

The reaction of asset markets to Swiss National Bank communication

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Abstract

In this paper we analyze high-frequency movements in Swiss asset markets in reaction to real-time communication by the Swiss National Bank. Our analysis of central bank communication encompasses monetary policy announcements, speeches and interviews. We examine the reactions of the currency market, the bond market and the stock exchange. The evidence suggests that speeches and interviews, along with monetary policy announcements, engender a significant price reaction. This paper sheds light on the relevance of communications other than monetary policy announcements.

Keywords: Central Bank Communication; Interviews; Speeches; Asset Markets; High-Frequency Data

JEL classification: E5

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Introduction

Communication by central banks has attracted considerable attention in the last few years. It is seen as instrumental in achieving transparency and a high degree of accountability. Moreover, by communicating their intentions, central banks affect the expectations of financial market participants and financial assets and thus increase the effectiveness of monetary policy (Blinder, 1998; Woodford, 2003; Bernanke, 2004). Ideally, monetary policy is able to respond less aggressively than would otherwise have been necessary.

In the last years, a burgeoning, mostly empirical, literature on central bank communication has developed. This paper contributes to this line of research by analyzing whether communication by Swiss National Bank (SNB) management affects Swiss asset markets using high-frequency data. The paper adds to the literature by investigating reactions of asset markets to official policy announcements, speeches and interviews using a new database derived from internal SNB information and external newswire reports. In addition, the study cross-checks news reactions, employing both non-parametric techniques as well as established parametric methods.

The paper's findings are that SNB communication does indeed affect asset markets. They react not only to official policy statements but also to speeches and interviews. Market participants actively monitor and promptly respond to central bank communication. While official policy announcements cannot be used in a discretionary way, speeches and interviews allow the monetary authorities to flexibly inform market participants about past and ongoing economic activity as well as about impending policy. The policy conclusions of this paper are that communication tools may be seen as additional policy instruments which, however, have to be handled with circumspection.

This paper's conclusion is partially at odds with Reeves and Sawicki (2007) who found that in the UK, speeches and testimony to parliamentary committees are less informative than the Bank of England's Minutes and Inflation Report. The Swiss case also contrasts with Kohn and Sack (2004) who found a significant response in interest rate expectations to the Federal Open Market Committee and to then-Chairman Greenspan's testimony to Congress, but no reaction to ordinary speeches - the most comparable form of communication across countries.

After reviewing related research, this paper describes the SNB's monetary policy concept and its communication instruments. Next, it describes the data, followed by a presentation of the results. After a discussion of methodological limits to the empirical framework, it draws some conclusions.

1. Literature survey

There is a growing body of literature on macroeconomic news and financial assets. One line of research, to which our paper contributes, focuses on information emanating from central banks. Guthrie and Wright (2000) made an early contribution by investigating the impact of statements by the Reserve Bank of New Zealand on interest rates. Bomfim (2003) studied the influence of Federal Reserve announcements on the U.S. stock market. Kohn and Sack (2004) analysed the response of various U.S. financial variables to FOMC statements accompanying interest rate decisions and to former chairman Greenspan's testimony to Congress. Jansen and De Haan (2005) analysed the reaction of euro-dollar exchange rates to statements by the European Central Bank and national central bank officials. Reeves and Sawicki (2007) looked into the reaction of sterling interest rates to Bank of England communication. Andersen et al. (2007) explored the response of US, German and British stock, bond and foreign exchange markets to US macroeconomic news, including target announcements by the Federal Open Market Committee. Ehrmann and Fratzscher (2007a) studied the effects on asset prices from ECB announcements and press conferences and Ehrmann and Fratzscher (2007b) the impact of communication by the Federal Reserve, the Bank of England, and the ECB on interest rates. Ehrmann and Fratzscher (2008) assessed the impact of communication by the Federal Reserve on the level and volatility of interest rates along the US yield curve. Overall central bank communication has been found affecting substantially asset markets. Official statements, reports and minutes exhibit the clearest and most consistent effects. The evidence on speeches is more mixed while interviews have been studied only little. While some studies have reported significant effects of speeches on asset markets (Ehrmann and Fratzscher, 2007b; Rozkrut et al., 2007; Andersson et al., 2006a), neither speeches by then-Chairman Greenspan (Kohn and Sack, 2004) nor those by the Bank of England (Reeves and Sawicki, 2007) had significant effects on financial markets.

2. SNB's monetary policy concept and communication tools

The SNB's monetary policy concept, which grew out of 25 years of monetary targeting, consists of three elements. The first element is a definition of what the SNB considers compatible with price stability - a rise in the CPI of less than 2% per annum that acts as a nominal anchor. The second element is an inflation forecast issued quarterly following a monetary policy assessment. Monetary policy assessments are held in mid-March, mid-June,

mid-September and mid-December (“scheduled decisions”). The third element is a published operational target range for the three-month Libor as a reference interest rate. Normally, this range has a width of 100 basis points. Additionally, the SNB announces where in this band it wishes the Libor to remain.¹ Typically, this reflects the midpoint of the announced target range. As a rule, the target range is reviewed by the Governing Board at the quarterly monetary policy assessment. If necessary, the Board may change the target range at short notice between regular meetings, giving rise to what we term “unscheduled decisions”.

Although the SNB has a decades-long history of regular explanation of its monetary policy decisions to market participants and the public, it has steadily refined its communication policies and substantially increased its transparency.² In order to communicate its current assessment of economic developments and its thinking about future policy decisions, the SNB resorts to a broad set of communication tools. First and foremost, a detailed press release - comprising i) assumptions for the global economy, ii) a comprehensive appraisal of domestic economic activity and its outlook, iii) an evaluation of monetary developments, iv) inflation perspectives based on ii) and iii) and the explanation of the monetary policy decision, v) the target range for the Libor and the envisaged interest rate within this band and vi) an inflation forecast based on the assumption that the new decided Libor will remain constant over the forecasting period of three years - is made available immediately after the monetary policy assessment. Great emphasis is laid upon the reasoning behind each decision, which is explained irrespective of whether policy settings have been changed or not. In the June and December assessments this information is delivered at a press conference.

Further means of communication include speeches and interviews delivered by the Governing Board and other senior officials in which supplementary information on Swiss monetary policy is offered. Although the SNB recurs to additional communication tools,³ we limit our analysis to the market impact of monetary announcements and of both speeches and interviews.

¹ Although the SNB does not have direct control over the three-month Libor, it controls it indirectly through its daily Repo transactions with banks, which allow a rather close control of the very short-maturity rates, especially the overnight and the one-week rate. Through arbitrage and expectations the three-month Libor is quite closely linked to very short-term rates.

² See Abegg (2007). The importance attributed to transparency for conducting monetary policy at the SNB has been stressed by Chairman Roth on several occasions. See, e.g., Roth (2006).

³ The SNB also publishes quarterly a Monetary Policy Report and an annual accountability report. Moreover, the Chairman of the Governing Board testifies before parliamentary commissions. However, no Minutes of the monetary policy meetings are made publicly available.

3. Data

The sample period begins with the implementation of the SNB's new monetary policy framework in January 2000 and extends to December 2005. The assets considered are the CHF/USD, the Swiss Bond Index (SBI) and, as the measure of the stock exchange, the Swiss Performance Index (SPI). High-frequency, intraday data on the CHF/USD rate was kindly provided to us by the Swiss-Systematic Asset Management SA, Zurich. The data on both the SBI and SPI were placed at our disposal by the SWX Swiss Exchange.⁴ Furthermore, we use daily data, obtained from Datastream, measured at one p.m. GMT time. In order to measure the market surprises we recur to the movements of the Futures written on the three-month Libor quoted in the first 20 minutes after the first newswire report on an SNB announcement. These data are from the SNB.⁵

The data contain information on transaction prices and the related time stamp to the nearest second of all index changes or representative forex quotes that occurred in our sample period. The data set has been organised into 5-minute time intervals. If no trades occurred in a given 5-minute interval, we copied down the price from the previous time interval. We carefully checked the presence of outliers and all other data properties. Indeed, we encountered irregular records for the SBI from 28/11/2002 to 7/11/2003. The SWX confirmed that this was due to a calculation problem in bond coupon values. For that reason, we excluded this period from the bond analysis.⁶

The three communication forms studied in this paper exhibit a methodological advantage as their dates are – apart from the few unscheduled assessments – published well in advance, so that no endogeneity problem found in the literature on central bank communication blurs our results.⁷

The communication sample had to be constructed from scratch. To this end, we first fell back on an unpublished daily report drawn up by the SNB's press office that provides coverage of highlights reported by the media. From these publications we selected all articles referring to SNB speeches, interviews and monetary policy decisions. Once our sample of speeches was constructed, we compared it with the SNB's in-house statistics. By

⁴ We thank Richard Meier and Marc Berthoud for their collaboration and assistance.

