Does surprise really matter? Unexpected central banks events and their effect on financial market[*]

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Abstract

On September 9, 2011 the euro dropped to a six-month low against the dollar, whereas on the same day stocks fell sharply at the opening on Wall Street. These negative reactions of the market were caused not by a pessimistic forecast of the Eurozone, but in result of an announcement that Jürgen Stark, a member of the Executive Board (EB) of the European Central Bank (ECB) resigns from his position before the end of his tenure. We analyze this and similar events using an event study approach. We investigate financial markets reactions to these situations by following changes in exchange rates and stock market indexes. The use of intra-day data helps to isolate variability of variables in interest from influence of other news and events. Estimations using EGARCH models allow us to justify our hypothesis that unexpected personal changes in the Euro zone influenced larger instability of financial markets.

Keywords: Central bank, transparency, EGARCH

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1   Introduction

On September 9, 2011 the euro dropped to a six-month low against the dollar, whereas on the same day stocks fell sharply at the opening on Wall Street.[1] These negative reactions of the market were caused not by a pessimistic forecast of the Eurozone, but in result of the announcement that Jürgen Stark, a member of the Executive Board (EB) of the European Central Bank (ECB) resign from his position before the end of his tenure. These kinds of unexpected announcements are part of the CB communication, which is in focus of our study. Central Banks have monopoly in monetary policy decisionion making, which creates an information gap between CB and private sector. Because of asymmetric information, market participants and policymakers face different levels of information, and communication is used to reduce that gap. Communication as part of Central Bank transparency has become important tool in monetary policy making process. Various studies has proposed that CB communication matters.

Central bank communication can be divided into two, formal and informal, by distinguishing the sources of communication. Official communication includes monetary policy decisions, press conferences and officials speeches of the committee members. It refers to the monetary policy committee as a whole and is usually pre-scheduled. The main source of communication is CB's website.

Informal communication consists of committee members' statements, which are published in media, usually by international news agencies like Reuters and Bloomberg, and is therefore filtered information. Informal information has highly individualistic perspective, because usually it consists of individual policy-makers' statements. It is also unscheduled: dates of monetary policy meetings are known beforehand, but communication by news agencies is not. Therefore informal information has market suprise effect in both content and timing of the announcements. Formal information has usually only the former effect.

The classification between formal and informal information is fairly new, because most of the studies have used formal information as a source. Still, informal information and news about central bankers has been emphasized more in the recent years. Ehrmann and Fratzscher have used informal information as a source and examined the content and timing of the CB commu-

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[1]Reuters information

nication[2]. They focused on the communication on Federal Reserve and the news releases during the silent period before FOMC meetings. They found out that timing matters: central bankers' statements had significant effects on market rates, when they were published during the silent period. In their study communication had a news effect because of timing but also content effect, because market players believed it included information about future monetary policy decisions.

The standard literature on analyzing effects of central bank communication on financial markets usually considers macroeconomic result reports or monetary policy meetings press releases. Their contribution lies in investigating short-term market reactions to positive or negative news from situations that are usually scheduled and expected by markets. Although there are some disagreements, main contribution of earlier communication studies is that CB communication is effective, i.e. it enables market movements. Wide range of market rates have been used to explain the effects of communication (see Rosa and Verga (2007), Bernanke and Kuttner (2005) and Bomfim (2003) about efficiency).[3]

Some studies have taken step forward and argued that communication has become even more important factor than the actual policy decisions, i.e. words have weighed more than deeds in the market. Kohn and Sack (2003) concluded that longer Treasury forward rates are driven more by what the Federal Open Market Committee FOMC says than what it does. In their research the power of words was even higher than power of deeds, which gave communication a great importance.

There has been a distinction between expected and unexpected communicationin the literature. It is essential, because financial markets respond more strongly on actions which are unanticipated. Bernanke and Kuttner (2005) assessed the suprise changes in Target Federal Funds Rates and their effects on equity prices. By using event study method, they found that broad stock market indices react to 0.25 % target rate reduction by increasing 1 percent.

