner to interpret the innovations either as a real or as a nominal information shock. An application of this strategy is provided using daily panels for Switzerland.

The paper proceeds as follows. Section one defines the identification procedure for the information shocks. Section two presents the responses of Swiss macro variables to information shocks. Applications of shock interpretation with respect to CPI inflation are given in section three. The discussion addresses issues of monetary policy shocks, the synchronization of real and nominal shocks, and exchange rate pass-through. Conclusions are offered in section four.

1. The Identification Procedure

To facilitate the discussion of data releases and forecasting in real time, we define an estimation framework suitable for daily panels that is able to capture information from macroeconomic releases. The factor structure follows Forni *et al*. (2000). We assume that the N variables in the panel, $x_t = (x_{1,t}, x_{2,t}, \cdots, x_{N,t})'$, are measured with error and that they can be decomposed into the sum of two orthogonal components: the signal $x^*_{i,t}$ and the measurement error $e_{i,t}$ for variable i for month t is specified as

$$x_{i,t} = x^*_{i,t} + e_{i,t}. \tag{1}$$

Next, under suitable conditions on the variance-covariance matrix of the $x's$ defined in Forni *et al*. (2000), $x_{i,t}$ is specified as a generalized dynamic factor model:

$$x_{i,t} = \chi_{i,t} + \xi_{i,t} = b_{i1}(L)f_{1,t} + \cdots + b_{iq}(L)f_{q,t} + \xi_{i,t}, \tag{2}$$

where $\xi_{i,t}$ is the idiosyncratic component and $\chi_{i,t} = x_{i,t}$ - $\xi_{i,t}$ is the common component.[2] The latter consists of q dynamic common factors, $f_t = (f_{1,t}, \cdots, f_{q,t})'$, and $b_{ij}(L)$ is of order s.

To capture the influence of the releases of new macroeconomic information, as in the event studies summarized by MacKinlay (1997), we focus on the one-day difference in the estimates of $\chi_{i,t}$ around important release

[2]Hereafter, we refer to them as 'idiosyncratic' and 'common'. Note, the latter refers to the common component, χ_{it}, and not to the common factor, $f_t = (f_{1,t}, \cdots, f_{q,t})'$.

dates. More specifically, $\epsilon_{i,t+h|j,t}$ is the innovation in variable i for forecast $t+h$ conditional on information before and after the release on day j in month t:

$$\epsilon_{i,t+h|j,t} = \chi_{i,t+h|j,t}^{post-release} - \chi_{i,t+h|j-1,t}^{pre-release}. \quad (3)$$

In the terminology of the the event studies defined by MacKinlay (1997), the forecast period from t to $t+h$ represents the event window and $\chi_{i,t+h|j-1,t}^{pre-release}$ denotes the model for measuring normal performance.

The factor structure can be extended in two ways to capture more cross-sectional information from the data releases. First, the contribution of different types of economic activity such as trade, money, employment, interest rates and so forth can be evaluated. Amstad and Fischer (2004) note for Swiss releases, disaggregated data tend to cluster on particular days of the month. Second, the clustering of data releases can also be divided between nominal and real information; this approach follows the general concept of a Taylor rule, where monetary decisions are a weighted function of nominal and real shocks from their trend values. The focus on clustered releases allows us to define the innovation more narrowly in terms of real and nominal shocks to variable $x_{i,t}$ for release dates j and k:

$$\epsilon^n_{i,t+h|j,t} = \chi^n_{i,t+h|j,t} - \chi^n_{i,t+h|j-1,t} = h(u^n_t), \tag{4}$$

$$\epsilon^r_{i,t+h|k,t} = \chi^r_{i,t+h|k,t} - \chi^r_{i,t+h|k-1,t} = g(u^r_t), \tag{5}$$

where now the innovations capture nominal and real shock information; $h(u^n_t)$ and $g(u^r_t)$.