⁵ We are grateful to Marcel Zimmermann. For lack of data, the surprise component of the first two communications contained in Table 1 was captured by the changing of the three-month Libor with respect to the previous day.

⁶ Unfortunately, all other relevant indices on Swiss bonds provided by the SWX are also affected by this problem. Moreover, SWX does not plan to recalculate these intraday data. Therefore, it is impossible to find a better alternative to the total bond index.

⁷ Our database does contain communications by SNB spokesmen in which an endogeneity problem may arise, as spokesmen interventions may occur in reaction to particular market conditions. However, spokesmen communication represents only 16% of interviews – too few to affect the results significantly.

contrast, our sample of interviews contains only those covered by the media. Speeches and interviews were included irrespective of their content. If we simultaneously came across newswire reports alluding to SNB spokesmen comments, we added them to our database. The collected information was then used to do a search of pertinent references in Bloomberg, Dow Jones and Reuters. For the information provided by Dow Jones and Reuters we resorted to Factiva®, from Dow Jones, entering several keywords, such as “Swiss National Bank”, “SNB”, “Monetary policy”, the name of speaker or interviewee and others. Newswire services’ information provided us the time stamp of the news release to the nearest minute, enabling us to arrange precise intraday time windows around the earliest newswire report. The issuance time of the monetary policy announcements was provided by the SNB’s press office.⁸ For the sake of completeness and extension of observations we also considered the remarks of the Chairman of the Board made during the annual Ordinary General Meeting of the SNB’s stockholders and bank authorities (General Meeting). Eventually, we complemented our data set with reports on the traditional year-end meetings of the Chairman of the Board with the cabinet and with information relating to elections and resignations of the Enlarged Governing Board members.

Table 1 offers an overview of the three communication forms at issue in this study, distinguished by the time of news arrival. From the first row we can infer that there were 36 monetary policy announcements, i.e. official joint communication by the Governing Board, 146 official speeches and 177 interviews. The other three rows display the three communication forms according to three time frames of newswire reporting. The first time frame comprises communication reported on during trading hours. The second frame includes reports issued after market closure, i.e. five o’clock p.m. The third frame catalogs weekend communication.

TABLE 1 ABOUT HERE

Table 2 provides a detailed summary of the 36 monetary policy announcements which are parsed into 23 scheduled (S) and seven unscheduled (U) monetary policy decisions on the one hand and six General Meetings (G) on the other.⁹ Three distinct policy phases can be distinguished. The first phase covers the period from 20 January 2000 to 8 December 2000 and is characterised by rising interest rates. The second phase, from 22 March 2001 to 18

⁸ We are deeply indebted to Roland Baumann.

⁹ We excluded from our analysis the unscheduled monetary policy announcement of 17 September 2001 since it was made public outside of business hours.

March 2004, is marked by falling and a long period of exceptionally low short-term interest rates. The third phase begins in June 2004 and is characterized by the gradual return to a level of short-term interest rates commensurate with the historical average. The table also includes the official time of SNB news releases. The last two columns refer to the market surprise based on changes in the Libor Futures and the corresponding t -statistics. A positive (negative) surprise hints at an unexpectedly high (low) interest rate decision. Overall, positive and negative surprises are evenly represented.

TABLE 2 ABOUT HERE

4. Market reaction to SNB communication

4.1 Non-parametric analysis

In order to assess the asset market reactions to SNB communication we resort to an event study approach. Event studies can in principle be carried out by means of parametric or non-parametric methods. We apply both procedures, beginning with a non-parametric analysis. We estimate the statistical significance of price impacts surrounding communication events by means of t -statistics. We refer to two-tail statistics for the inequality between the price changes related to a specific event and the mean overall returns (inequality hypothesis). Note that we perform the two-sample equal variance (homoscedastic) test. The standard errors for the t -test are based on the population's standard deviation. We also considered a more contingent and time-variable definition of standard deviation.¹⁰

Moreover, we attempt to analyze the statistical impact related to a specific communication tool. To this end, we examine whether the mean, median and variance of intraday returns clustered around communication events are likely to be equal to those of the population. At the bottom of the tables are displayed three tests covering the mean (Anova F-test), the median (Chi-square test) and the variance (Variance F-test) of all market reactions. Other methodologies for the mean, median and variance test have been considered.¹¹ These additional measures – not reported in the paper – are supportive of its results.

¹⁰ We account for intraday seasonalities by considering the return standard deviation at the same time of day as each specific event occurred. We also condition return variability on the recent past by considering the last eight, 26 or 52 weeks. Our findings remain essentially unchanged.

¹¹ For the median tests, we also estimated the Wilcoxon signed test and the Mann-Whitney test. We also considered additional variance tests such as Singel-Tukey, Barlett and Levene methods.

To ease the reading of our results, we organise the tables as follows. First, we analyse the three communication events in the following order: monetary policy announcements, official speeches, and interviews. For each communication event, we investigate in turn the reaction of the forex, of equities and bonds.¹² Second, each table exhibits significant event-specific results. Accordingly, we report intraday price impacts on an event-by-event basis (size of price impact and related *t*-test), followed by the overall impact of each communication tool measured by the Anova F-test, the Median Chi-square and the Variance F-test.

Table 3, 4 and 5 show the reactions of the CHF/USD rate, stocks and bonds, respectively, to each scheduled and unscheduled monetary policy decisions as well as to each statement made at the General Meeting. We construct six time windows. The first time window captures price movements 15 minutes ahead of an announcement while the second window covers the reaction in the 5 minutes immediately following an announcement. The third window covers the market's behaviour from 5 to 15 minutes after a communication event. In the remaining three time windows the interval is widened to 15 minutes, i.e. from 15 to 30 minutes, from 30 to 45 minutes and from 45 to 60 minutes after an announcement. We calculate the three tests for all monetary policy announcements and for a subsample including only the scheduled, unscheduled announcements as well as Ordinary General Meetings.

TABLES 3, 4, 5 ABOUT HERE

Table 6, 7 and 8 report the speeches that significantly affected the three asset prices in at least one of eight time windows and Table 9, 10 and 11 exhibit significant interviews. The first column indicates the day and year in which a speech or interview was recorded. Entries in columns two to six are based on intraday data. The second column shows the market movements 30 minutes before the earliest newswire report, followed by the market development in the next 30 minutes, the interval between 30 and 60 minutes and the interval between 60 and 120 minutes following the first newswire report linked to a communication by an SNB official. The fourth to last column indicates the results in the 24 hour-window. The last three columns display the outcomes from daily data for the day preceding the communication event, the day of communication, and the day after it. This

¹² We also analysed the market reaction to speeches and interviews released off trading hours or during weekends. This additional analysis is available upon request.

allows us to compare the results obtained with the higher frequency intraday data and to infer whether other causes could have triggered the significant price movements we found. Daily data refer to values at one p.m. (GMT time). At the bottom of these tables we present the overall test on whether speeches and interviews influenced asset markets differently from other days' news.

TABLES 6, 7, 8 ABOUT HERE

TABLES 9, 10, 11 ABOUT HERE

A number of clear results emerge from our non-parametric event-study analysis. First, asset markets react significantly to monetary policy announcements. This finding is similar to previous research on other asset markets (Kohn and Sack, 2004; Musard-Gies, 2006; Ehrmann and Fratzscher, 2007b). Not only some unscheduled monetary policy announcements but also some scheduled decisions moved the markets significantly. Thus, even if the monetary policy framework is highly transparent and substantiated by a high communication frequency, the information delivered at scheduled monetary policy decisions may contain news for market participants.

Second, akin to what has been found by Ehrmann and Fratzscher (2007b) for the Federal Reserve, the Bank of England and the ECB, speeches and interviews also affect asset markets. In general, interviews influence the asset markets more than speeches. While the effects on the currency market were relatively modest, both communication forms tended to strongly affect the bond market. Interviews also had a perceptible impact on the stock market. Overall, our findings suggest that these additional tools of communication may flexibly be used to improve the regularity and frequency of information flow and thus enhance central bank transparency.

Third, in line with previous findings in the literature, bonds are the most responsive to all three communication tools considered.¹³ Equities display the least reaction to SNB communication. One explanation resides in the factors determining the discounted value of

¹³ When comparing the effect of announcements on the bond market with the other two markets, it has to be borne in mind that the number of observations pertinent to monetary policy announcements available diminishes from 35 to 29 due to data unavailability for Swiss bond indices for the period 28 November 2002 to 7 November 2003. We had to make do with 19 scheduled announcements, five unscheduled announcements and five General Meetings only.

these assets. By simply splitting the discount factor into three main components, we can interpret the value drivers as the real interest rate, expected inflation and risk premia. Bonds appear to manifest the closest link with monetary policy since two of the three main ingredients making up the bond discount factor (i.e. real interest rates and expected inflation) largely depend on central bank decisions. Exchange rates are essentially valued in terms of economic fundamentals that, in turn, significantly depend on monetary policy too. On the other hand, discounted equity values may be largely influenced by equity risk premia (see e.g. Bernanke and Kuttner, 2005). Also, dividend and cash-flow streams are more affected by corporate-specific issues than monetary policy decisions.