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[2]Ehrmann and Fratzscher (2007),Ehrmann and Fratzscher (2007b)

[3]Communication hasn't had significant effects on market rates in its every aspect. Jansen and de Haan (2005) focused to real time policy recommendations of the ECB and how they affected euro-dollar exchange rate. Their result was that in some cases there are effects of statements on the conditional mean of the euro-dollar exchange rate, but those have been relatively small ones. Efforts to talk up the euro have generally not been successful either.

Academic literature has mostly discussed the influence of CB communication at the committee level, and the individual approach is still in infancy. Still, as various studies (see e.g. Ehrmann and Fratzscher (2007b)) have argued, individuals matter in the communication.

Moser and Dreher (2007) studied CB Governor changes in 20 emerging economies and their effects on bond markets, stock markets and exchange rates in 1992-2006. They find out that Governor changes led usually to depreciation in exchange rate, increasing bond spreads and decreasing stock prices. They saw the negative reaction as a consequence of credibility problem, which is associated with resignation. However, Moser and Dreher didn't find any significant patterns between anticipated and unanticipated resignations, which is in focus of this study.

Kuttner and Posen (2007) made similar study concerning the advanced economies: they studied the announcements of CB governor appointments and and his predecessor's departure. Their dataset consisted of 15 industrialized countries including Euro Zone countries like Germany, Italy and France. They included analysis of schedule vs. unscheduled appointments. Their main result was that the personality of the governor matters in the case of CB appointments. Still, departure of the predecessor had no significant effects on the market, even if it was unscheduled.

This study takes a highly individualistic approach to communication and focuses on effects of unexpected messages sent by central bankers. It uses both formal (CB's own announcements) and informal communication (newds by international news agencies) as a source to examine communication effects on financial markets. Moreover, these messages are rather blurry in a sense that they possess qualitative features. For example, the resignation of Jürgen Stark from the Executive Board does not mean a resignation of "one of many" members. Stark has been perceived as "hawkish" by financial markets, and as a strong supporter of the German style of central banking. This qualitative feature of Stark would have been possible to quantify if the ECB would have published detailed information about country members inflation preferences during general meetings. It could as well be traced from Starks's speeches and interviews. The financial markets intuition has drawn them to read this message as a negative one and plunge the dollar/euro exchange rate and stock exchange indices.

We proceed this analysis with an event study approach, where we investigate financial markets reactions to these events by following changes in

exchange rates and stock market indexes. We search for a measure of abnormal change, that is, the actual ex post variability of these variables minus normal variability. The use of intra-day data helps to isolate unevenness of variables in interest from influence of other news and events. Our aim is to verify if larger variability took place, measure its size and compare it with markets reactions to scheduled information sent by central banks. Hence, we search for answers "if surprise really matters?"

2   'But what am I supposed to do? Kill him?'

The current financial turmoil does not make the conduct of monetary policy by the ECB an easy task. The personal reshuffling in the ECB Executive Board in 2011 seems to be have even greater impact on financial markets than expected. Inspired by the sequence of these events and comments by market analysts we select three occasions worth of analyzing.

Chronologically first, perhaps the least commented but in our opinion a crucial event was Alex Weber's resignation from the chairmanship of the Bundesbank. Anyone following the history of the ECB knows that the French chairman of the bank was expected to be succeeded by the German banker. Thus, in the year, when the governor of the European monetary authority is elected, it was of no surprise that the chairman of the Bundesbank was expected to be this race's a frontrunner. Talking in expected-unexpected terms, Alex Weber was expected to be the next governor of the ECB and anything different would be unanticipated. The information was first released by Bloomberg on 9 February, 2011 and followed by the official statement by the Bundesbank denying this information, issued on the same day. However, two days later the Deutsche Bundesbank confirmed that Weber would resign after completing seventh year of his term. His decision meant he was not considered as a candidate for the position of the chairman of the ECB. Also in this situation, markets perceived Weber as a spokesman of keeping the price stability goal as the main prevailing one in the ECB monetary policy. Their intuitive understanding of this decision was expressed in increased uncertainty about the future leading policy of the bank and in greater pressure on euro/dollar exchange rate.