An issue that we do not treat formally is the fact that the idiosyncratic components (ξ^n_t, ξ^r_t) are not screened from the shocks $h(u^n_t)$ and $g(u^r_t)$. A large number of data releases on a single day is of considerable practical interest not only for the estimation but also for the identification of the model (see Reichlin (2003) for an overview of these topics). The estimates of $\hat{\chi}^n_{i,t+h|j,t}$ and $\hat{\chi}^r_{i,t+h|k,t}$ are in this case dependent on the number of the data releases for days j and k in month t; respectively N^n and N^r, where $N \geq N^n + N^r$ defines the number of variables in the cross section. This means that $E_t(\chi^n_{i,t+h|j,t}) = h(u^n_t) + \frac{1}{N^n}\sum_{p=1}^{N^n} \xi^n_{p,t}$ and $E_t(\chi^r_{i,t+h|k,t}) = g(u^r_t) + \frac{1}{N^r}\sum_{l=1}^{N^r} \xi^r_{l,t}$. Here, the removal of the idiosyncratic component is dependent on the size of N^n and N^r. This implies that N^n and N^r should be fairly large in the panel so that this is not of serious concern.

2. Information Shocks to Swiss Forecasts

This section demonstrates how the shocks to Swiss macro variables are generated. We begin with a brief discussion of the data. This is followed by a description of the estimation procedure in which smoothing plays an integral role for determining the shocks. Last, the shocks to key macro variables are presented.

The Data Panels

All economic series used to construct the data panels are taken from the Swiss National Bank's (SNB) data bank. The intention of the data set's construction is to replicate the contours of a data-rich environment in which the SNB operates. Most of the data are systematically reviewed by the bank's economists and thus does not represent new information.

Since we are concerned with the problem of how to weigh the most recent information against what we already know at daily intervals, we are interested in economic data that are frequently released. This means working with data that have a daily or monthly frequency. Table 1 shows the breakdown of the 434 series into nominal and real variables and their frequency. There are 27 financial variables at the daily frequency and 407 nominal and real variables at the monthly frequency.[3] Quarterly variables such as industrial production or GDP were intentionally excluded because we did not want to contaminate our estimates with revision errors.[4]

Two types of panels are constructed. The first uses end of month data from 1993:5 to 2003:11. We generate our initial forecasts with this panel. After 2003:11:1, we update the panels daily. The starting date 1993:5 is chosen because a large number of series do not go further back than 1990 and 1993:5 coincides with a major revision in the CPI index.

An explicit intention in constructing the data set was to transform the series as little as possible. First, no seasonal filtering is undertaken because of its reliance on future information and is therefore not consistent with real time diagnosis. Amstad and Fischer (2004) demonstrate that seasonal adjustment can be treated through band-pass filtering. The absence of seasonal revisions allows us to interpret better the daily innovations in $\epsilon_{it|jt+k}$.

Several data transformations, however, were necessary at the initial stages of estimation. The series were filtered in the following manner. First, log-

[3]The daily variables were used to generate an updated monthly average.

[4]The monthly series are not revised in Switzerland, apart from the monthly credit and monetary aggregates. Also preliminary estimates revealed that the introduction of the quarterly information from GDP or industrial production did not alter our estimates.

arithms were taken for nonnegative series that were not in rates or in percentage units to account for possible heteroskedasticity. Second, the series were differenced if necessary to account for stochastic trends. Third, the series were taken in deviation from the mean and divided by their standard deviation to remove scalar effects.

The Estimation Procedure

Our estimation procedure follows Cristadoro *et al.* (2004). We begin with the estimation of the spectral density matrices of the common and the idiosyncratic using the method of dynamic principal components of Forni *et al.* (2000). Next, we use the variance-covariance matrices of the common and the idiosyncratic component implied by the spectrum in the first step to estimate the static factors by generalized principal components. As in Amstad and Fischer (2004), we work with two dynamic factors and twelve static factors.[5] In a further step, we estimate the common component at low frequency by using the static factors. This last step involves performing a projection of the common component at low frequency on the leads and lags

[5] This has been tested in Amstad and Fischer (2004). Also many empirical studies find that two dynamic factors represent the panel's variance well. See Giannone and Levina (2004) for savings and investment in OECD countries and Giannone, Reichlin, and Sala (2004) for the United States.

of the estimated static factors.

To generate the forecasts, we apply the shifting procedure for the covariance matrix by Altissimo *et al.* (2001). This means we first expand the data set using the shifting procedure in Altissimo *et al*. (2001) and then estimate the common components on data up to the forecast period, $t+h$.[6] The stability properties of the model for the same data set were investigated in Amstad and Fischer (2004). It was shown that the monthly estimates were stable and that the model demonstrates good forecasting properties for CPI inflation.

An important step in our forecasting procedure is to apply the band-pass filter before projecting. Our decision to work with the low frequency component with cutoff $2\pi/12$ introduces a smoothed common. For the forecasts, this implies that the idiosyncratic component should not have a large influence on the forecasts. We therefore interpret that changes in the forecast can be attributed to new information from the data release and not to measurement error.

