Impact of ECB communication on high frequency response of EUR-USD exchange rate
—— with a comparison in pattern before, during and after 2008 recession

Jin Deng

1. Introduction

I investigate the high-frequency impact of European Central Bank's (ECB) monetary policy communication, which is published on monthly Governing Council meeting days, on the EUR-USD exchange rate, in different year periods.

A meeting day consists: Announcement of the next key interest rate via a press release at 13.45 ECT and a press conference with introductory statement at 14.30 ECT, then it ends with a Q&A session. Press release and press conference are important events. First, Press release tells the public the next interest rate decision, then the investors usually anticipate the policymaker's decision and decide their own buy and sell. Second, press conference is usually host by the president of European central bank, and how he or she explains the interest rate decision and comments on economics situation will affect investors assessment of this decision and future path of monetary policy. We may guess that, if the economics is on a healthy and optimistic path, investors tend to be more relaxed on those meeting days because they have predicted the plan of policymakers which will not be too far from the true news; If the economics shows a pessimistic and even concussive outlook, investors are usually nervous before the new policy release time and one slight surprise in the news will cause a big price fluctuation. This is what I observe from the forex market investors I meet, and I want to see whether the whole market reacts before, during and after 2008 recession time. I choose three time period, 2004-2006, 2007- 2008, 2009-2014. In fact, 2008 is not the year that recession ends, but 2007-2008 is the time with blast of events which cause the shocking movement of the market and I assume this period has a particular different pattern compared with others.

An approach to trace the effects of these events is to analyze the intraday high-frequency movements of the EUR-USD rate pattern under the press release and press conference. We then need to relate the pattern to the interest rate news, and this is conducted by using event study method where we measure the news by measure the difference between the expectation and true announced one.

2. Data

Minute by minute quotes of EUR-USD exchange rate for Jan 2004 – Jan 2014 is downloaded from www.Dukascopy.com and it is used to form 5min return, 10min return, 15min return. Each quote contains a bid and an ask price, we obtain the log price by forming the average of the bid price and ask price at each five-minute interval. Five minute return is the change in these five-minute log prices. Then we take average absolute return of all announcement days and it is denoted by Y_n, n =1,2,3….7200, totally 7200 5min interval in 24 hour.

Key interest rate is from database of European central bank and it is denoted by X. Forecast of interest rate on each meeting days is from a ECB survey that invites economists to finish. Since it is quarterly survey, forecast for each quarter is the same. It is not precise enough but is the best forecast data we can find now.

3. Findings

3.1 Comparison of average absolute 5min returns in different periods

Figure 1 to 4 depict the movement of average absolute 5min returns during the time span 24h for all announcement days, in different year periods. From figure 1, period 2004-2014, it is obvious that the absolute return series display an identical intraday volatility pattern, which reaches its peak from 13.00 to 15.00 and it corresponds to the time that ECB meeting holds. So on ECB announcement days, market focuses on the news and response to the news. Look at figure 2 to 4, it seems that some year period tend to reach its volatility peak around press release time 13.45 and some period reaches it volatility peak around press conference time.

3.2 Comparison of volatility in different periods

We check the observation result in 3.1 by picking up three largest volatilities of the returns during time 13.40-14.55 in table 1. The three largest volatilities in each column are marked by three, two and one stars. Three star represents the largest volatility, two star represents the second largest volatility and one star represents the third largest volatility. In column 1, whole 2004-2014 period, main peak is around time 13.45, the press release time. In column 2, 2004-2006, the largest peak appears at the time 13.45 due to the press release and the second appears at the time 14.35 due to the press conference. In column 3, it is characterized by three main peaks. The first and largest peak is due to press release at 13.45, the second at 14.10 and the third due to the press conference. In column 4, it reveals a single peak from 13.35 to 13.50. By comparison, we can say that press release time dominates the day all the time and it is paid main attention by the market.