The resignation of the frontrunner in the ECB race led to another personal change in the Executive Board. Since an Italian candidate became a leader in the ECB chairman competition, French representatives had started

to put pressure on Lorenzo Bini Smaghi, an Italian member of the Executive Board to step down in order to keep the country-ratio in order. This political pressure has been perceived to be a breach of an independent monetary authority rule. It has been yet another unexpected signal sent to the market that the level of the ECB monetary policy uncertainty rises. The first information about the possibility that Bini Smaghi would stop being a member of the board appeared in May 2011 and lasted until his final statement given on 11 November, 2011. This period proliferated with controversial statements like the one by former Italian prime minister: "Sarkozy has started to get annoyed ... At a certain point I said to Sarkozy, 'But what am I supposed to do? Kill him?'". This and many other similar remarks signalled that the choice of the board members is more about politics and "big countries" balance than the professionalism of candidates. Moreover, they acted as a warning to markets that the famous division of monetary policy from the political influence could be under a serious threat.

Ultimately, probably the most unanticipated personal change in the ECB was observed in September, 2011. Jürgen Stark, perceived by the market as the spokesman of German style of central banking, decided to retire from his post as a member of the Executive Board. Stark did not mask his negative attitude towards unorthodox new monetary policy instruments. Several times he has spoken against further involvement of the ECB in a Greek bailout. No differently has he motivated his decision about departure from the Executive Board.

The identification of events of interest is only a part of our goal. Next, it is necessary to choose the "normal" day, the day, which will act as the control for our analysis. One solution was to pick exchange rates of any other day but the day of interest; or a day before the financial crisis has started. Finally, we have decided to select a date with a similar characterization, that is, the day when another member of the EB has ended its work, but this expiration date was long known by the public. Gertrude Tumpel-Gugerell's position in the board ended on 31 May 2011.

3   Description of data

The data used to measure financial markets reactions consists of intraday data on euro exchange rates versus dollar, British pound and Swiss franc, as well as daily data on Eurobir interest rates and euro area stock market in-

dices. The data has been extracted from Forex and Reuters data sources. The dates for the ECB's monetary policy decisions have been collected from the bank's webpage, whereas info on U.S. macro.news is collected from Reuters.

3.1 Intraday volatility

The following subsection delivers graphical analysis of intraday 10-minutes volatility return of euro/usd exchange rates in three cases: Stark, Weber and Bini Smaghi. Returns are defined as continuously compunded intraday return

$$r_t = 100 * ln(P_t) - ln(P_{t-1}), \tag{1}$$

whereas its volatility is calculated as return's square value, and P_t is the price of the index in interest. We focus on information during a trading day, that is, 8:30-19:00 within a month of the event. In each figure we distinguish three time-series: one for the day of the event, another one for the day of the Monetary Policy Committee (MPC) meeting[4], and finally the time-series representing average of other days in the month.

Time-series representing our events of interests are marked with a triangle (Figures 1-3). MPC days of meetings are marked with a diamond, while average value from other days in a month is represented with time-series with a circle. All three figures display a number of interesting intraday features. First, volatility, as expected, is higher on a day of the event than on average within the month. It is especially visible in September with Jürgen Stark resignation when spikes are especially high during the time of a press conference (13:00) and a few hours later when Reuters - news agency reports the results of press conference. Although the magnitude of volatility is lower for Weber and Bini Smaghi cases, here we also draw a conclusion that afternoon's volatility is higher than the average of the respective month. Second, our data also confirms conclusions from other studies that the day of MPC monetary policy decision affects intensively volatility of exchange rates.

One should notice that the spikes occuring in the afternoon, that is around 14:00 and 16:00 could be caused by the release of several US macro announcements and hence our results could be driven only by these news. In order to