[6]The forecasting approach of Stock and Watson (2002) instead first estimates the common factors with data up to t and then uses the estimated factors in a separate regression to forecast inflation for $t+h$. An alternative forecasting procedure based on the Kalman filter is offered by Giannone *et al.* (2004).

To generate our nominal and real shocks, we rely on the largest cross-sectional releases in our panel; these are the CPI index and its subcomponents and the trade figures for various sectors. Figure 1 provides an example of the clustering of these releases for December 2003. The number of data releases for a particular day is listed on the vertical axis with the calendar days given on the horizontal axis. The releases are divided into nominal (shaded) and real variables (non shaded). Of interest are the clusterings on the second and the nineteenth of the month. The first spike stems from CPI releases and their subcomponents, whereas the second arises due to the release of trade volumes across sectors. In the next sections, we refer to the information shocks stemming from CPI and the trade releases as the 'nominal' and 'real' shocks. Note, our use of nominal and real shocks does not refer to the identification of common factors as either nominal or real.

The Information Shocks for October 2004

Figures 2 and 3 show nominal and real shocks to CPI inflation, the three-month Libor, and the unemployment rate for October 2004. The information shocks to the macroeconomic forecasts have a length of 24 months. The upper and lower bands are +/- one standard deviation based on shocks from the previous 12 months. These should not be interpreted as confidence bands;

they do however give an indication as to how the shocks to the three variables behaved in 2004.

The nominal shocks are constructed using the October CPI release from 4 November 2004. The difference in the macroeconomic forecast based on the daily panels from the pre-release date, 3 November 2004, and the post-release date, 4 November 2004, defines the nominal shock. In a similar manner, the real shock is constructed around the the October trade figures released on 20 November 2004.

The size of the nominal and real shocks for October are relatively small compared to the 12 previous months. The bands of the standard deviations narrow only after 18 months. The direction and the dynamics of the shocks also yield important information for policymakers. Figures 2 and 3 show that the two shocks offset each other: the nominal shock is expansionary and the real shock is contractionary. Note, for the Libor this does not apply, because both shocks on the interest rate go in the same direction. The negative real shock is consistent with lower real rates, whereas it is necessary to make claims that a temporary liquidity effect occurs for the nominal shock. In terms of dynamics, both shocks generate a response to the Libor that does not last longer than six months. Nominal shocks in October to inflation responded quicker than real shocks.

The shock diagnosis presented in Figures 2 and 3 can be extended in several ways. First, policymakers would be interested in spanning the time domain by at least several months to establish whether persistent trends in the shocks are observed. A second consideration is to examine alternative release dates; money supply or unemployment figures entail considerable cross sectional information. This could also expand the analysis to include monetary policy shocks. In the next section, we offer alternative applications along these dimensions.

3. Simple Applications to Swiss Inflation

This section presents three empirical applications of the information shocks to Swiss CPI inflation. The first considers monetary policy shocks on inflation for the year 2004. The second application asks whether real and nominal shocks to CPI inflation are synchronized. The third application examines a specific measure of exchange rate pass-through: the influence of import price shocks to CPI inflation.

Monetary Policy Shocks in 2004

The SNB defines a target range of 100 basis points for the three-month

Libor as its operating target. To steer the Libor rate within the target range, the SNB sets the one or two-week repo rate accordingly. Four times a year on scheduled dates, the SNB releases a policy statement in which it announces a change or no change in the target range.[7] In 2004, the dates were March 18th, June 17th, September 16th, and December 16th. We use these four policy dates to define our monetary shock. This shock is defined as the one-day difference in the inflation forecast based on post-release information minus the pre-release information. The difference in this information set should capture only information from (daily) financial variables and their reaction to the policy statement. There are 27 financial variables in our panel.[8]

Figure 4 plots the monetary policy shock on inflation for the four release dates. In June and in September the SNB's Board of Directors raised the target range by 25 basis points; in March and in December the target range was left unchanged. The responses to the monetary policy shock differ considerably. For the March release, there is no change in the forecast. For the dates when the SNB raised its target range, we observe a strong response in the inflation forecast but in opposite directions. Contractionary

[7] Outside of these pre-arranged dates, the SNB reserves the right to change the target range.

[8] Forni *et al.* (2001) show for the euro area that financial variables help predict inflation.

behavior is observed for the June rate hike and expansionary behavior for the September rate hike. For the last shock in December, we observe a weak but expansionary response to the no change decision.

