

Impact of ECB communication on high frequency response of EUR-USD exchange rate, before and after 2008 recession

Brief intro

We investigate the high-frequency impact of European Central Bank's (ECB) monetary policy communication , which is published on meeting days (nearly every month), on the EUR-USD exchange rate on those meeting days, in different periods.

What happens on those meeting days?

1. Annoucement of the **next key interest** rate via a press release 13:45 ECT
2. Press conference with introductory statement (ends with Q&A) 14:30 ECT

Why study this?



Data

1. Exchange rate

Minute by minute quotes of EUR-USD exchange rate for Covering Jan 2004 – Jan 2014, from www.Dukascopy.com

2. Forecast of key interest rate

Quarterly forecast from a survey done by ECB

3. Key interest rate

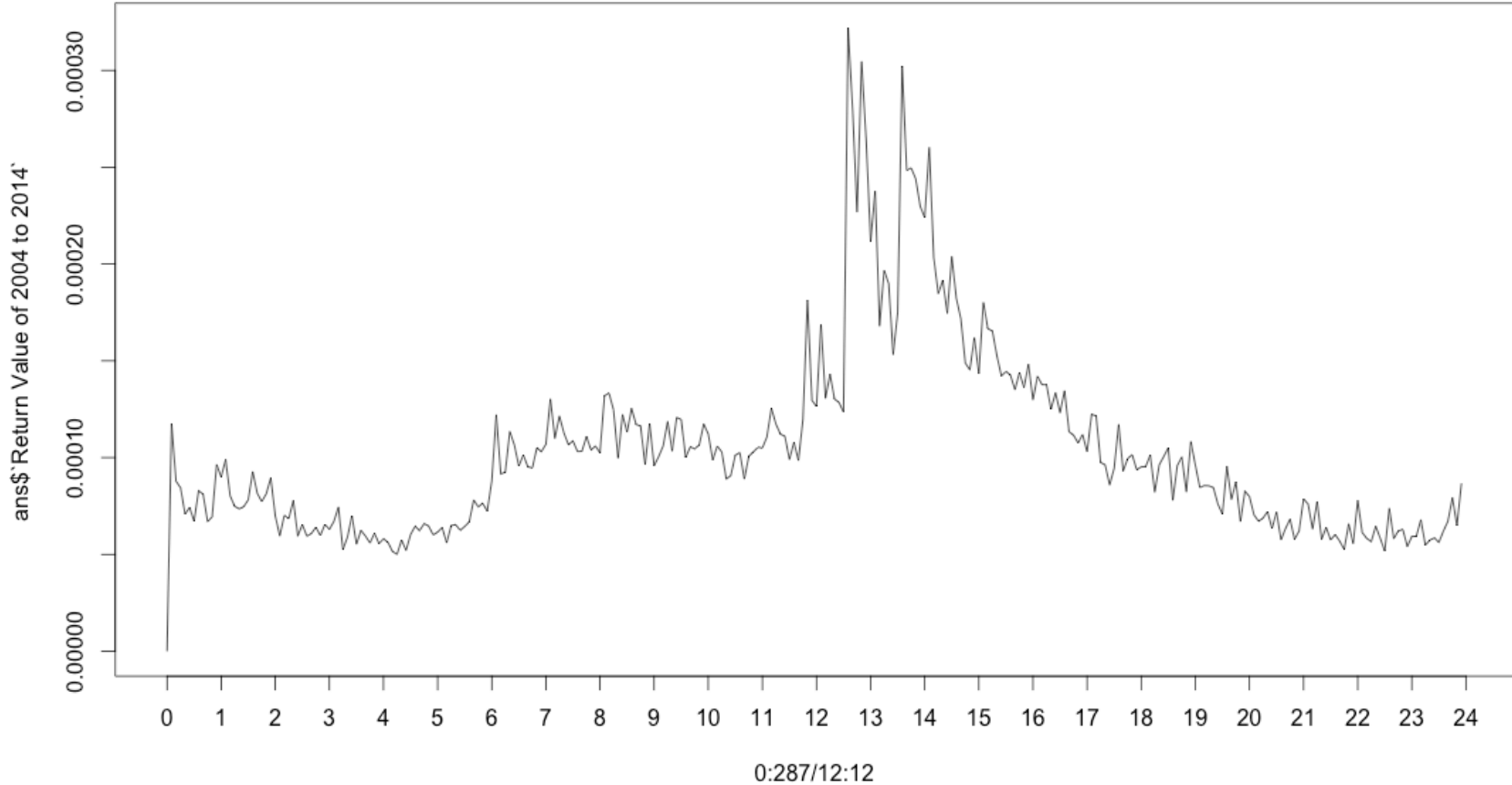
From ECB public website

Method & Findings

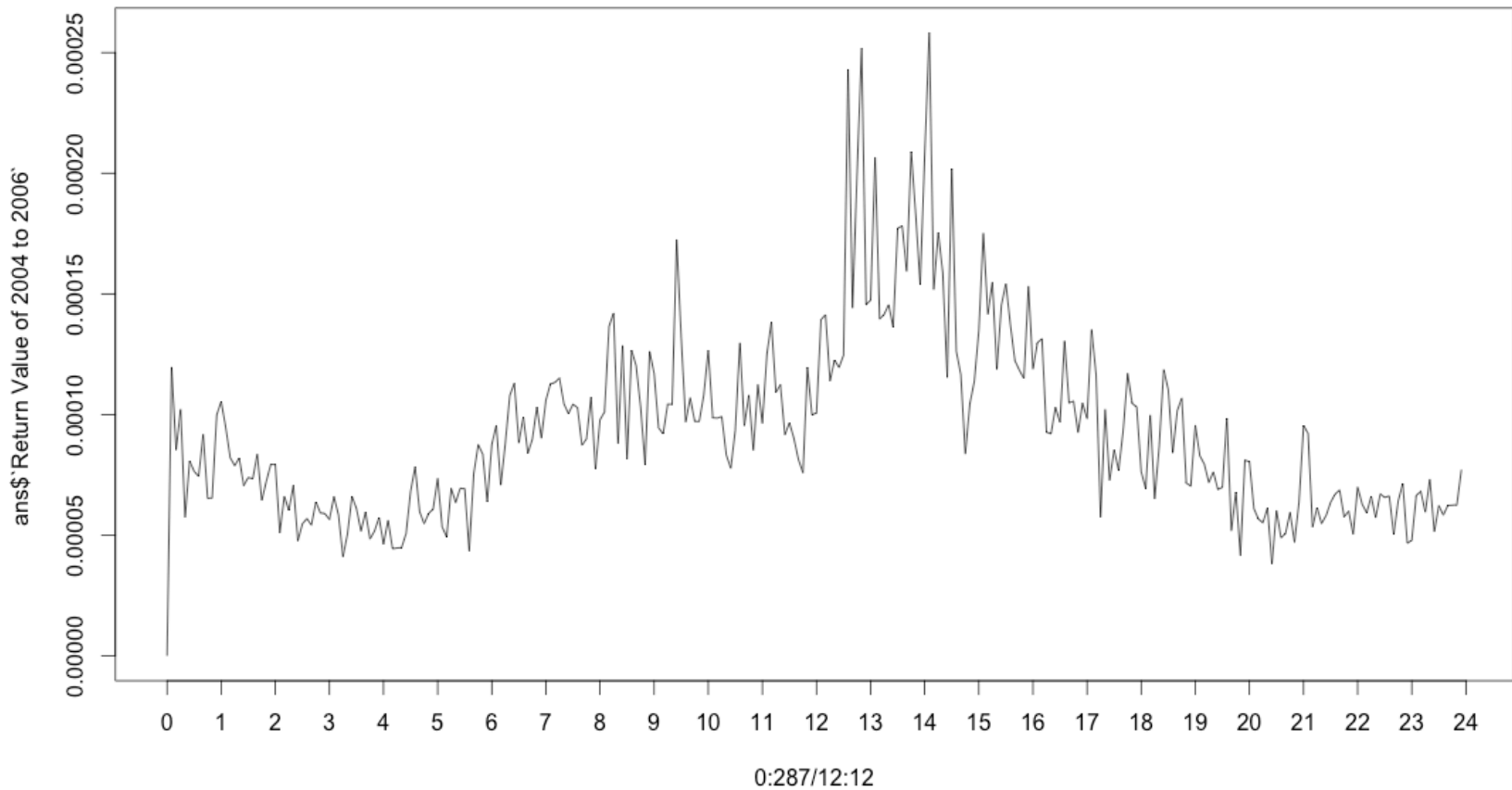
1. Event study
2. Key interest rate counts?
3. How does key interest rate count?
 - Press release and press conference?
 - Different periods? Positive/negative surprise?