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[4]As many studies showed, for example Andersson (2007), the MPC meetings always cause higher volatility on the relative market.
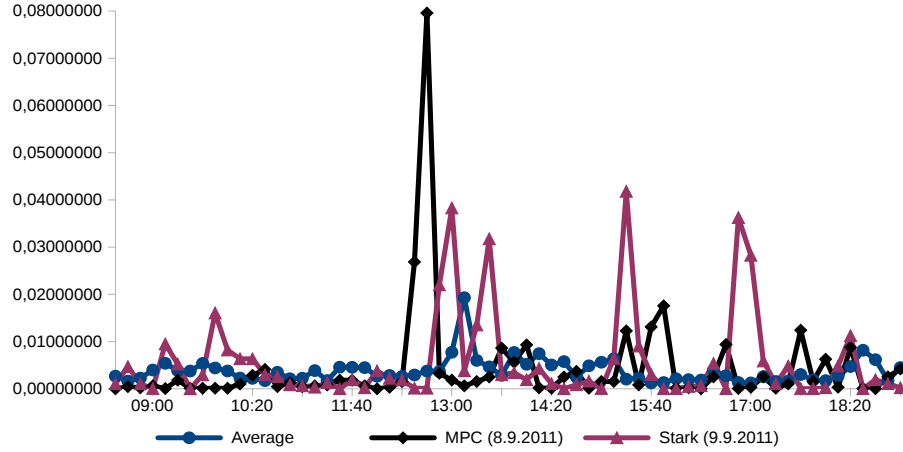
Figure 1: EUR/USD intraday volatility in September 2011
Time-series marked with a circle, diamond and triangle represent data for monthly
average, MPC meeting and a day of the event, respectively.
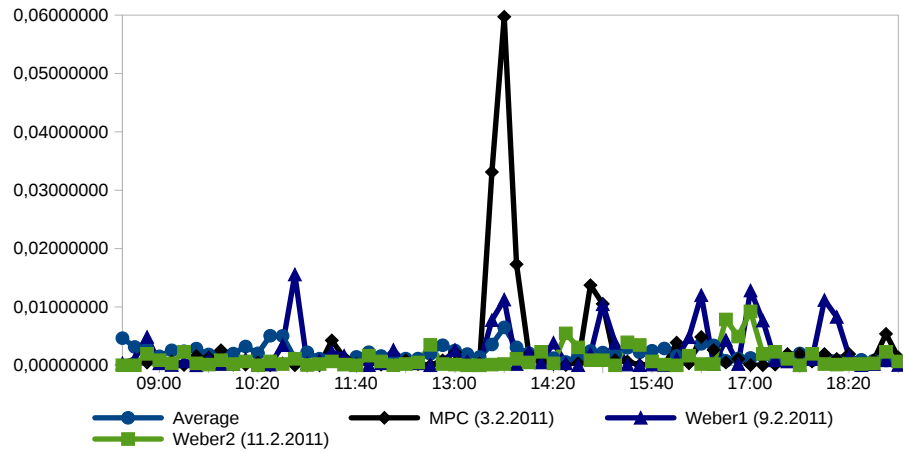Source: Own calculations; source of data: Forex

Figure 2: EUR/USD intraday volatility in February 2011
Time-series marked with a circle, diamond and triangle represent data for monthly
average, MPC meeting and a day of the event, respectively.
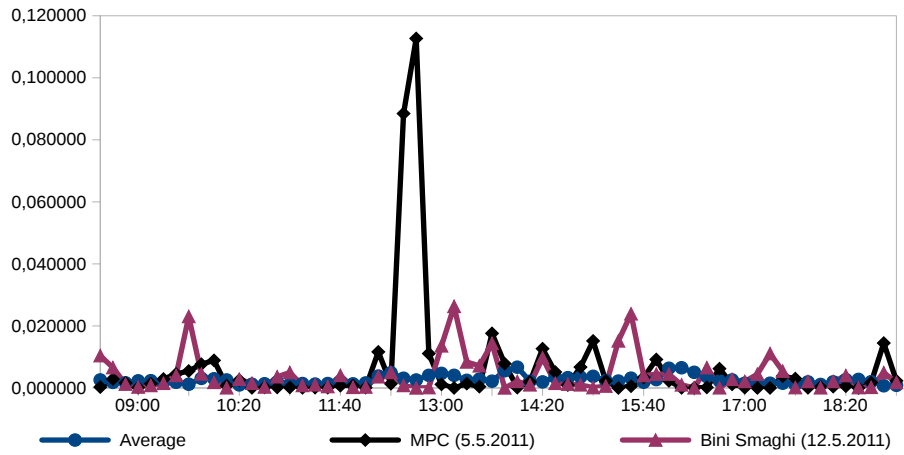Source: Own calculations; source of data: Forex

Figure 3: EUR/USD intraday volatility in May 2011
Time-series marked with a circle, diamond and triangle represent data for monthly
average, MPC meeting and a day of the event, respectively.
Source: Own calculations; source of data: Forex

accurately investigate if our events have effect on market volatility, we introduce dummy viariables also for the days with MPC meetings and those of US macro news releases.