How do we explain the differing reactions to the change and no change decisions in the target range? As in Hamilton and Jorda (2002), anticipated shocks of change and no change in the target have different implications. The release dates that signal a change in the target range account for larger reactions in inflation. The stronger response to the shock with a change in the target range rests on the fact that many financial contracts in Switzerland (i.e., automobile leases, home and commerical property loans) are tied to the three-month Libor. To determine the shock's direction, it is necessary to control for what the markets had anticipated. One possible method is to use a spread of the SNB's policy rates: the three-month Libor rate minus the repo rate. This interest rate spread is plotted in Figure 5 along with the mid-point in the SNB's target range for the three-month Libor.[9] The interest rate spread shows that the market anticipated the rate hikes in June and September; the spreads widen. In the case of the no change decisions,

[9]This graph is taken from Dueker and Fischer (2005). The repo rate is either the one-week or the two-week repo rate. In most cases it is the former.

the spreads do not change in March and widen slightly before the December policy release.

To understand the post-release estimate, we need to examine what happens to the spread the day after the policy statements are released. In the March release, the spread does not change between the pre and post-estimate. This is consistent with the March response of no reaction to the monetary policy shock. For the June release, the change in the spread is 0.01, whereas for the September release it is -0.14. In the latter case, the SNB did not raise the repo rates high enough to move the three-month to the mid-point of the target range. In other words, the short-end of the yield curve was steeper than was anticipated by the market. This lead to a rise in the post-release estimate of inflation. For the December release of no change in the target range, we observe a similar phenomenon as in the September case. Although the size of the reaction is small, the change in the spread for the post and pre-release dates of -0.04 is consistent with the shock's direction.

Are Real and Nominal Shocks Synchronized?

Next, we want to test whether real and nominal shocks to CPI inflation are synchronized. A priori, we do not expect the shocks to be similar. First, the size and dynamics of the individual shocks can differ from month to month. Second, the co-movement of real and nominal shocks should not be restricted to be the same for each month. In related empirical studies on the procycicality of prices in the long run, Ravn and Sola (1995), Smith (1992), and Backus and Kehoe (1992) find that the cyclical properties of prices and output are not stable. Third, if strong evidence of co-movement is found, then this would cast doubt on the evidence presented in section 2 and on the information content of the macro (real and nominal) releases for the revised forecasts.

To test whether the shocks are synchronous, we calculate the concordance indexes of Harding and Pagan (2002). The application of the index examines whether the co-movement of real and nominal shocks to inflation can be quantified by the fraction that both series are simultaneously in the same state of expansion ($S_t = 1$) or contraction ($S_t = 0$) with the index, $I_{1,2} = \frac{\sum_{t=1}^{24} S_{1,t}S_{2,t}+(1-S_{1,t})(1-S_{2,t})}{24}$, measuring the degree of concordance between series 1 and 2, which are $\epsilon^r_{\pi,t+h|k,t}$ and $\epsilon^n_{\pi,t+h|j,t}$ in our case.[10]

The concordance index can be used to determine whether nominal and real shocks to inflation are pro or counter-cyclical. If they are exactly pro-

[10]The concordance index has similar properties as the Cowles-Jones Test used for testing an IID random walk process.

cyclical then the index is unity, while a zero value denotes evidence of counter-cyclical behavior. Table 2 presents the degree of concordance between $\epsilon^r_{\pi,t+h|k,t}$ and $\epsilon^n_{\pi,t+h|j,t}$ for June 2004 to November 2004. In the first row of the table, the index values for $\epsilon^r_{\pi,t+h|k,t}$ and $\epsilon^n_{\pi,t+h|j,t}$ show that the shocks behaved in a pro-cyclical manner in June and July, but the real and nominal shocks to inflation behaved in a counter-cyclical manner from August through November. In the second and the third row, information on the volatility of the shocks is given by constructing the index for $\epsilon^n_{\pi,t+h|j,t}$ and $\epsilon^n_{\pi,t+h|j-1,t}$ and $\epsilon^r_{\pi,t+h|k,t}$ and $\epsilon^r_{\pi,t+h|k-1,t}$. Here, the evidence shows that the likelihood of the shock behaving in the same manner as in the previous month is stronger for real shocks than for nominal shocks to inflation. In other words, the real shocks to inflation demonstrate a higher level of persistence of being in the same state than do the nominal shocks.