Fourth, bonds react within 30 minutes, but mostly between 5 and 15 minutes. The strongest effect of policy announcements on the foreign exchange market crops up within 15 minutes. Equities are the most sluggish. Most reactions occur within 30 minutes but in some circumstances 45 minutes are necessary. Our finding of a longer lasting effect of communication on asset prices, in particular for the reaction of the bond market to policy assessments, is different from what has been uncovered by Andersen et al. (2007) in a parametric model with both a conditional mean and variance equation to capture the news effect. According to Andersen et al. (2007) news are incorporated in financial assets within five minutes. The difference to us may be due to the fact that their analysis was based on highly liquid futures assets while we used underlying stock and bond indices that by construction also include relatively illiquid assets.¹⁴

Fifth, compared with policy announcements, the reactions to speeches and interviews last longer on all three markets. In addition to the technical reasons mentioned above, this may be due to the more time-consuming analysis required to thumb through speeches and interviews. It is also possible that a protracted re-valuation process elicited by speeches and interviews is a sign of market participants' heterogeneity. The fact that a price reaction is still visible one or two hours after a news release may also be put down to more passive traders. Another plausible explanation for sluggish market responses is that there are many information sources available and that the same news provider may release information updates related to the original news item. Given the possibility that broadcasters release the same news items in a non-synchronised way and/or quote each other within a short period of time, multiple information sources may translate into a longer-lasting impact of news items.

¹⁴ Tse (1999) and Upper and Werner (2007), among others, show that it is the futures markets rather than the underlying markets that play the leading role in the price discovery process.

Sixth, the variance F-test suggests that SNB communication tends to have a greater impact on the second moment of return distributions than on the first moment, a finding that may be interpreted as a sign of the heterogeneity in market participants' expectations.

Finally, the reaction to monetary policy announcements was time-variant across the three markets. At the beginning of the sample period the currency market responded most conspicuously to SNB communication, coinciding with a restrictive monetary policy. The equity market showed special responsiveness in the middle of the sample, concomitant with a very expansionary policy stance. Bonds responded in the later part of the sample, when the SNB started a gradual normalization of interest rates. Hence, it appears that the currency market was more sensitive to communications when interest rates were rising, equities when they were falling and bonds when they started rising again from historically low levels. This is akin to Andersson et al. (2006b) who also found a regime-dependent impact of public information on the German long-term bond market.

4.2 Regression analysis

The non-parametric approach employed so far allows us to infer the frequency with which central bank communication affects the financial markets. In this section we complement the non-parametric procedure with a parametric test that summarizes the analysis and allows us to check the robustness of the results. Following Kohn and Sack (2004), we estimated the following regression equation:

$$\Delta y_{t,k} = \alpha_0 + \beta_1 \Delta ff_{t,k} + \eta_{t,k} \quad (1)$$

where $\Delta y_{t,k}$ is the intraday change in the financial variable on day t and intraday time k . α is a constant and β captures the effects of the unexpected component of monetary policy decisions, measured by Δff . It is computed from the change in the nearest-to-maturity Futures contract of the three-month Libor within the first 20 minutes (for announcements) or 30 minutes (for speeches and interviews) after the first newswire report on SNB communication. The error term, $\eta_{t,k}$, represents any other pricing factors affecting the financial variable, such as revisions of the implicit short-term interest rate path beyond the next three months, term premia, risk premia and all other possible asset-specific value drivers.

The results are reported in Table 12. The sign of the β coefficient is as expected (with one exception). An unexpected interest rate increase tends to strengthen the Swiss franc to the

US dollar while it negatively affects stocks and bonds. All three communication forms analyzed in this paper exhibit estimated β -coefficients that are only weakly significant in statistical terms. By this measure, the strongest (weakest) reaction is perceptible in the bond (equity) market. The bond market reacts not only to monetary announcements but also to speeches and interviews. The last column shows what we call the "variance ratio". It represents the ratio of the variance of the error term for each financial variable on communication day t to the variance on all non-communication days in the sample at the same intraday time k . That is, we contrast the intraday effect of communication days with those days that did not involve any policy announcements, speeches or interviews. Given that equation (1) controls for the direct effect of policy surprises, the residual $\eta_{t,k}$ should genuinely determine whether communication had any effect beyond the short-term policy outlook.

The results show that monetary policy announcements had some effect beyond the contemporaneous policy decisions. The variance of the error term in the regression involving the exchange rate and bonds is sizable and statistically significant while no effect is discernable on the equities' variance ratio. Besides the announcements, only interviews increase the variance ratio. Overall, the regression results are essentially in line with those of the non-parametric analysis. However, it is worth stressing that these results are based on relatively few observations and thus should be interpreted with due care.

TABLE 12 ABOUT HERE

In the analysis so far the component of market surprises was distilled from changes in the Futures on the three-month Libor, akin to previous studies that rely on Kuttner (2001). However, as pointed out by Gürkaynak et al. (2005), this procedure can be of limited validity as market participants may not only react to what monetary policymakers decided but also to what they said in the accompanying statements. Using a principal components method, they showed that the two main orthogonalized factors capture the market reaction to FOMC statements. These are the "target" and "path" factor. The target factor refers to the surprise component of the change in the current federal funds rate target. The path factor is related to the forward-looking communication in the statement. The path factor is meant to account for market participants' reading of the future path of monetary policy that affects interest rates across the yield curve. It appears to be the dominant factor at the long end.

Similar to Gürkaynak et al. (2005) we estimate the effects of each of the two dimensions of monetary policy announcements on asset prices by running the regression

$$\Delta y_{t,k} = \alpha_0 + \beta_1 target_{t,k} + \beta_2 path_{t,k} + \eta_{t,k} \quad (2)$$

where *target* represents the target factor and *path* the path factor. While the target factor is defined as before, the path factor is the principal component of the next three maturities of the Futures on the three-month Libor, both appropriately scaled. Results, together with the variance ratio, are reported in Table 13. It appears that the target factor exerts the main effect on financial assets. The target factor is significant across all three assets. As opposed to it the path factor is insignificant in two out of three markets. A 1% innovation to the target factor causes responses of 14, 38, 44 bp in the currency rate, the stock market and the bond market, respectively.

There are three main reasons explaining the weak significance of the path factor. First, there were arguably too few fundamental changes of policy course and only exceptional policy reversals within a monetary policy cycle to affect the markets substantially. Using Blinder's (2006) definition of a policy reversal implying a change in direction within three months, we count only one policy reversal. Widening the window to four months adds one more reversal. Moreover, the share of rate changes of 25 bp or less was 73% while the share of rate changes of 50 bp amounted to 23%. Second, our results suggest that the regular and coherent use of interviews and speeches enhances the transparency and predictability of monetary policy, leaving little room for surprises on the future monetary policy path. Third, unlike other central banks, the SNB has not made systematic use of code words, statements on a "policy bias", "balance of risks", etc., whose sudden change or drop in the policy announcement can precipitate a substantial repricing of financial assets as described by Gürkaynak et al. (2005).

TABLE 13 ABOUT HERE

5. Methodological limits

There are methodological limits to our analysis. First, the accuracy of the results depends significantly on the extent of broadcasting systems information taken into account and the

precision with which their reports are captured. Given that it is impossible to track all broadcasting systems, one methodological limit is that it is restricted to three newswire companies. However, there are many others which may report on communication events by the SNB, such as AWP (AG für Wirtschafts-Publikationen), SDA (Schweizerische Depeschagentur AG), etc.

A second limit refers to the precision with which the event time can be time-stamped. Several issues come into play here. While the actual time of a monetary policy announcement can be precisely identified, there may be a mismatch between a speech or interview and the time of a related news release. On the one hand, a speech may be given ahead of the official time, followed by a waiting period (also called "embargo"). Thus, information may become publicly available before the official embargo elapses. When it comes to interviews, it is possible that SNB-related information circulates among market participants prior to newswire reporting. The reason is that unlike speeches, the dates of interviews are not always publicly available in advance. Occasionally, broadcasting companies call up the SNB's press office to check the content of an interview before reporting on it. Information may therefore already be in circulation when the first newswire appears. A related limit is linked to the intraday time windows, set to five minutes. This five-minute rule means that all events must be rounded up or down to the nearest five-minute time interval, even if an event was reported in between.¹⁵

Third, by using high-frequency data we attempt to nail down the effects of SNB communication on financial markets distinct from other news. By narrowing time windows around a specific event, it becomes much less likely that any other cause can mistakenly be identified as having determined market reactions. Moreover, estimations are more efficient in terms of identification and evaluation of single outliers. However, we cannot exclude that price movements are due to other causes. For instance, there may be overlapping SNB communication events. They are reported in footnotes to each table. Some of them explain apparent early price movements.