3.2 Intraday volatility within an event-news release time period

We are interested in returns on exchange rates and stock market indices calculated within a day of interest. As the time of press release or any information release we treat 14:00 hrs. As noticed from the Reuters data, this news agency provides first information about such press release with a 2-hour delay, that is at 16:00. Therefore, we calculate the returns between 14:00 and 16:00, and every 10 minutes until 18:00, that is four hours after the key information have been published. These rates of return are computed according to equation 1, however in this case $t = (16 : 00, 16 : 10, 16 : 20, ..., 17 : 50, 18 : 00)$, and P_t is the price at time $14 : 00$. We use a high-frequency data, that is, quotes given every 10 minute. Such data is provided with opening and closing values for every minute, which we use to calculate the average value for each observation.
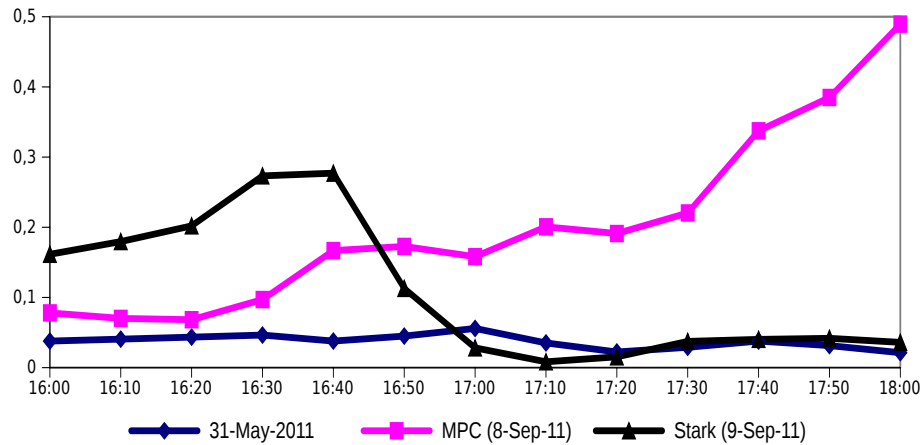
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Figure 4: Volatility of eur/usd exchange rates as compared to 14:00 hrs

Notes: X-axis marks observations from 16:00 every 10 minutes. A line marked with triangles indicates return volatility on 9 September, a line with squares marks values for a day of MPC meeting, and a line with rhombus represent values for 31 May, 2011. Volatility measured as square value of returns.
Source: Own calculations; source of data: Forex