How does the Exchange Rate Pass-Through Behave?

The response of CPI inflation to import price shocks should be informative about the exchange rate pass-through. McCarthy (2000) uses this approach in a VAR setup, where the import price shock is estimated given past values of all the model's variables plus the current value of oil prices, the output gap, and the exchange rate. In our factor structure, the import price shock is defined as the difference in the 24-month ahead forecasts in CPI inflation based on the daily panel that includes the post-release information from import prices and the previous day's panel that entails information from the pre-release.

Figure 6 displays the response of the CPI inflation to an import price shock for three months: November 2004, October 2004, and September 2004. Again a one standard deviation band, based on past responses since December 2003, is depicted around the forecast's response. The evidence finds that the pass-through under this measure is small. In November and October, the innovations of the import prices were slightly negative for the first 15 months and zero thereafter. The response for September was stronger; again the effect of import prices is absorbed within 18 months.

The finding that the Swiss pass-through is weak in Q4:2004 does not contradict the cross-country evidence by McCarthy (2000), Campa and Goldberg (2002), and Gagnon and Ihrig (2004). Under different channels, their long-run studies find that the pass-through for Swiss prices is surprisingly small when comparing the empirical evidence against other small open economies.

4. Concluding Remarks

The recognition that policymakers insist on the most recent forecasts implies that forecasts change over time. Even if the changes are minor in scale; information on the direction and the dynamics of the innovation to the forecast is informative. The need to understand how new information influences the forecast is of extreme importance for the policymaker. Their decisions will be guided by the knowledge of whether it is real or nominal shocks that are driving the most up-to-date forecast.

The proposed common factor procedure based on daily panels for specific release dates makes a step in this direction. As in event studies it is possible to define the source of the shock in a precise manner; yet the estimation technique based on daily factor analysis goes further for it allows us to broaden the scope of the shock analysis beyond the reaction of financial variables. The identification scheme relies on the recognition that macroeconomic and policy releases can be interpreted either as a real, a nominal, or a policy (information) shock to the variable of interest.

The shock analysis is applied to Swiss CPI inflation for specific months. The information shocks to key macroeconomic variables revealed that the nominal and the real shocks offset each other, although in the aggregate the change in the forecasts is small. Such information is important to the policymaker when having to evaluate how new information influences the forecast of inflation or real activity.

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Figure 1: Nominal and Real Data Releases for December 2003