6. Conclusions

Communication provides monetary policy authorities with an effective means of explaining their thinking and decisions. As such, it is potentially an important avenue for central bankers to disseminate valuable information to investors. This paper adds to the expanding

¹⁵ For instance, if a newswire report occurs at 1.58 p.m., it is rounded up to 2 o'clock. A report clocked up at 1.57 p.m. is rounded down to 1.55.

literature on central bank transparency by highlighting the effects of SNB policy announcements, speeches and interviews on asset markets from 2000 to 2005. We provide evidence for intraday patterns of asset market reactions, showing that market participants react promptly to SNB communication. Significant market movement at the time of the earliest news release suggests that traders actively monitor real-time central bank information.

Our results, derived from Swiss financial data, hint at two conclusions. First, the construction of a new high-frequency database allowed us to accurately analyze reactions of currency, bonds and stocks to real-time communication. The bond market is the most responsive to SNB communication, followed by the currency market. Stocks are the least reactive. We attribute these diverse reaction patterns to the various relationships between monetary policy and discounted asset values. Second, all three communication tools provide important information to market participants. Speeches and interviews can be used to complement monetary policy announcements in notifying market participants of past, current and future SNB decisions and economic conditions in a flexible way, effectively contributing to enhancing the transparency of the central bank. In this paper we have focused on the use of communication tools and the associated market reactions. Further research could be devoted to the content, the clarity, the length and complexity of central bank communication and its market effects.

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Table 1
Communication items

Summary	Monetary policy announcements		Speeches		Interviews	
	Number	Rel. Freq.	Number	Rel. Freq.	Number	Rel. Freq.
All	36	100%	146	100%	177	100%
Within trading hours (from 9 to 17)	35	97%	68	47%	54	30%
Off market	1	3%	78	53%	86	49%
During weekends	0	0%	0	0%	37	21%

Table 2
SNB Monetary policy announcements

Date	Issuance time	Event	New mid-point target	Surprise	t-stat
20.01.2000	09:31	Unscheduled	2	0.018*	1.94
03.02.2000	13:55	Unscheduled	2.25	0.067***	7.12
23.03.2000	14:00	Scheduled	3	0.054***	6.04
28.04.2000	10:00	General Meeting	3	0.009	0.98
15.06.2000	08:50	Scheduled	3.5	0.003	0.33
14.09.2000	14:15	Scheduled	3.5	-0.003	0.33
08.12.2000	09:45	Scheduled	3.5	0	0.00
22.03.2001	14:00	Scheduled	3.25	0.003	0.38
20.04.2001	10:00	General Meeting	3.25	-0.006	0.71
14.06.2001	09:30	Scheduled	3.25	0.006	0.70
17.09.2001	17:43	Unscheduled	2.75	NA	NA
24.09.2001	14:00	Unscheduled	2.25	-0.045***	5.08
07.12.2001	09:45	Scheduled	1.75	0	0.00
21.03.2002	14:00	Scheduled	1.75	0.025***	2.80
26.04.2002	10:00	General Meeting	1.75	0.019**	2.10
02.05.2002	11:40	Unscheduled	1.25	-0.016*	1.74
14.06.2002	09:30	Scheduled	1.25	-0.008	0.88
26.07.2002	13:00	Unscheduled	0.75	-0.178***	20.02
19.09.2002	14:00	Scheduled	0.75	0.029***	3.26
13.12.2002	09:45	Scheduled	0.75	0	0.00
06.03.2003	13:51	Unscheduled	0.25	-0.474***	53.22
20.03.2003	14:00	Scheduled	0.25	0	0.00
25.04.2003	10:00	General Meeting	0.25	0	0.00
13.06.2003	09:30	Scheduled	0.25	0.08***	8.99
18.09.2003	14:00	Scheduled	0.25	-0.087***	9.77
12.12.2003	09:45	Scheduled	0.25	0	0.00
18.03.2004	14:00	Scheduled	0.25	0	0.00
30.04.2004	10:00	General Meeting	0.25	-0.057***	6.42
17.06.2004	09:28	Scheduled	0.5	-0.057***	6.42
16.09.2004	13:58	Scheduled	0.75	-0.011	1.23
16.12.2004	09:30	Scheduled	0.75	-0.067***	7.49
17.03.2005	13:59	Scheduled	0.75	-0.024	2.74
29.04.2005	10:00	General Meeting	0.75	0.013	1.49
16.06.2005	09:29	Scheduled	0.75	0	0.00
15.09.2005	13:59	Scheduled	0.75	-0.026***	2.92
15.12.2005	09:29	Scheduled	1	-0.01	1.10

Table 3

Foreign exchange market reactions to monetary policy announcements

Date	S/U*	Surprise	15 min before	5 min after	From 5 to 15 min	From 15 to 30 min	From 30 to 45 min	From 45 to 60 min
20.01.2000	U	0.018*	-0.0011	0.0003	-0.0002	0.0034**	-0.0005	0.0016
03.02.2000	U	0.067***	0.0012	0.0018**	-0.0046***	0.0005	-0.0026*	0.0012
23.03.2000	S	0.054***	0.0005	-0.0039***	-0.0025*	-0.0005	-0.0011	-0.0003
28.04.2000	G	0.009	0.0012	0.0006	-0.0002	-0.0011	0.0001	-0.0014
15.06.2000	S	0.003	-0.0008	0.0018**	0.002	0.001	0.0014	-0.0007
14.09.2000	S	-0.003	0.0029	0.0008	0.0003	0.0007	0.0013	0.0016
08.12.2000	S	0	0.0014	0.0036***	-0.0009	-0.0002	-0.0006	0.0001
22.03.2001	S	0.003	0.001	-0.0022**	0.0026**	-0.0022	0.0019	0.0026*
20.04.2001	G	-0.006	0.0004	0.0009	0.0006	0.0002	0.0006	-0.0004
14.06.2001	S	0.006	-0.0006	-0.0009	0.0006	0	-0.0009	0.0002
24.09.2001	U	-0.045***	0.0001	0.0021**	0.0010	0.0019	-0.0009	-0.0006
07.12.2001	S	0	0.0007	0.0002	0.0006	0.0001	0.0003	-0.0001
21.03.2002	S	0.025***	-0.0001	-0.0008	0.0005	0.0008	0.001	-0.0005
26.04.2002	G	0.019**	0.0023	-0.0003	-0.0006	0.0011	0.0001	-0.0002
02.05.2002	U	-0.016*	0.0023	-0.0002	0.0007	0.0000	0.0006	-0.0002
14.06.2002	S	-0.008	0.0012	-0.0005	0.0003	0.0012	-0.001	0.0004
26.07.2002	U	-0.178***	-0.0006	0.0027**	-0.0004	0.0013	-0.0001	-0.0005
19.09.2002	S	0.029***	0.0009	0	-0.0012	0.0011	-0.0016	0.0004
13.12.2002	S	0	0	-0.0003	0	-0.0002	0.0002	-0.0018
06.03.2003	U	-0.474***	0.0000	0.0014	0.0012	-0.0009	-0.0024	-0.0010
20.03.2003	S	0	0.0001	0.0005	0.0017	0	-0.0003	-0.0013
25.04.2003	G	0	-0.0007	0.0007	-0.0003	0.0014	0.0014	-0.0009
13.06.2003	S	0.08***	-0.0008	0.0006	-0.0027**	0.0003	0.0016	-0.0008
18.09.2003	S	-0.087***	0.0004	-0.0001	-0.0003	-0.0006	0.0005	0.0001
12.12.2003	S	0	-0.0002	0.0001	0.0002	0.0015	-0.0008	-0.0007
18.03.2004	S	0	0.0002	0.0002	-0.0008	-0.0006	0.0006	0
30.04.2004	G	-0.057***	0.0001	0.0002	0.0018	-0.001	0.0007	-0.0001
17.06.2004	S	-0.057***	-0.0012	-0.019**	-0.0033**	-0.0013	0.0000	0.0004
16.09.2004	S	-0.011	0.0005	0.0002	0.0006	-0.0005	-0.0005	-0.0002
16.12.2004	S	-0.067***	-0.0001	0.0006	0.0007	0.0006	-0.0005	0.0006
17.03.2005	S	-0.024	0.0003	0.0013	0.0006	0.0009	0.0017	-0.0006
29.04.2005	G	0.013	0.0001	-0.0005	0.0008	-0.0003	0.0003	-0.0001
16.06.2005	S	-0.001	-0.0004	-0.0001	-0.0002	0.0002	-0.0003	-0.0006
15.09.2005	S	-0.026***	-0.0008	0.0011	0.0005	0.0014	0.0006	-0.0006
15.12.2005	S	-0.01	-0.0002	0.0005	0.001	-0.0009	-0.0015	0.0009
All announcements								
Anova F-stat		622***	6.11**	15.87***	51.47***	7.66***	0.18	0.05
Med. Chi-sq.		3.25**	2.35	3.28**	10.35***	3.47*	0.27	2.32
Variance F-test		4229***	1.14	9.49***	8.24***	1.36	1.47	1.01
Scheduled only								
Anova F-stat		161***	4.86**	3.54*	54.63***	2.79*	2.46	0.09
Med. Chi-sq.		2.78*	1.69	1.42	7.78***	1.7	1.69	1.69
Variance F-test		816***	1.03	8.93***	6.69***	1.01	1.14	1.07
No unscheduled, no General Meetings								
Anova F-stat		188***	2.49	3.30*	35.3***	2.86*	0.83	0.06
Med. Chi-sq.		2.9*	0.67	0.99	5.28**	2.13	0.05	0.04
Variance F-test		1345***	1.01	10.92***	7.72***	1.02	1.33	1.07