3.3 The speed of the market response to press release and press conference

First, we divide average absolute return into two groups according to the time: press release at 13.45 and press conference at 14.30. Then we run a regression of average absolute return on actual interest rate:

$$Y_i = \alpha + \beta * X + \vartheta \qquad (*)$$

Y_i is the average absolute return for different time intervals. X is the actual announced key interest rate corresponding to all announcement days. Table 2 shows the result of regression (*), we can see there is no significance for group 2, press conference at 14.30. Coefficients of actual key interest rate are significant, especially for 5min return and 10min return. It reveals that investors are sensitive to key interest rate news in press release. Also they response to the news in a very quick time, usually digest the news in 5 minutes.

Then we drop return in longer time interval and focus on 5min return, look at the pattern in different periods:

$$W_i = \alpha + \gamma * X + \vartheta \qquad (**)$$

W_i is the average absolute 5min return for one of the periods 2004-2006, 2007-2008, 2009-2014. X is actual announced key interest rate corresponding to announcement days in particular period. Table 3 shows the result of regression (**), and it shows highly significant effect at press conference time during period 2007-2008 and 2009-2014, which suggest that the market seems more sensitive during the nervous recession time and put much focus on the officials' comment rather than simple value of next interest rate, so that they can understand the policy decision more precisely and then make reasonable buy and sell choice.

3.4 Positive surprise and negative surprise in interest rate news

Then we want to see does positive surprise and negative surprise make a difference. By event study approach, we form the surprise as follow:

$$X_{surprise} = X_{announced\ value} - X_{epected\ value}$$

If announced value is larger than expected value, it is a positive surprise; if announced value is smaller than expected value, it is a negative surprise. By the short run relationship between interest rate surprise and movement of home currency, appreciation of home currency happens when there is a surprise monetary tightening which usually comes with positive interest rate surprise. Depreciation of home currency happens usually when there is a negative monetary easing and comes with negative interest rate surprise.

We use following regression to see whether market cares about key interest rate news, and whether is press release paid more attention than the conference.

$$W_i = \alpha + \theta * X_{surprise} + \vartheta \qquad (***)$$

W_i is the average absolute 5min return for one of the periods 2004-2006, 2007-2008, 2009-2014. $X_{suprise}$ is the surprise part of interest rate defined as above. Results are in table 4. Column 2 shows a highly significant depreciation of EUR-USD right after the negative surprise and this pattern continues after 2007 and 2008. The effect for surprise is not so significant which suggests the positive news are usually in their expectation and new information is used to update or stronger their beliefs on future interest rate setting.

4. Conclusions

This project analyzes the effect of the ECB's monetary policy communication of the monthly Governing Council meeting days on the market response to EUR-USD exchange rate. We measure the effect by measuring the effect of interest rate news release at 13.45 ECT, the press conference at 14.30 ECT.

We find that, First, the market does focus on news of meeting days and there is an identical volatility pattern on announcement days. Press release time is always paid much attention by investors. Second, the market responses to the interest rate news in a very quick manner, usually in 5 minutes, this corresponds with the findings by Christian Conrad and Michael J. Lamla (2010). Third, investors are more sensitive during the recession time and they pay more attention on press conference, where they can get reasons of this interest rate decision. Fourth, response to positive surprise and negative surprise is not symmetry, and the market is affected more by negative surprise Which brings depreciation of EUR-USD. We verify this finding corresponds to the short run relationship between interest rate and exchange rate. And this pattern is very significant during recession time 2007-2008.

Since our forecast value is the same for one quarter, for further work we can try to find another suitable forecast data, for example, option of EUR-USD, to get a more precise result.

5. Reference

1. Christian Conrad and Michael J. Lamla. "The high-frequency response of the EUR-USD exchange rate to ECB communication"2010

2. Pierluigi Balduzzi, Edwin J. Elton, and T. Clifton Green. "Pierluigi Balduzzi, Edwin J. Elton, and T. Clifton Green"2001

3. Pierluigi Balduzzi, Edwin J. Elton, and T. Clifton Green. "Micro Effects of Macro

Announcements: Real-Time Price Discovery in Foreign Exchange”2003
4. Refet S. Gu ̈rkaynak, Brian Sack, and Eric T. Swanson. “Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements”2005
5. Hayo, Bernd; Kutan, Ali M.; Neuenkirch, Matthias. “Communicating with many tongues: FOMC speeches and US financial market reaction”2008
6. Carlo Rosa. “The Financial Market Effect of FOMC Minutes.”2007
7. Yuriy Gorodnichenko and Michael Weber.” Are Sticky Prices Costly? Evidence From The Stock Market”2015