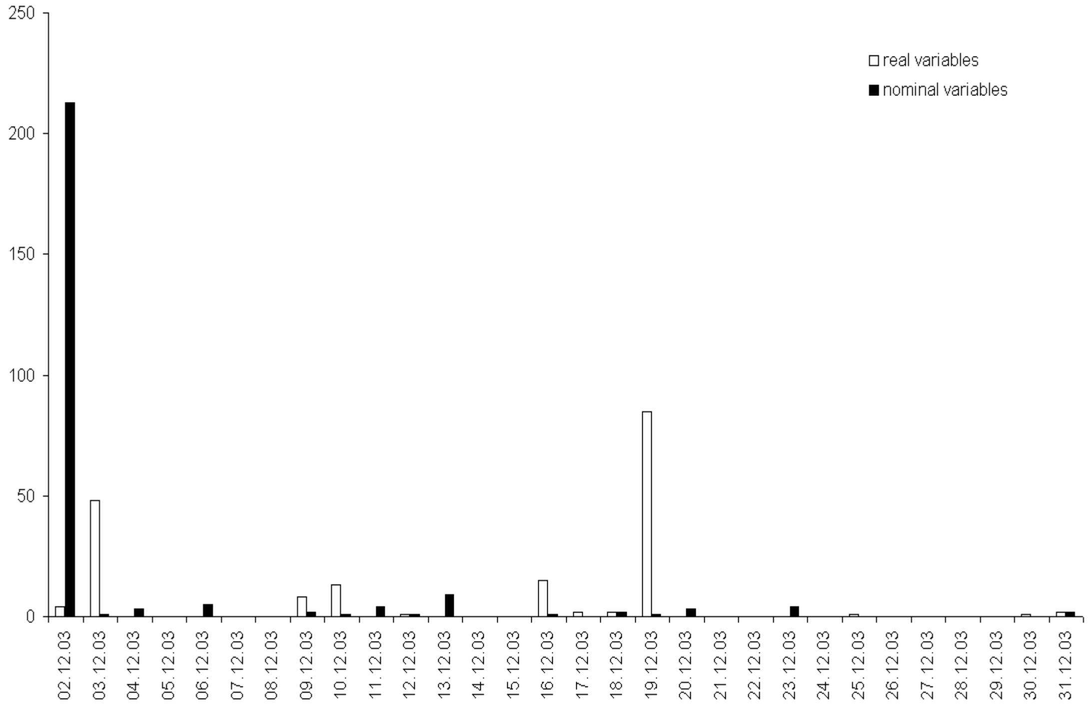


Figure 2: Nominal Shocks to Swiss Variables

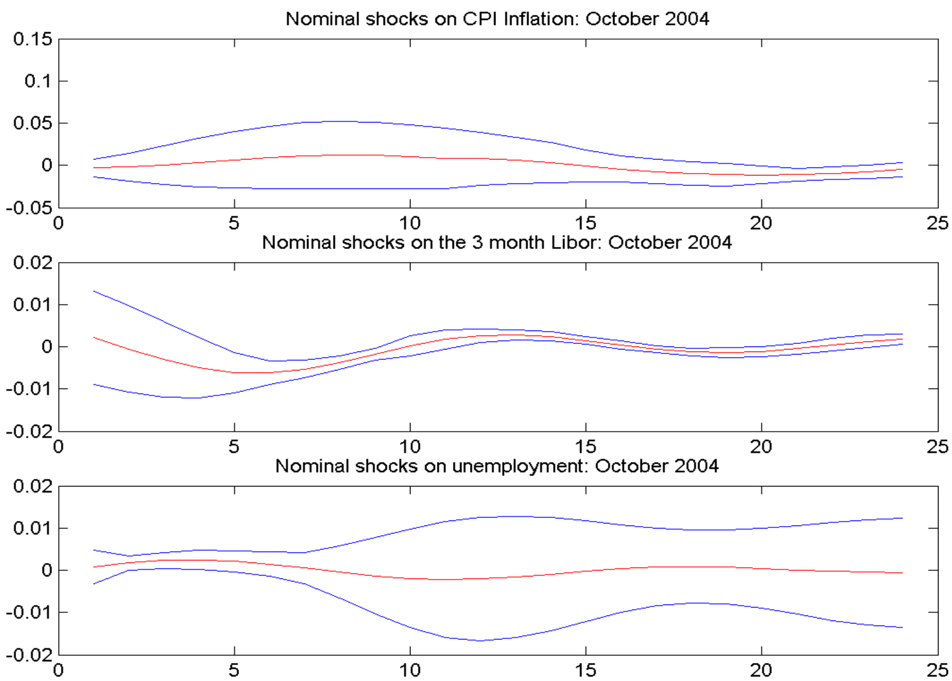


Figure 3: Real Shocks to Swiss Variables