* S means scheduled monetary policy decisions; U means unscheduled monetary policy decisions; G stands for General Meeting.

Table 4
Swiss equity market reactions to monetary policy announcements

Date	S/U*	Surprise	15 min before	5 min after	From 5 to 15 min	From 15 to 30 min	From 30 to 45 min	From 45 to 60 min
20.01.2000	U	0.018*	0.0002	-0.0003	-0.0001	-0.0012	-0.0002	-0.0039*
03.02.2000	U	0.067***	0.0012	-0.0006	0.0019	-0.0003	0.0002	0.0004
23.03.2000	S	0.054***	-0.001	0.0001	0.0003	0.0013	-0.002	-0.0007
28.04.2000	G	0.009	-0.0013	0.0002	0.0003	0.0011	-0.0007	-0.0001
15.06.2000	S	0.003	0	-0.0006	0.0018	0.0007	-0.0005	-0.0001
14.09.2000	S	-0.003	-0.0001	0.0001	0.0015	0.0005	0.0012	0.0013
08.12.2000	S	0	0.0012	0.0005	0.0007	0.0021	-0.0024	0.0001
22.03.2001	S	0.003	-0.0025	0.0027**	0.0022	-0.0043**	0.0033	0.0046**
20.04.2001	G	-0.006	-0.0007	-0.0005	-0.0004	0.0005	0.001	-0.0004
14.06.2001	S	0.006	-0.0018	0.0003	-0.001	-0.0004	-0.0002	-0.0003
24.09.2001	U	-0.045***	0.0001	0.0011	0.0058***	-0.0008	0.002	0.0033
07.12.2001	S	0	0.0026	-0.0005	-0.0011	-0.0018	-0.0028	0.0011
21.03.2002	S	0.025***	-0.0001	0.001	-0.0001	-0.0004	0.0004	-0.0001
26.04.2002	G	0.019**	-0.0001	-0.0003	0.0001	-0.0017	0.0005	-0.0002
02.05.2002	U	-0.016*	-0.0001	-0.0013	-0.0008	-0.0008	0.0001	0.0011
14.06.2002	S	-0.008	-0.0037*	-0.0007	-0.0040**	0.0019	-0.0047**	-0.00025
26.07.2002	U	-0.178***	0.0018	0.002	-0.0008	0.0045**	0.0037*	0.0025
19.09.2002	S	0.029***	0.0007	0.0006	-0.0021	-0.0037*	0.0023	0.0003
13.12.2002	S	0	0.0014	-0.0002	0.0017	-0.0031	-0.0009	0.002
06.03.2003	U	-0.474***	-0.0025	-0.0042***	0.0027	-0.0004	-0.0013	-0.0013
20.03.2003	S	0	0.0002	-0.0006	0.0019	-0.0019	-0.0002	-0.0044**
25.04.2003	G	0	0	0.0008	0.0013	-0.0016	-0.0008	-0.0011
13.06.2003	S	0.08***	-0.0031	-0.0015	-0.0038**	-0.0013	-0.0011	0.0004
18.09.2003	S	-0.087***	-0.0008	0.0005	0.0018	0.001	0.0005	0.0005
12.12.2003	S	0	-0.0008	0.0005	0.0004	0.0009	0.0002	-0.0004
18.03.2004	S	0	0.0011	-0.0009	-0.0008	0	-0.0001	-0.0022
30.04.2004	G	-0.057***	0.0001	-0.0002	0.0007	0.0003	0.0001	-0.0003
17.06.2004	S	-0.057***	0.0012	0.0001	-0.0005	-0.0003	-0.0002	-0.0001
16.09.2004	S	-0.011	-0.0007	0.0001	0.001	0.0016	-0.0002	0
16.12.2004	S	-0.067***	0.0002	0.0001	-0.0001	0.0003	0.0003	0
17.03.2005	S	-0.024	0	0.0004	0	0.001	0.0002	0
29.04.2005	G	0.013	0.0013	0.0001	-0.0007	-0.0028	0	0
16.06.2005	S	0	0.0001	0.0002	-0.0007	0	-0.0002	-0.0002
15.09.2005	S	-0.026***	-0.0002	-0.0001	-0.0002	0.0004	0.0006	-0.0002
15.12.2005	S	-0.01	-0.0011	-0.0008	-0.0019	-0.0008	-0.0018	0
All announcements								
Anova F-stat		622***	0.34	0.77	0.52	0.61	0.1	0.05
Med. Chi-sq.		3.25**	0.72	1.33	0.03	0.71	0.6	3.46*
Var. F-test		4229***	2.27***	1.31	1.21	1.4	1.68*	1.59*
Scheduled only								
Anova F-stat		161***	0.47	0.05	0.52	0.6	0.1	0.15
Med. Chi-sq.		2.78*	1.69	0.92	0.04	0.71	0.25	0.59
Var. F-test		816***	2.28***	2.34***	1.21	1.41	1.68**	1.59*
No unscheduled, no General Meetings								
Anova F-stat		188***	0.52	0.12	0.14	0.4	0.7	0.02
Med. Chi-sq.		2.9*	1.08	1.14	0.39	0.04	1.08	2.1
Var. F-test		1345***	1.94**	1.98***	1.07	1.04	1.52	1.45

* S means scheduled monetary policy decisions; U means unscheduled monetary policy decisions; G stands for General Meeting.