Appendix

Figure 1:Average absolute 5min EUR-USD return for 2004-2014

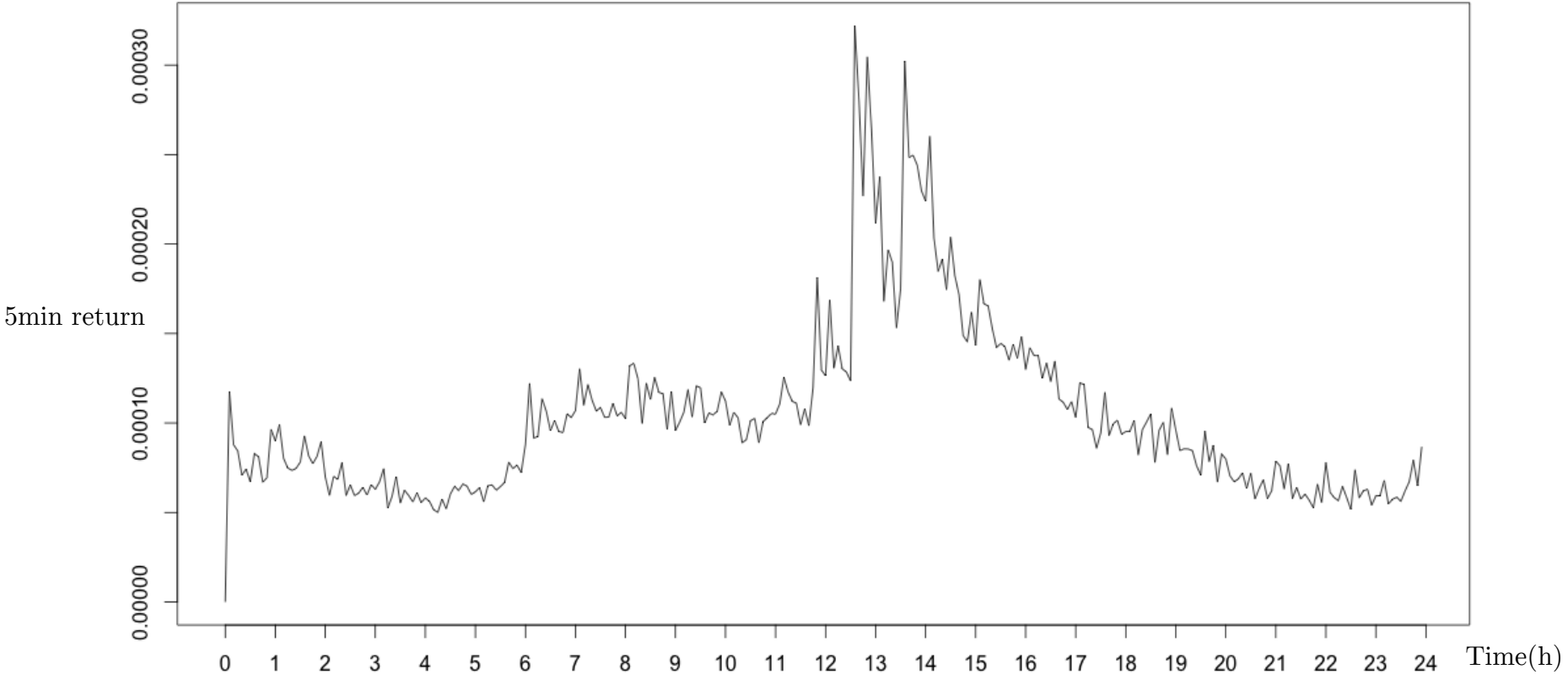

Figure 2: Average absolute 5min EUR-USD return for 2004-2006

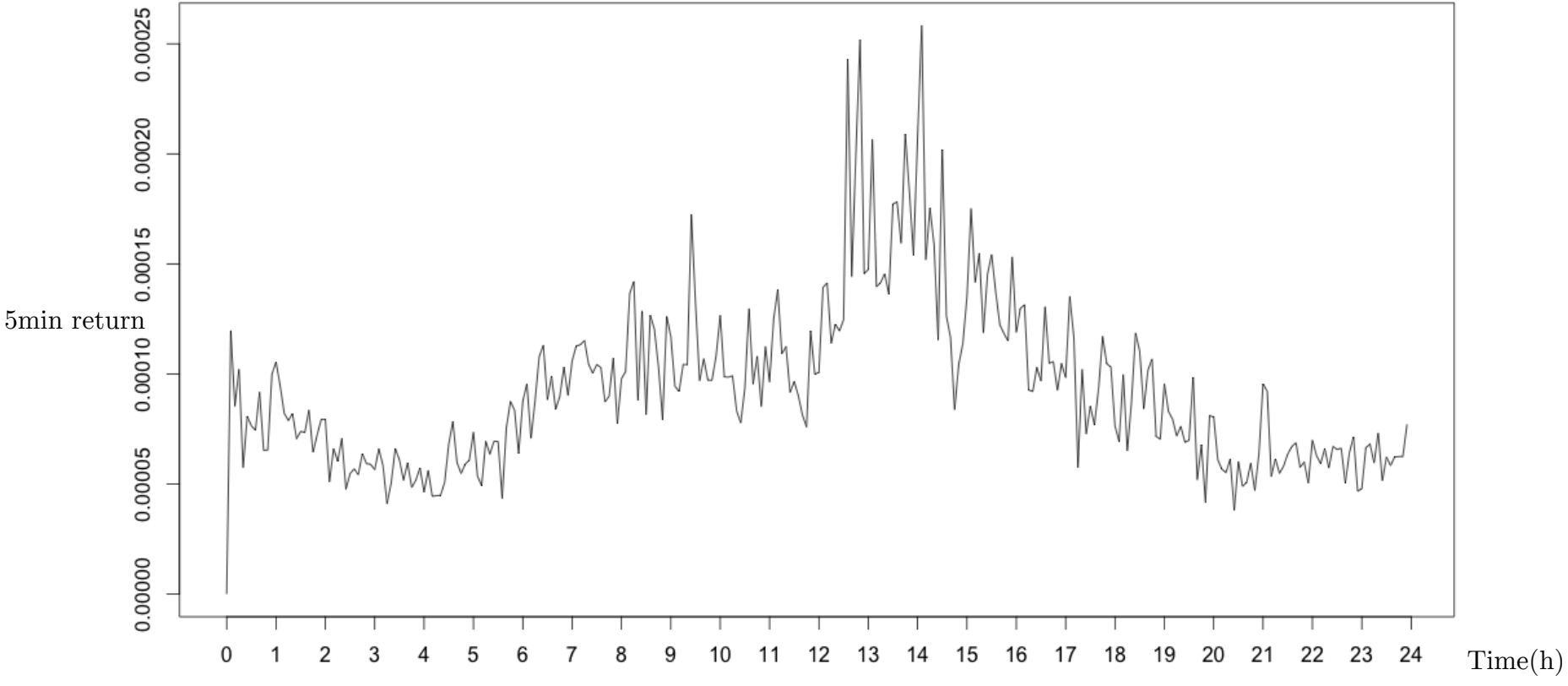

Figure 3: Average absolute 5min EUR-USD return for 2007-2008

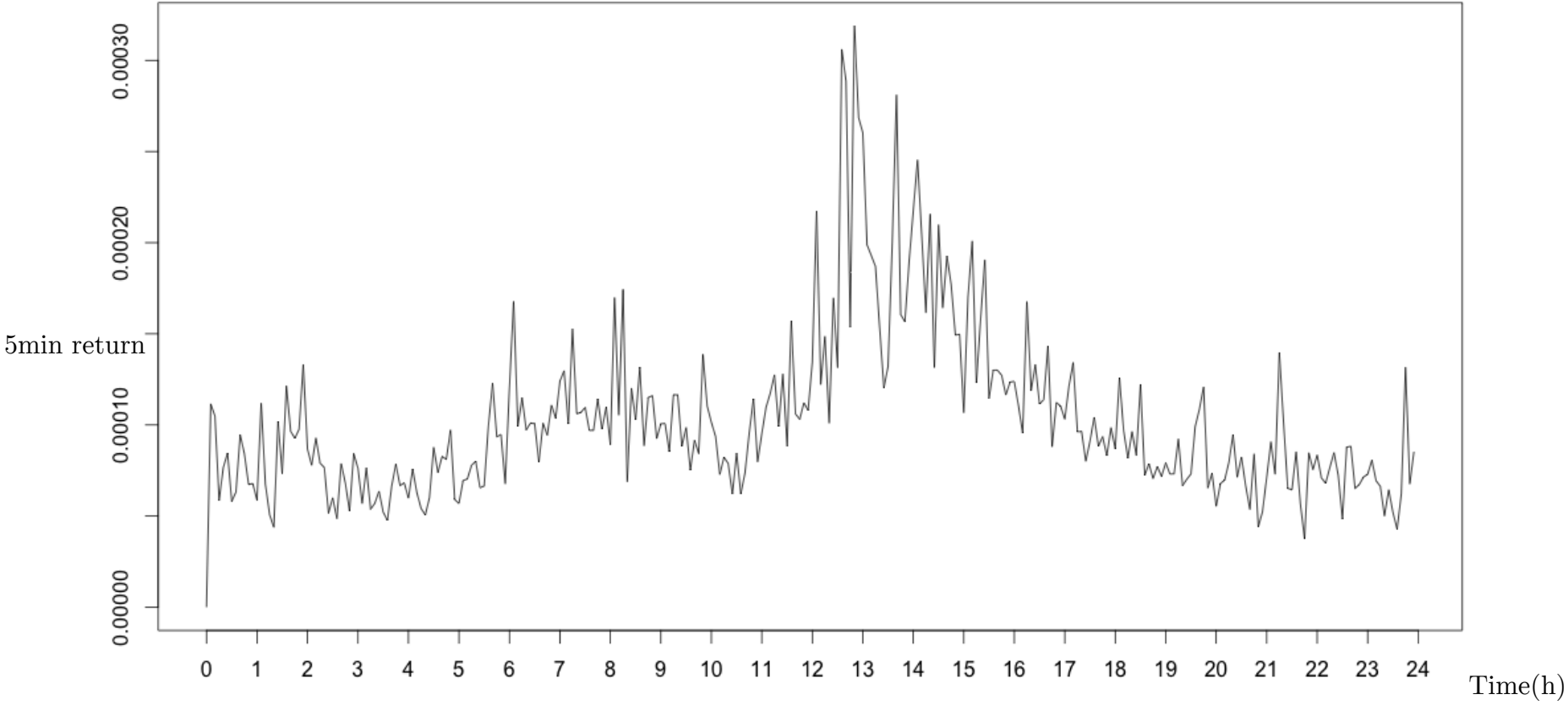

Figure 4: Average absolute 5min EUR-USD return for 2009-2014