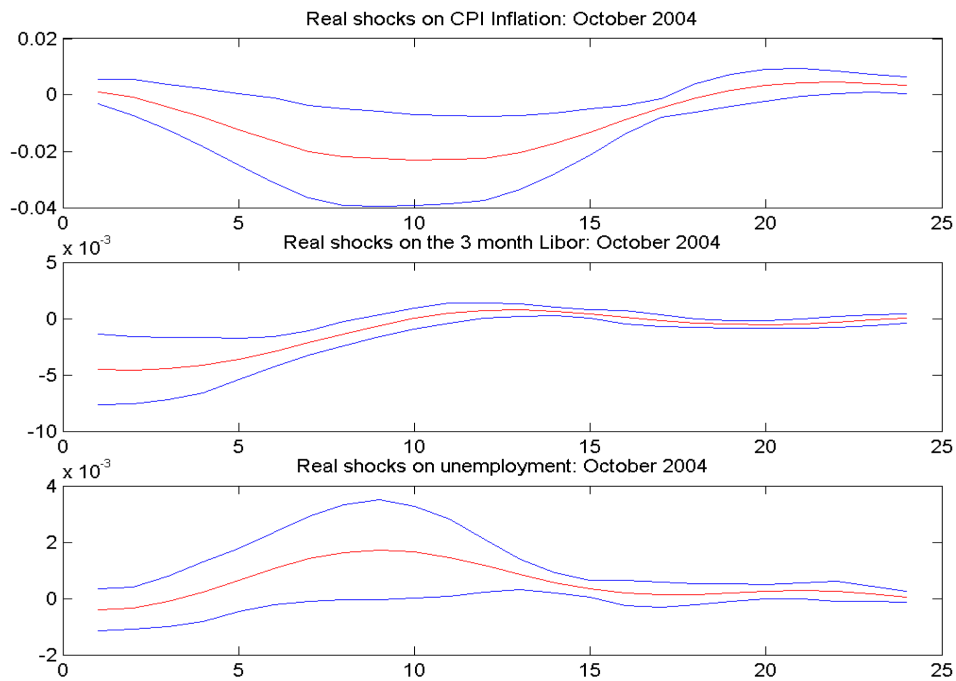


Figure 4: Monetary Policy Shocks

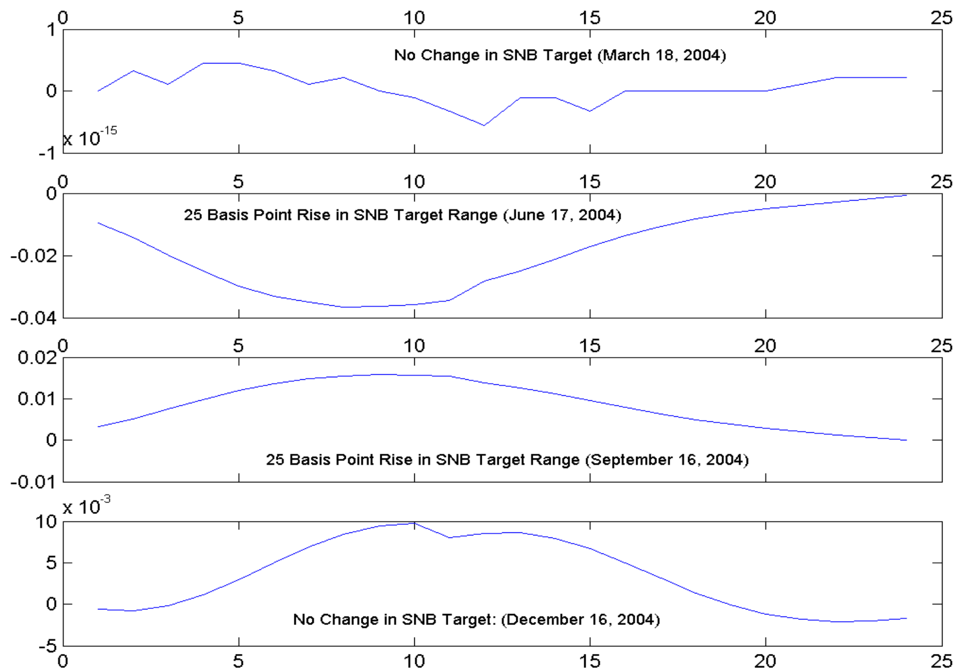
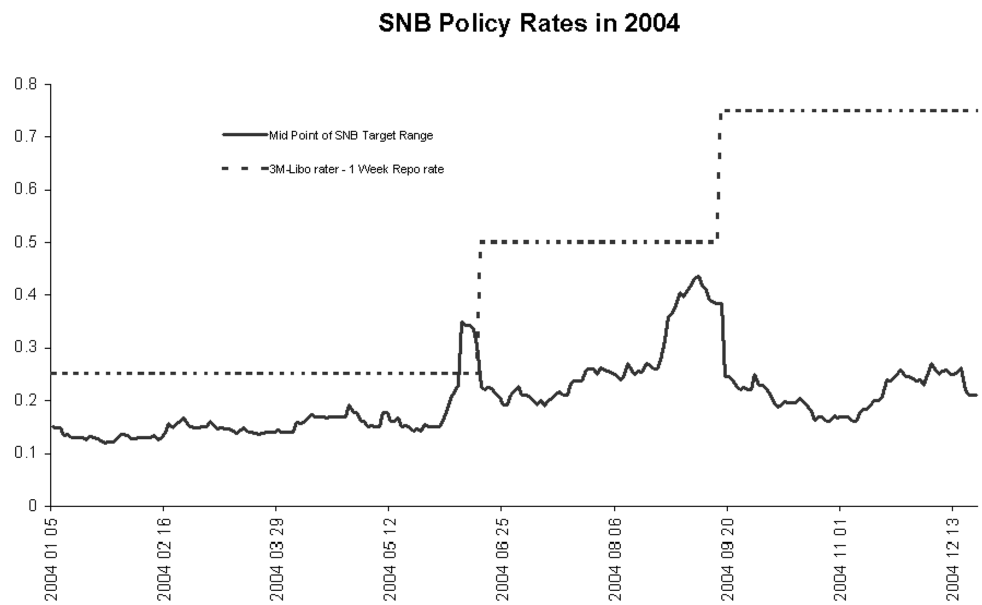