Table 5
Swiss bond market reactions to monetary policy announcements

Date	S/U*	Surprise	15 min before	5 min after	From 5 to 15 min	From 15 to 30 min	From 30 to 45 min	From 45 to 60 min
20.01.2000	U	0.018*	0	0	-0.0001	0.0001	0.0006**	0
03.02.2000	U	0.067***	0.0002	0.0001	0.0005**	-0.0003	-0.0003	-0.0001
23.03.2000	S	0.054***	0	0	-0.0004**	-0.0001	-0.0001	0
28.04.2000	G	0.009	0	-0.0004***	0.0004*	0	0	0.0001
15.06.2000	S	0.003	0.0002	0	0.0002	-0.0003	-0.0003	-0.0003
14.09.2000	S	-0.003	0	0	0	0.0002	0.0001	0
08.12.2000	S	0	-0.0002	0.0001	0.0001	0.0003	0	0
22.03.2001	S	0.003	0	0	0.0002	-0.0001	0	-0.0001
20.04.2001	G	-0.006	-0.0002	0.0001	0.0001	0.0001	0.0003	0
14.06.2001	S	0.006	0.0002	-0.0002*	-0.0004*	-0.0004	-0.0006**	-0.0005*
24.09.2001	U	-0.045***	-0.0001	0.0001	0.0001	0.0001	0	0.0001
07.12.2001	S	0	0	0.0001	0.0001	0	-0.0003	0.0002
21.03.2002	S	0.025***	0	0.0002	-0.0002	0	-0.0001	0
26.04.2002	G	0.019**	-0.0002	0	-0.0001	-0.0002	0.0002	0
02.05.2002	U	-0.016*	0	0	0.0003	0.0005**	0.0001	0.0002
14.06.2002	S	-0.008	0.0002	-0.0003	0	0	0	0.0001
26.07.2002	U	-0.178***	-0.0004	0	0.0001	0.0001	0.0004	0.0001
19.09.2002	S	0.029***	0	0	0.0001	0.0001	0.0004	0
13.12.2002	S	0	0.0002	-0.0001	0	0.0001	0.0001	0
18.03.2004	S	0	-0.0001	-0.0001	0	0.0001	-0.0001	-0.0002
30.04.2004	G	-0.057***	-0.0001	0.0001	0.0009***	0.0006**	0.0002	0.0008***
17.06.2004	S	-0.057***	0.0004	-0.0001	-0.0008***	-0.0011***	0.0004	0.0001
16.09.2004	S	-0.011	-0.0001	0.0001	0.0002	0.0003	0.0001	0.0001
16.12.2004	S	-0.067***	0.0001	0.0001	0.0005**	0.0001	-0.0001	0.0001
17.03.2005	S	-0.024	0.0001	0.0001	0.0007***	-0.0002	0.0003	-0.0001
29.04.2005	G	0.013	-0.0003	0.0001	-0.0007***	0.0003	0.0002	0.0001
16.06.2005	S	0	0.0001	-0.0001	-0.0003	-0.0008***	-0.0007***	0.0001
15.09.2005	S	-0.026***	0	-0.0019***	0.0009***	0.0014***	-0.0001	-0.0019***
15.12.2005	S	-0.01	0.0001	-0.0014***	0.0013***	0.0032***	0.0001	-0.0004
All announcements								
Anova F-stat		572***	0.13	42.55***	20.71***	15.01***	0.38	2.11
Med. Chi-sq.		3.15**	0.8	7.03***	15.05***	7.12***	3.51*	1.16
Var. F-test		3829***	1.67*	21.05***	10.01***	16.2***	2.54***	5.33***
Scheduled only								
Anova F-stat		141***	0.70	57.22***	14.23***	15.51***	0.39	2.97*
Med. Chi-sq.		2.77*	0.33	5.56**	9.77***	7.12***	3.51*	1.16
Var. F-test		601***	1.27	24.89***	11.72***	16.2***	2.54***	5.33***
No unscheduled, no General Meetings								
Anova F-stat		158***	1.84	68.02***	22.64***	11.13***	11.1***	9.59***
Med. Chi-sq.		2.6*	2.05	2.06	12.69***	6.95***	2.02	0.33
Var. F-test		854***	1.71	30.1***	10.86***	11.24***	24.04***	6.5***

* S means scheduled monetary policy decisions; U means unscheduled monetary policy decisions; G stands for General Meeting.

Table 6
Foreign exchange market reactions to official speeches

date	30 min before	30 min after	from 30 to 60 min	from 1 h to 2 h	within 24 hours	day before	same day	day after
03.04.2000	-0.0037***	-0.0009	-	-	0.0062	-0.0054	0.0000	0.0000
12.05.2000	-0.0019	-0.0026**	0.0006	-0.0016	-0.0102	0.0000	0.0068	-0.0150**
14.09.2001	-0.0006	-0.0022*	-0.0023*	-0.0016	-0.0265***	-0.0046	-0.0081	0.0000
17.09.2001	-0.0026**	-0.0053***	0.0007	0.0019	0.0061	-0.0081	-0.0288***	0.0098
22.10.2001	0.0035***	0.0014	-	-	0.0048	0.0021	0.0025	0.0116*
06.03.2002	-0.0028**	0.0008	-	-	-0.0089	-0.0057	0.0000	-0.0135**
18.06.2002 ^a	-0.0004	-0.0007	0.0002	-0.0008	-0.0123*	-0.0011	-0.0033	-0.0089
23.07.2002	0.0024*	0.0022*	-0.0023*	0.0004	-0.0007	-0.0011	0.0194***	0.0002
21.05.2003	0.001	0.0011	0.0002	-0.005***	0.0004	0.0059	-0.0092	0.0070
05.06.2003 ^a	-0.0035***	-0.0033***	0.0005	-0.0015	0.0088	0.0054	0.0077	-0.0122*
26.06.2003	0.003**	0.0002	-0.0014	0.0017	0.0086	0.0012	0.0071	0.0129*
27.10.2003	0	-0.0001	-0.0014	0.0033*	0.0039	0.0044	0.0019	0.0025
05.12.2003	0.001	-0.0005	0.0006	-0.002	-0.013*	0.0010	0.0004	-0.0148**
07.05.2004	0.0005	0.0002	-0.0002	-0.0002	0.0138**	0.0002	0.0094	0.0090
18.11.2004	-0.0009	-0.0003	0.0024*		-0.0049	-0.0018	-0.0087	0.0000
29.11.2004	-	-0.0004	-0.0023*	0.002	-0.003	0.0020	-0.0024	-0.0021
29.08.2005	0.0002	-0.0007	-	-	0.0129*	-0.0039	-0.0004	0.0110*
29.11.2005	0.0008	-0.0002	-0.0002	0.0031*	0.0035	0.0022	-0.0101	0.0041
% signif.	10%	7%	6%	4%	7%	0%	3%	10%
Anova F-stat	0.89	0.04	0.06	0.07	0.05	0.37	0.30	0.33
Med. Chi-sq.	0.68	0.68	0.11	0.35	0.39	0.06	0.53	0.01
Var. F-test	1.14	1.11	1.38*	1.25	1.34	1.06	1.12	1.35

^a Overlapping events: this speech was preceded by an interview.

Table 7
Swiss equity market reactions to official speeches

date	30 min before	30 min after	from 30 to 60 min	from 1 h to 2 h	within 24 hours	day before	same day	day after
24.02.2000	0.0007	-0.0006	0	0.0008	-0.0155**	0.0075	-0.0031	-0.006
03.04.2000	-0.0011	0.0005	0.0048***	0.0012	0.0049	0.0053	0.008	0.0048
25.08.2000 ^a	0.0012	0.0004	0.0029*	0.0008	0.0041	-0.0019	-0.0039	0.003
07.09.2001	-0.0023	0.0030*	0.0010	-0.0025	0.0034	-0.0162	-0.0201*	-0.0199*
14.09.2001	-0.0019	0.0027	-0.0027	-0.0077***	-0.0518***	0.0092	-0.0443***	0
17.09.2001	0.0029*	-0.0055***	0.0031*	-0.0027	0.0496***	-0.0443***	0.0256**	-0.0119
22.10.2001	-0.0004	0.0019	0.0062***	0.0026	0.0111	-0.0038	0.0164	0.0157
07.11.2001	0.001	0.0001	0.0001	-0.0023	0.0176**	0.0018	0.0024	0.0223**
26.02.2002	-0.0018	-0.0006	0.0003	-0.0056**	-0.0031	0.0072	-0.0036	0.0166
18.06.2002 ^a	-0.0003	-0.0042**	-0.0004	-0.0032	-0.0035	0.0276**	-0.0132	-0.0156
23.07.2002	0.0086***	-0.0041**	-0.0009	-0.0004	-0.0427***	-0.0539***	-0.0159	-0.0084
04.09.2002	0.0016	-0.0094***	-0.0002	0.0053**	-0.0129*	-0.0333***	0.0071	-0.0015
23.09.2002	0.0025	0.0018	0.0006	-0.0009	-0.0441***	0.0012	-0.0356***	-0.001
30.11.2002	-0.0012	0.0039**	0.0046***	0.0025	-0.0012	-0.0052	0.0067	-0.0268**
05.06.2003 ^a	-0.0071***	-0.0008	0.0014	-0.0017	0.0046	0.0071	-0.0079	0.0165
26.06.2003	0.0003	0.0037**	-0.0011	-0.0003	-0.0025	0.0006	0.0031	0.0009
19.08.2003	0.0018	0.0005	0	-0.0043*	-0.0029	0.0055	0.004	-0.0056
30.08.2003	-0.0076***	0.0026	0.0005	0.0054**	0.0023	-0.0131	0.0174	-0.0054
19.11.2004	0.0006	0.0008	-0.0006	-0.0001	-0.0143*	-0.0009	-0.0109	-0.0076
07.12.2005	-0.0003	-0.001	0.0007	0.0046*	0.0014	0.0029	-0.0026	-0.0035
% signif.	6%	10%	7%	9%	12%	6%	6%	4%
Anova F-stat	0.18	0.41	0.44	0.91	1.23	1.82	0.08	0.03
Med. Chi-sq.	0.01	0.72	0.19	6.49**	0.01	0.02	0.13	0.13
Var. F-test	1.96***	2.21***	3.42**	4.07***	1.2	1.04	1.09	1.23

^a Overlapping events: this speech was preceded by an interview.