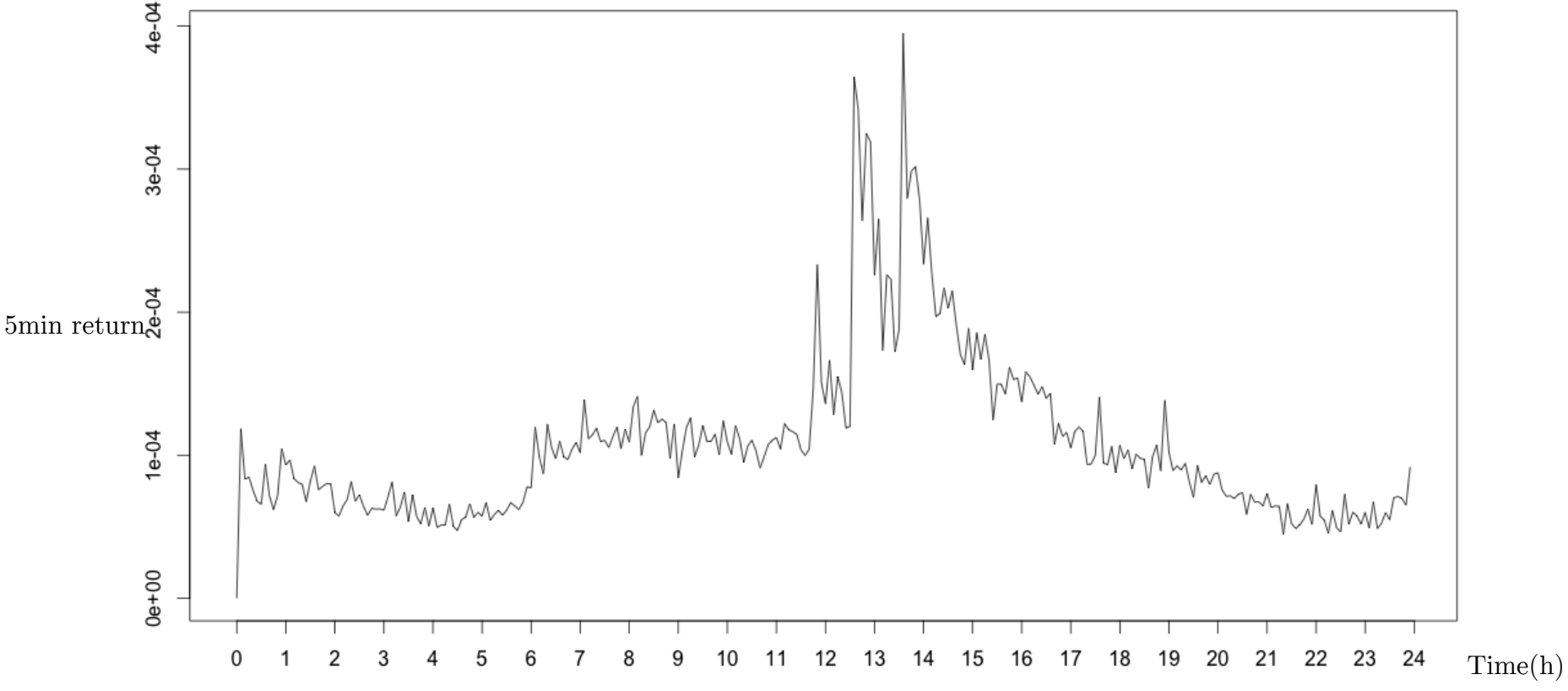

Table 1: Average absolute 5min EUR-USD returns with three largest volatilities

	2004-2014	2004-2006	2007-2008	2009-2014
13.35-13.40	0.2484**	0.1594	0.2810	0.2795**
13.40-13.45	0.2496***	0.2089*	0.1605***	0.2984***
13.45-13.50	0.2439	0.1827***	0.1566	0.3019*
13.50-13.55	0.2298*	0.1539	0.1895	0.2791
14.00-14.05	0.2240	0.2077	0.2177	0.2337
14.05-14.10	0.2601	0.2582	0.2453**	0.2660
14.10-14.15	0.2033	0.1518	0.2041	0.2273
14.15-14.20	0.1848	0.1754	0.1615	0.1970
14.20-14.25	0.1916	0.1587	0.2156	0.1991
14.25-14.30	0.1746	0.1154	0.1315	0.2169
14.30-14.35	0.2038	0.2019**	0.2097*	0.2027
14.35-14.40	0.1824	0.1263	0.1642	0.2150
14.40-14.45	0.1718	0.1166	0.1926	0.1909
14.45-14.50	0.1489	0.0837	0.1769	0.1703
14.50-14.55	0.1453	0.1043	0.1493	0.1633
14.55-15.30	0.1619	0.1137	0.1497	0.1887

Note:Table 1 shows the average absolute t min EUR-USD returns for all announcement days and the returns with three largest returns are marked by stars.The three largest volatilities in each column are marked by three, two and one stars. Three star represents the largest volatility, two star represents the second largest volatility and one star represents the third largest volatility.