There is no doubt that the personal changes in the ECB had an impact on financial markets. Analysts and press had noticed larger than usual volatility of exchange rates as a consequence of these events. It is visible on Figure 4, which shows the volatility of returns on eur/usd exchange rates in the case of Stark. The rectangle marked line indicates changes during "regular" days. This variability is small, up to 0.1 point. The black line marked with triangles presents a different story. It characterizes exchange rate variability on the day of Stark's resignation. First media publications appeared around 16:00 hrs in Reuters and Bloomberg. The biggest volatility as compared to the time of the ECB's press release is around 16:30hrs and reaches up to 0.3 points. These changes get smaller with the time and 4 hours after the first statement decrease to "normal" levels. Variability of eur/usd exchange rates is distinguishable for MPC meeting during this month. Talk concerning Axel Weber's resignation started on February 9th, when unknown German source told that decided to rule himself out for the ECB Governor post. Argument behind the decision was that Weber's candidacy would not be supported in other euro zone nations outside Germany. The message was interpreted as a start for his resignation talk. Nevertheless, German Bundesbank denied the rumors in an official statement during the same day. Exchange rate
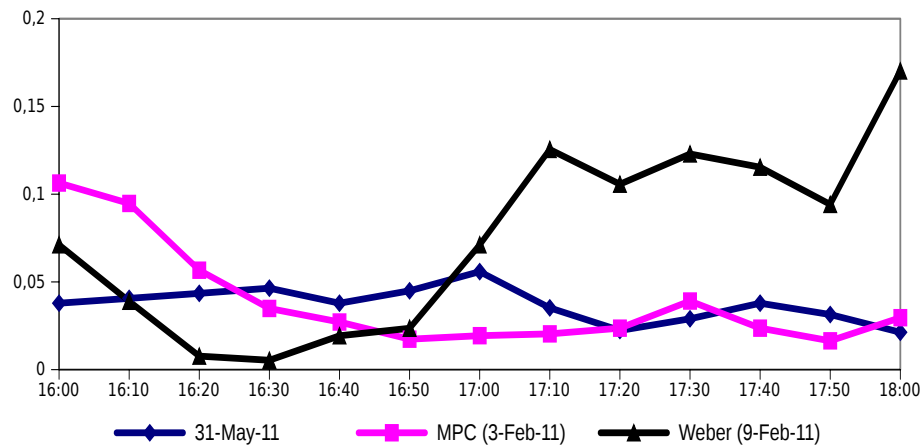
Figure 5: Volatility of eur/usd exchange rates as compared to 14:00 hrs
Notes: X-axis marks observations from 16:00 every 10 minutes. A line marked with triangles indicates volatility on 9 February, a line with squares marks values for a day of MPC meeting, and a line with rhombus represent values for 31 May, 2011. Volatility measured as square value of returns.
Source: Own calculations; source of data: Forex

markets reacted heavily on the resignation news (Figure 5). Squared returns on eur/usd exchange rates fluctuated heavily during that day and signaled that the statements by news agencies had a significant effect on market. Return on Nasdaq technology index in the U.S markets was significant as well and showed that unscheduled event enabled market movements. Drama ended on February 11th, when government spokesman Steffen Siebert told in official statement that Weber will step down as a Governor of the Bundesbank a year before his term ends. After the first announcement two days before, official statement didn't have similar significant effect on market indices.

First signals of resignation by Italian Central Banker Lorenzo Bini Smaghi were published on May 12th, when unknown euro zone source informed Reuters that Bini Smaghi's position will be discussed by the euro area leaders next time when they meet to name next ECB president Mario Draghi. Again, reaction in exchange rate markets was remarkable. After the rumor returns of eur/usd exchange rates varied significantly. Pressure towards Bini Smaghi added significantly on June 16th, as Italian government asked Bini Smaghi to leave the post as an ECB Executive Board Member. Bini Smaghi did not comment the statement. Conversation concerning the resignation continued next day, on 17th June, when Italian Prime Minister Silvio Berlusconi
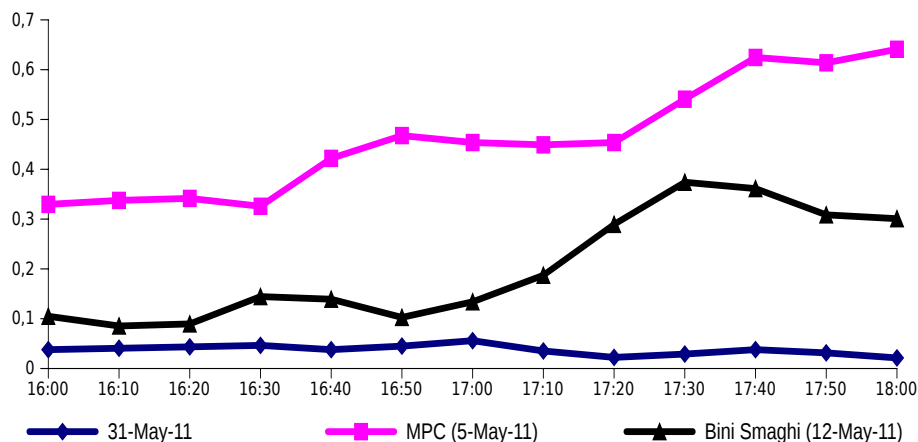
11

Figure 6: Volatility of eur/usd exchange rates as compared to 14:00 hrs
Notes: X-axis marks observations from 16:00 every 10 minutes. A line marked with triangles indicates
volatility on 12 May, a line with squares marks values for a day of MPC meeting, and a line with
rhombus represent values for 31 May, 2011. Volatility measured as square value of returns.
Source: Own calculations; source of data: Forex

and French President Nicolas Sarkozy agreed to maintain equilibrium on the
bank's board in the future. After the confirmation that Mario Draghi will
be the next ECB Governor, Sarkozy and Berlusconi wanted to signal with
their statement, that ECB Board has excess of Italians and that can hurt the
equilibrium among the euro zone countries. Officially Bini Smaghi stepped
down on December 31th.