Table 8
Swiss bond market reactions to official speeches

date	30 min before	30 min after	from 30 to 60 min	from 1 h to 2 h	since 24 hours	day before	same day	day after
03.04.2000	0	0.0004**	0.0004	0.0001	0.0025***	-0.0016	-0.0006	0.002
12.07.2000	0	-0.0002	-0.0001	-0.0001	-0.0019**	0.0016	0	-0.001
25.08.2000	0	0.0008***	0.0002	0.0002	0.0013	0.0011	0.0012	0.0007
16.01.2001	0	0	0	-0.0001	-0.0027**	-0.0006	-0.0001	-0.0016
09.05.2001	0.0005**	-0.0001	0.0002	0.0002	0.0007	0.0003	0.0005	0.0006
07.09.2001	-0.0005**	0.0001	0	0.0001	0.0006	0.0003	0.0016	0.0006
14.09.2001	0.0002	0.0002	0.0001	0.0001	0.0023***	-0.0004	0.0013	0
17.09.2001	0.0004*	0	0	0.0001	0.0002	0.0013	0.0007	0.0008
26.02.2002	0.0001	0	-0.0002	0.0006*	-0.0002	-0.0005	-0.0006	-0.001
04.09.2002	-0.0006***	0.0001	0.0005*	-0.0001	0.0033***	0.0021	0.0015	0.0028**
23.09.2002	0.0001	0	0.0001	-0.0002	0.0016*	-0.0003	0.0006	0.0008
04.11.2002	-0.0005**	-0.0004**	0.0001	0.0001	-0.0012	0.0019	-0.0009	-0.0002
11.02.2003	-0.0009***	0	-0.0004	0.0005*	0.0011	0.0001	-0.0002	0.0014
21.05.2003	-0.0009***	0	-0.0004	0.0005*	0.0011	-0.0008	0.0005	-0.0005
05.06.2003 ^a	-0.0009***	-0.0003	-0.0001	0.0004	0.0011	0.0015	0.0025*	-0.0002
26.06.2003	0.0001	-0.0004**	0.0001	0.0004	0.0011	0.0015	-0.003**	0.0011
19.08.2003	0	-0.0004**	0.0001	0.0004	0.0011	0.0005	-0.0011	0.0011
30.08.2003	0	-0.0004**	0.0005*	0	0.0011	-0.0002	-0.0008	-0.0049***
08.10.2003	0	-0.0004**	0.0005*	-0.0005*	0.001	0.001	-0.0004	0.0001
27.10.2003	0	-0.0004*	0.0004	-0.0001	0.001	0	-0.0018	-0.0011
05.12.2003	-0.0006***	-0.0002	0.0001	0	0.0022**	0.0006	0.0024*	0.0024*
29.01.2004 ^a	-0.0006***	0	0	-0.0001	-0.0024***	0.0008	-0.0035***	0.0005
08.03.2004	-0.0001	0.0002	-0.0001	0.001***	0.0022**	0.0033**	0.0028**	0
23.04.2004	0.0001	0	0	0	-0.0042***	-0.0002	-0.0009	-0.0016
07.05.2004	0.0003	0.0005**	0.0003	0	-0.001	-0.0025*	-0.0031**	-0.0013
04.06.2004	-0.0007***	0.0003	0	-0.0001	-0.0013	-0.0015	-0.0015	-0.0004
18.11.2004	-0.0001	-0.0003	-0.0007**	0.0003	-0.0003	-0.0014	-0.0018	0
23.11.2004	-0.0001	0.0003	-0.0001	-0.0001	0.0026***	0.0017	0.001	0.0012
06.12.2004	0	0.0001	0.0001	0.0001	0.0023**	0.0005	0.0021	0.001
11.01.2005	-0.001***	0.001***	0.0002	-0.0001	0.0007	0.0005	0	-0.0004
02.02.2005	0.0001	0.0001	0.0005	0.0001	0.0019**	0.0018	0.0004	-0.0003
04.02.2005	0.0009***	-0.0001	0.0003	0.0019***	0.0042***	-0.0003	0.0024*	0.0008
04.03.2005	0.0003	0.0005**	0	0.0007**	0.006***	0.0023*	0.002	0
07.03.2005	0.0002	0.0002	0	0	0.0034***	0.002	0.0008	0.0007
21.04.2005	0	-0.0002	0.0005	-0.0001	0.0039***	-0.0009	-0.0002	0.0001
27.05.2005	0.0001	0.0009***	-0.0003	0	0.0013	-0.0008	0.0001	0.0002
14.06.2005	-0.0001	-0.0001	0.0001	0.0007**	-0.0027***	-0.0007	-0.0006	-0.0034**
29.08.2005	0.0001	0.0004**	0	-0.0001	0.0008	0.0003	0.0002	-0.0002
02.11.2005	-0.0023***	-0.0008***	0.0001	-0.0025***	0.0023**	-0.0007	-0.0029**	-0.0013
29.11.2005	0.0001	0.0012***	0.0004	-0.0006**	0.0036***	-0.0005	0.0011	0.0006
07.12.2005	0.0012***	-0.0003	0.0003	0.0006**	0.0015	0.0031**	-0.0008	0.0017
% signif.	23%	23%	6%	17%	30%	6%	12%	6%
Anova F-stat	9.98***	3.13*	3.37*	1.49	22.15***	1.1	0.38	0.05
Med. Chi-sq.	0.4	0.28	4.22**	0.36	11.03***	0.18	2.85*	0.18
Var. F-test	4.44***	2.33***	1.3	2.06***	2.46***	1.03	1.01	1.06

^a Overlapping events: this speech was preceded by an interview.

^b Overlapping events: this speech was preceded by another speech.

Table 9
Foreign exchange market reactions to interviews

date	30 min before	30 min after	from 30 to 60 min	from 1 h to 2 h	within 24 hours	day before	same day	day after
02.03.2000	-0.0029	0.0004**	0.0001	0.0000	0.0065	0.0067	-0.0027	0.008
31.08.2000	-0.0012	0.0033	0.0016***	0.0002	0.0066	0.016**	-0.0055	0.0058
18.01.2001	-0.0006	-0.0016	-0.0044	-0.0001***	-0.0097	0.0034	-0.0023	-0.0126*
10.05.2001	0.0015	0.00293**	0.0014	0.0034*	0.0090	0.0026	0	-0.0039
21.09.2001	0.0000	-0.0087***	0.0010	-0.0018	0.0047	-0.0043	-0.0136**	0.0136**
04.03.2002	0.0000	-0.0001	0.0006	-0.0030*	-0.0058	-0.0038	0.0063	-0.0057
23.07.2002 ^a	0.0022*	-0.0030**	0.0000	0.0001	-0.0038	-0.0011	0.0194***	0.0002
27.01.2003	0.0005	0.0008	0.0002	0.0051***	0.0080	-0.0046	-0.0069	0
02.04.2003	0.0033***	0.0009	-0.0006	0.0015	0.0073	-0.0037	0.0103	0.0069
07.04.2003	-0.0023*	0.0009	0.0020	-0.0005	-0.0088	0.0047	0.0151**	-0.0099
05.06.2003	-0.0032***	-0.0037***	-0.0044***	-0.0012	-0.0076	0.0054	0.0077	-0.0122*
18.06.2003	0.0007	0.0004	0.0014	0.0032*	0.0157**	0.0054	0.0068	0.0156**
21.08.2003	0.0014	0.0006	0.0000	0.0009	0.0121*	-0.0039	0.0061	0.0092
22.10.2003	0.0007	-0.0003	0.0013	0.0000	-0.0151**	0.0042	-0.0053	-0.0143**
29.01.2004	-0.0033***	-0.0045***	0.0010	0.0016	0.0122*	-0.0094	0.0056	0.0086
07.04.2004	-0.0028**	-0.0012	0.0010	-0.0008	-0.0126*	0.0041	-0.0075	-0.0097
% signif.	11%	11%	2%	11%	9%	2%	6%	7%
Anova F-stat	0.31	0.20	2.67*	1.29	0.05	0.48	1.41	0.55
Med. Chi-sq.	0.71	0.71	3.73*	0.38	0.09	0.24	0.01	0.58
Var. F-test	1.20	2.16***	1.19	1.23	1.19	1.01	1.10	1.18