Table 2: Average absolute return of different intervals on announced interest rate

	press release at 13.45			press conference at 14.30		
	5min	10min	15min	5min	10min	15min
	(1)	(2)	(3)	(4)	(5)	(6)
actual interest rate	-0.0542^{***}	-0.0755^{***}	-0.0711^{**}	-0.0103	-0.0201	-0.0085
	(0.0154)	(0.0242)	(0.0308)	(0.0144)	(0.0165)	(0.0200)
Constant	0.3403^{***}	0.5021^{***}	0.6130^{***}	0.2008^{***}	0.2716^{***}	0.3041^{***}
	(0.0333)	(0.0525)	(0.0667)	(0.0311)	(0.0358)	(0.0434)
Observations	130	130	130	130	130	130
R^2	0.0885	0.0704	0.0399	0.0040	0.0114	0.0014
Adjusted R^2	0.0813	0.0632	0.0324	-0.0037	0.0036	-0.0064
Residual Std. Error (df = 128)	0.2169	0.3418	0.4348	0.2024	0.2332	0.2825
F Statistic (df = 1; 128)	12.4219^{***}	9.6958^{***}	5.3158^{**}	0.5194	1.4721	0.1782

Note : Table 2 shows results of regression (*), average absolute return of different time intervals on announced interest rate. *p<0.1; **p<0.05; ***p<0.01

Table 3: Average absolute return of different periods on announced interest rate

	press release at 13.45			press conference at 14.30		conf
	2004-2006	2007-2008	2009-2014	2004-2006	2007-2008	2009-2014
	(1)	(2)	(3)	(4)	(5)	(6)
actual interest rate	−0.0843	−0.0500	−0.0545	0.0412	−0.4054***	−0.4054***
	(0.0771)	(0.0781)	(0.0669)	(0.0450)	(0.0865)	(0.0865)
Constant	0.3757**	0.3492	0.3479***	0.0322	1.7266***	1.7266***
	(0.1796)	(0.3023)	(0.0634)	(0.1047)	(0.3349)	(0.3349)
Observations	34	24	72	34	24	24
R^2	0.0360	0.0183	0.0094	0.0255	0.4996	0.4996
Adjusted R^2	0.0059	−0.0264	−0.0047	−0.0049	0.4769	0.4769
Residual Std. Error	0.1987 (df = 32)	0.1405 (df = 22)	0.2467 (df = 70)	0.1159 (df = 32)	0.1557 (df = 22)	0.1557 (df = 22)
F Statistic	1.1961 (df = 1; 32)	0.4094 (df = 1; 22)	0.6654 (df = 1; 70)	0.8379 (df = 1; 32)	21.9668*** (df = 1; 22)	21.9668*** (df = 1; 22)

Note: Table 3 reports result of regression (**), average absolute 5min return of different periods on announced interest rate. *p<0.1; **p<0.05; ***p<0.01

Table 4: Average absolute 5min return on interest rate surprise in different periods

	negative suprise			positive suprise		
	2004-2006	2007-2008	2009-2014	2004-2006	2007-2008	2009-2014
	(1)	(2)	(3)	(4)	(5)	(6)
suprise part of interest rate	0.0164	-0.4162^{***}	0.3594^{***}	0.0771	-0.0097	0.3594^{***}
	(0.0751)	(0.1060)	(0.1037)	(0.0463)	(0.0834)	(0.1037)
Constant	0.1047	1.7637^{***}	-0.0977	-0.0771	0.2811	-0.0977
	(0.1706)	(0.4058)	(0.1034)	(0.1115)	(0.1732)	(0.1034)
Observations	20	15	38	14	15	38
Adjusted R^2	-0.0528	0.5071	0.2293	0.1199	-0.0758	0.2293

Note: Table 4 presents results of regression (***), average absolute 5min return on interest rate surprise in different periods. Column 1, 2, 3 is based on negative surprise and column 4, 5, 6 is based on positive surprise.