4   Empirical analysis

In order to investigate whether unexpected ECB resignations influence the
expectations of the market agents, it is essential to measure the reaction of
market variables on them. The goal is to examine, how the level of asset
prices and volatility of log returns in EUR/USD, EUR/GBP and EUR/CHF
exchange rates. Intraday data with 10 minute interval is used to capture the
instant effects of market variables.
The goal is to study effects by focusing both level of asset prices and degree
of volatility, but the main interest is in latter aspect. Therefore the effect of

communication is estimated on asset price returns r_t[5] and asset price variance σ_t, which is here used to describe the uncertainty of the market. Estimation is done with exponential GARCH(1,1), or EGARCH, model introduced by Nelson (1991). It specifies the conditional variance of the dependent variable and allows negative returns. EGARCH is well fitted model to volatility estimation, because it captures the volatility clustering. Therefore it is widely used in CB literature[6] (see e.g. Ehrmann and Fratzscher (2007b), Ehrmann and Fratzscher (2009), Rozkrut, Rybinski, Sztaba, and Szwaja (2007), for overview of the methodological framework, see Greene (2002)).

The model is estimated via maximum likelihood estimation by using normal distribution. It consists of two equation, mean equation and variance equation. Conditional mean equation is formulated by using past returns r_{t-1}, and dummies MPC and EVENT as regressors to assess the effect on exchange rates. Conditional variance equation had the same regressors, but also variable of past variance, h_{t-1} and innovations, ϵ_{t-1}, were included. It is assumed that $\epsilon_t = \sqrt{h_t} * v_t$, where v_t is an i.i.d sequence with zero mean and unit variance. The mean equation and variance equation are following:

$$r_t = \alpha + \delta r_{t-1} + \theta_1 MPC_t + \theta_2 EVENT_t + \epsilon_t$$

$$ln(\sigma_t) = \gamma + \beta_1 \left(|\frac{\epsilon_{t-1}}{\sqrt{\sigma_{t-1}}}| - \sqrt{\frac{2}{\pi}} \right) + \beta_2 \left(\frac{\epsilon_{t-1}}{\sqrt{\sigma_{t-1}}} \right) + \beta_3 ln(\sigma_{t-1})$$
$$+ \lambda_1 MPC_t + \lambda_2 EVENT_t$$

We are interested in particular in parameters relating to a dummy variable EVENT, and additionally in MPC or/and MACRO news dummy variables. First and foremost our hypothesis is that $H_o : \theta_2 > 0$, that is, that surprise events have effect on levels of Euro-market interest rates and on Euro foreign exchange rates. At the same time we expect that these events would have effect also on variability of these variables, that is on λ_2.

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[5]Returns are defined as continuously compunded intraday return, $r_t = ln(P_t) - ln(P_{t-1})$.

[6]About the weaknesses of GARCH models, see Tsay (2002)

4.1 Estimation results

The dummy variable EVENT marks all three days of our interest in February, May and September 2011. EGARCH estimation results show that these days had statistically significant effect on increased volatility of interest rates: Euribor3m and Euribor6m. Convergence has not been reached for Euribor1y, while the EVENT has not significantly affected volatility of daily returns on EUR/USD exchange rates. Surprise events had effect only on levels of Euribor3m. In our opinion daily returns do not capture the key volatility that could occur around MPC press conferences and foremost, at times of the surprise events announcements. Therefore, we continue our analysis with intraday data defined as 10-minutes returns on exchange rates and interest rates[7]

Table 1: EGARCH daily returns estimations

The mean eq.	Euribor3m	Euribor6m	Euribor1y	EURUSD
$EVENT$	-0.001***	0.000		-0.010
$MACRO$	0.001	0.000		0.000
The variance eq.	Euribor3m	Euribor6m	Euribor1y	EURUSD
$EVENT$	-7.327***	-2.851***		-0.044
$MACRO$	0.210	0.366***		-0.345*

Euribor1y convergence not received. Number of observation - 260. Estimations with normal distributions. ***, **, and * indicate statistical significance at 1%, 5% and 10% percent, respectively.