^a Overlapping events: this interview was preceded by a speech

Table 10
Swiss equity market reactions to interviews

date	30 min before	30 min after	from 30 to 60 min	from 1 h to 2 h	within 24 hours	day before	same day	day after
11.05.2000	0.0016	0.0029*	0.0026	0.0029	0.0174**	-0.0047	0.0162	0.0046
10.05.2001	0.0031*	0.0004	0.0003	0.0012	0.0019	-0.0073	0	0.0138
21.09.2001	-0.0066***	-0.0084***	0.0084***	-0.0108***	0.0049	-0.0454***	-0.0518***	0.0569***
03.01.2002	0.0027	-0.0048***	0.0003	-0.0003	-0.0009	-0.0072	0.0018	0.003
18.06.2002	-0.0012	-0.0015	-0.007***	-0.0024	-0.0043	0.0276**	-0.0132	-0.0156
23.07.2002 ^a	-0.0036**	0.0015	-0.0011	-0.0061**	-0.069***	-0.0539	-0.0159***	-0.0084
25.07.2002	-0.0076***	-0.0035**	0.0029	0.0149***	0.0471***	-0.0084	0.0579***	0.0218*
02.09.2002	-0.0026	-0.0055***	0.0006	0.0028	-0.0116	0.0181	-0.0248**	-0.0333***
12.09.2002	0.0018	-0.0025	-0.0022	0.0015	-0.0192**	0.0226**	-0.0308***	-0.0233**
11.11.2002	0.0019	-0.0007	-0.0008	0.0047*	0.0068	-0.0104	-0.0108	0.0123
05.12.2002	0.0012	-0.0031*	0.0002	-0.0051**	-0.028***	0.0002	-0.0113	-0.0038
20.12.2002	0	0.0003	-0.0024	0.0053**	0.0027	-0.0046	-0.0010	-0.0086
27.01.2003	-0.0016	-0.0007	-0.0041*	0.0101***	-0.023***	-0.0106	-0.0356***	0
28.01.2003	0.0009	-0.0059***	-0.0084***	-0.0016	-0.024***	-0.0356***	-0.0038	0.0047
24.02.2003	-0.0021	0.0012	-0.0019	-0.0013	-0.0136*	0.003	-0.0109	-0.0201*
02.04.2003	0.0095***	0.0061***	-0.0002	-0.0014	0.0147*	0.0111	0.0308***	0.0121
07.04.2003	0.0003	0.0031*	0.004	0.004	-0.009	0.0147	0.0232**	-0.0056
05.06.2003	-0.0021	0.0018	-0.0055**	-0.0026	-0.0009	0.0071	-0.0079	0.0165
18.06.2003	0.0011	0.0038**	0.0042*	0.0024	0.0027	0.0095	0.0077	-0.0141
15.08.2003 ^b	0.0007	0.0048***	-0.0019	-0.0017	0.0087	0.008	0.0119	0.0055
01.10.2003	-0.0038**	0.002	0.0022	-0.0056**	0.0041	-0.0112	0.0028	0.0043
% signif.	13%	20%	11%	15%	17%	7%	15%	9%
Anova F-stat	0.05	0.02	0.31	0.11	0.80	0	0.10	0.03
Med. Chi-sq.	3.65*	1.86	1.19	0.00	1.43	0.31	0.68	0.68
Var. F-test	1.53**	1.47**	1.36*	1.41*	1.59**	1.63**	1.92***	1.13

^a Overlapping events: this interview was preceded by a speech.

^b Overlapping events: this interview was preceded by another interview.

Table 11
Swiss bond market reaction to interviews

date	30 min before	30 min after	from 30 to 60 min	from 1 h to 2 h	within 24 hours	day before	same day	day after
12.01.2000	0.0002	0.0003	0.0003	0	0.0023**	-0.001	-0.0001	0.0004
03.08.2000	-0.0003	0	0	-0.0005*	-0.0016*	0.0005	-0.0003	-0.0001
25.08.2000 ^a	0	0.0008***	0.0002	0.0002	0.0013	0.0011	0.0012	0.0007
31.08.2000	0.0001	0.0003*	-0.0001	-0.0015***	-0.0019**	-0.0002	-0.0003	0.0014
30.04.2001	-0.0002	-0.0004**	-0.0004	-0.0005*	-0.0015	-0.0002	-0.0016	0
10.05.2001	0.0001	-0.0002	-0.0003	-0.0009***	-0.0015	0.0005	0	0.0006
03.01.2002	0.0001	0.0004*	0.001***	0.0003	0.0036***	0	0.0016	0.0008
27.03.2002	0.0001	0.0002	0	0.0001	0.0019**	0.0008	0.0022*	0.0017
14.05.2002	-0.0001	0	0	0.0005*	0.0012	0.0004	-0.0017	-0.0001
23.07.2002 ^b	0.0002	0.0002	0.0001	-0.0001	0.002**	0.0022	0.0004	0.0034*
25.07.2002	-0.0003	0.0001	0.0004	-0.0005*	0.0001	0.0034**	-0.0014	0.0003
02.09.2002	0.0001	0.0004*	-0.0001	0.0003	0.002**	0.0005	0.0011	0.0021
12.09.2002	0.0008***	0.0011***	0.0001	-0.0003	0.0026***	-0.0005	0.0024*	0.0032**
05.12.2002	-0.0009***	0	-0.0003	0.0003	0.0009	0.0001	0.0009	0.0026*
27.01.2003	-0.0009***	0	-0.0004	0.0004	0.0009	0.0017	0.0005	0
28.01.2003	-0.0009***	0	-0.0004	0.0004	0.0011	0.0005	-0.0007	0.0005
24.02.2003	-0.0009***	0	-0.0004	0.0004	0.0011	-0.0006	0.0009	0.0003
02.04.2003	0.0001	0	-0.0004	0.0005*	0.0011	0.0008	-0.0024*	-0.0037***
07.04.2003	0	0	-0.0004	0.0005*	0.0011	-0.0005	-0.0044***	0.0007
18.06.2003	0	-0.0004**	0.0001	0.0004	0.0011	-0.0031**	-0.0054***	-0.0039***
15.08.2003 ^a	0	-0.0004**	0.0001	0.0004	0.0011	-0.0031**	0.0007	0.0005
21.08.2003	0	-0.0004**	0.0005	0	0.0011	0.0011	-0.0016	-0.0006
01.10.2003	0	-0.0004**	0.0005	-0.0005	0.001	0.0033**	0.0006	-0.0025*
22.10.2003	0	-0.0004*	0.0004	-0.0001	0.001	0.0009	0.0014	0.0006
29.01.2004	0.0001	-0.0009***	-0.0001	-0.0006**	-0.0043***	0.0008	-0.0035***	0.0005
23.11.2004 ^b	0.0001	0.0001	0.0005*	0.0007**	0.0029***	0.0017	0.001	0.0012
17.01.2005	-0.0002	0.0001	0.0003	0.0005*	0.0018**	-0.0008	0.0013	0
28.01.2005	-0.0001	0.0017***	-0.0003	0	0.0025***	-0.0005	0.001	0.0007
08.04.2005	0	0	0.0001	0.0001	0.0019**	0.0017	-0.0013	0.0018
20.04.2005	-0.0004*	0.0001	0.0002	0.0009***	0.0005	0.001	-0.0009	-0.0002
07.09.2005	-0.0001	0.0003	0.0006*	0.0006*	0.0012	-0.0003	0.0005	-0.0002
% signif.	11%	24%	6%	24%	24%	7%	11%	9%
Anova F-stat	3.24*	0.02	0.20	0.14	6.95***	1.18	0.65	1.45
Med. Chi-sq.	0.1	0.38	1.33	5.53**	9.30***	2.8*	0.11	6.37**
Var. F-test	1.27	1.95***	1.19	1.15	1.24	1.1	1.37	1.30

^a Overlapping events: this interview was preceded by another interview.

^b Overlapping events: this interview was preceded by a speech.

Table 12
Effects of central bank communication

Foreign exchange				
	α	β	R^2	Variance Ratio
Announcements	-0.06	-0.67	0.02	8.72
Prob ttest	0.41	0.07		0.00
Speeches	-0.01	0.77	0.00	0.28
Prob ttest	0.75	0.63		0.78
Interviews	-0.02	-1.48	0.07	1.88
Prob ttest	0.42	0.09		0.06
Equity market				
	α	β	R^2	Variance Ratio
Announcements	-0.03	-0.98	0.14	0.66
Prob ttest	0.49	0.03		0.52
Speeches	-0.01	-0.33	0.00	0.54
Prob ttest	0.81	0.90		0.59
Interviews	0.00	-2.54	0.04	0.78
Prob ttest	0.93	0.23		0.44
Bond market				
	α	β	R^2	Variance Ratio
Announcements	0.00	-0.44	0.18	3.86
Prob ttest	0.90	0.09		0.00
Speeches	0.00	-0.70	0.06	1.14
Prob ttest	0.73	0.06		0.26
Interviews	0.00	-0.40	0.07	1.30
Prob ttest	0.53	0.10		0.20

Table 13

Reaction of asset prices to target and path factors

	Alpha	Target	Path	Variance Ratio	R2
CHFUSD	0.00	-0.14	-0.11	8.59	0.03
Prob ttest	0.65	0.08	0.14	0.00	
SPI	-0.03	-0.38	-0.25	0.49	0.20
Prob ttest	0.48	0.00	0.10	0.62	
SBI	0.00	-0.44	-0.13	4.36	0.20
Prob ttest	0.89	0.10	0.34	0.00	