Figure 5:



SNB Policy Rates in 2004
Mid Point of SNB Target Range
3M-Libo rater - 1 Week Repo rate
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2004 01 05
2004 02 16
2004 03 29
2004 05 12
2004 06 25
2004 08 06
2004 09 20
2004 11 01
2004 12 13

Figure 6: Exchange Rate Pass-Through

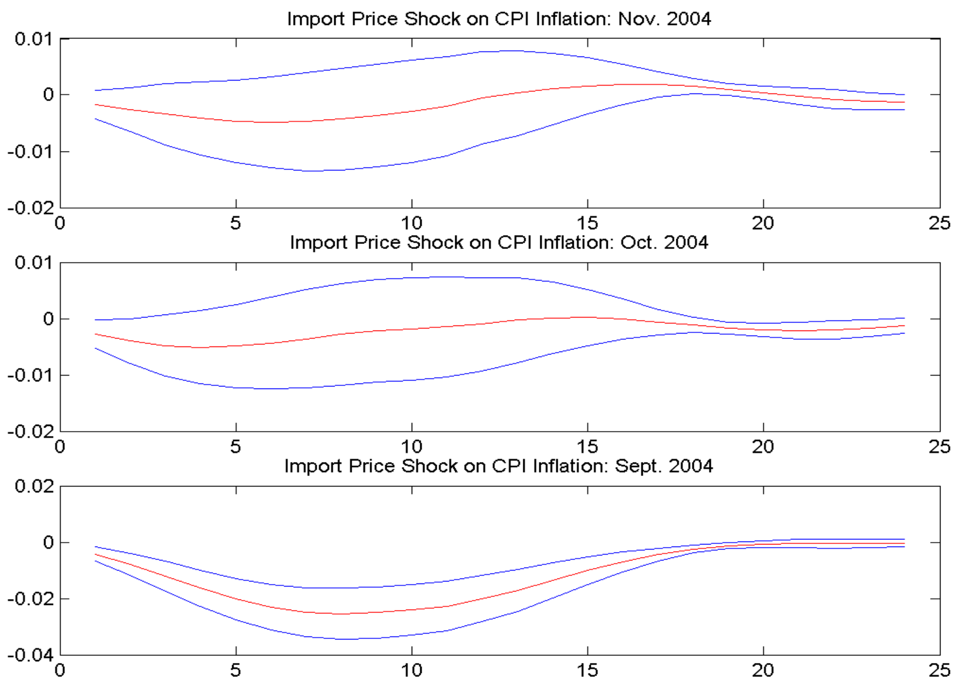


Table 1: Data and their release frequencies

	monthly	daily	total
nominal:			254
Prices (CPI total, subcomponents, cores)	178		
Money	9		
Financial	6	9	
Interest Rates	12	11	
Exchange Rates	4	3	
Foreign Prices	10		
Foreign Interest Rates	8	4	
real:			180
Survey	40		
External Trade	83		
Labor	14		
Demand	16		
Foreign Industrial Production	8		
Foreign Labor Market	19		
Total	**407**	**27**	**434**

Table 2: Synchronization of Nominal and Real Shocks to Inflation

Shocks	Nov. 04	Oct. 04	Sept. 04	Aug. 04	July 04	June 04
$\epsilon^n_{\pi,t+h\|j,t}$, $\epsilon^r_{\pi,t+h\|k,t}$	0.174	0.348	0.130	0.348	0.826	0.565
$\epsilon^n_{\pi,t+h\|j,t}$, $\epsilon^n_{\pi,t+h\|j-1,t}$	0.522	0.522	0.870	0.822	0.391	0.261
$\epsilon^r_{\pi,t+h\|k,t}$, $\epsilon^r_{\pi,t+h\|k-1,t}$	0.61	0.74	0.565	0.478	0.652	0.434

Note: The real and nominal shocks to inflation are denoted by $\epsilon^r_{\pi,t+h|k,t}$ and $\epsilon^n_{\pi,t+h|j,t}$. The index for concordance by Harding and Pagan (2002) lies between 0 (counter-cyclical) and 1 (pro-cyclical). The index is calculated for the months June 2004 to November 2004.