In this exclusively foreign exchange rate market analysis, surprise events did not affect euro exchange rates versus British pound. In this case, mainly day of MPC meetings affected significantly volatility of Eur/GBP volatility. Estimations for two other foreign exchange rates, i.e. with U.S. dollar and Swiss franc indicate that the surprise dummy significantly increases their volatility. What is interesting, this volatility goes into opposite directions depending on the currency.

5 Conclusions

The aim of this paper was to analyze the volume of possible increased volatility of eur/usd exchange rates caused by personal changes in European central banks. Year 2011 was exceptionally unfortunate for the European Central

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[7]Temporarily we report only results on exchange rates returns and its volatility.

Table 2: EGARCH intraday 10-minutes returns estimations

The mean eq.	EUR/USD	EUR/GBP	EUR/CHF
EVENT	-0.003**	0.001	-0.002
MPC	-0.001**	0.000	-0.001*
MACRO	0.00***	-0.000*	0.008***
The variance eq.	EUR/USD	EUR/GBP	EUR/CHF
EVENT	0.054***	0.016	-0.044***
MPC	-0.000	0.023***	-0.0.012**
MACRO	0.001	-0.004*	0.023***
Observation	37642	37637	37631

Estimations with normal distributions. ***, **, and * indicate statistical significance at 1%, 5% and 10% percent, respectively.

Bank in this area. We distinguish three resignations of key central bankers, who played important role in creating "price stability" credibility. The introductory analysis of the data leaves us with no doubt that all these events had negative effects on the position of the euro currency against the U.S. dollar. The intra-day data allowed us to follow changes in euro-usd exchange rates minute by minute. We were the most interested in comparing differences between the values given at the time of announcements and 2-4 hours later, hence in the first reaction of the market. In our opinion we were able to detect and depict this variability using graphical presentation. Similarly, figures of volatility of 10-minutes returns indicates spikes in the data during the day of MPC meetings (hence according to other studies) but first and foremost during the days of our interest, that is surprise resignations of key central bankers in the euro zone.

Empirical analysis is performed with EGARCH estimation method and data is corrected for dummy variables of MCP meeting days and US macro-news announcements. Only to some scale we are able to prove our hypothesis, that the surprise events have effect on levels of interest rates or foreign exchange rates. However, in majority of our cases, that is, daily data on Euribor3m, Euribor6m, and intraday data of EUR/USD AND EUR/CHF our model proved that these unexpected resignations affected significantly the variability of these rates.

As our conclusion we give a positive answer to the question asked in the title of this paper: yes, surprise does still matter. Although we are not analysing effects of monetary policy decisions, to some extent we treat Stark's and Bini Smaghi's resignation as a form of unconventional monetary policy.

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6   Appendix 1

Reuters, the European Central Bank and the Bundesbank example headlines used as a motivation for the study

1. 09.02.2011–Bundesbank denies rumours about Weber statement (Bundesbank)

2. 09.02.2011–Euro falls on Weber report, rising US yields help dlr (Reuters)

3. 11.02.2011–Statement issued by the Deutsche Bundesbank

4. 11.02.2011–Key Euribor rates dip amid ECB leadership confusion (Reuters)

5. 12.05.2011–Bini Smaghi job to be discussed (Reuters)

6. 31.05.2011–Gertrude Tumpel-Gugerell ends her term at the Executive Board of the ECB (ECB information known from the term schedule of the board members)

7. 17.06.2011–Berlusconi asks Bini Smaghi to step aside

8. 09.09.2011–Jürgen Stark resigns from his position (ECB)

9. 09.09.2011–Euro slides to lowest in more than 6 months vs dollar. ECB's Stark quits (Reuters)