1. Whole day performance

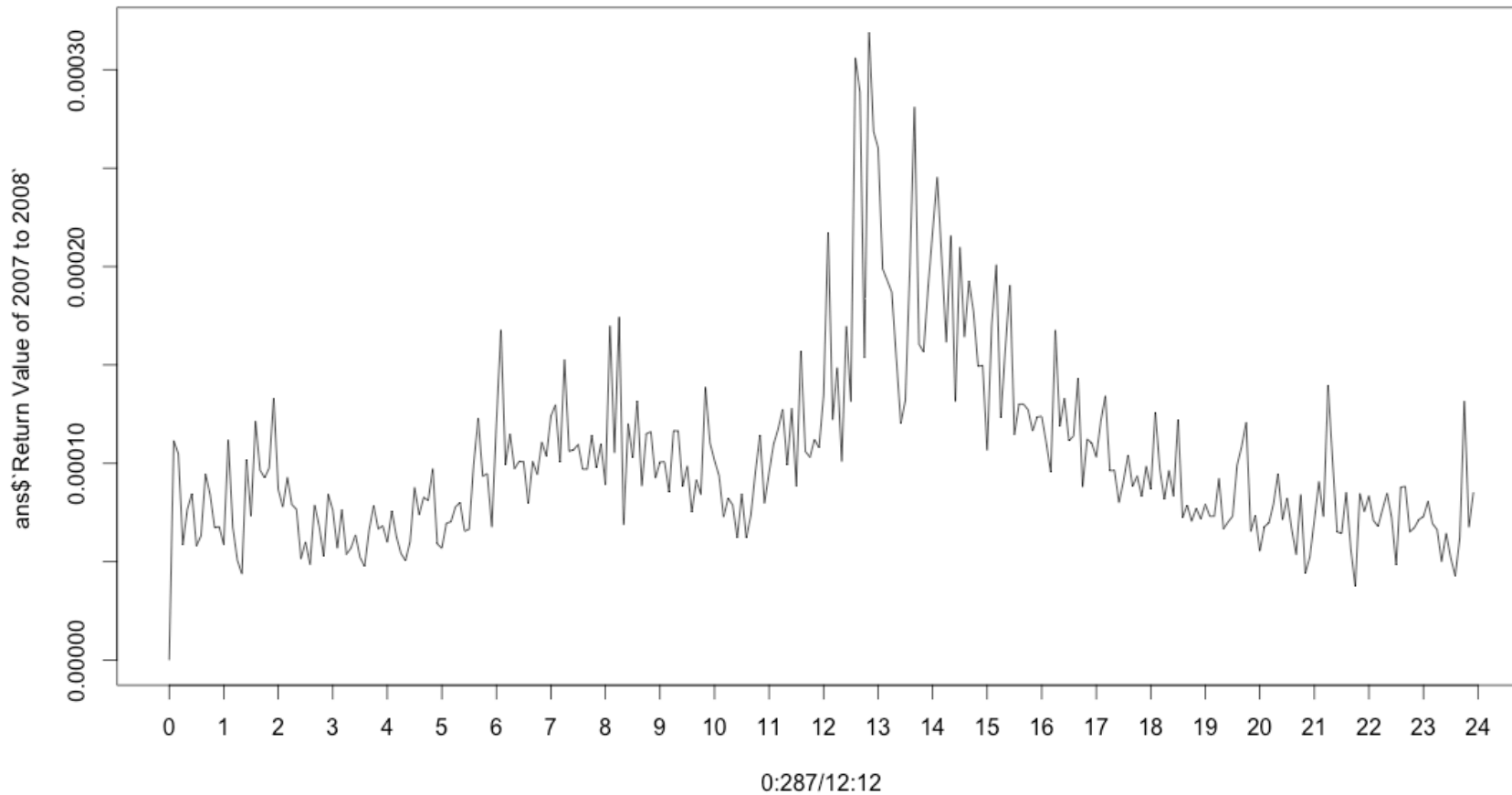
Average absolute 5min EUR-USD return for 2004-2014



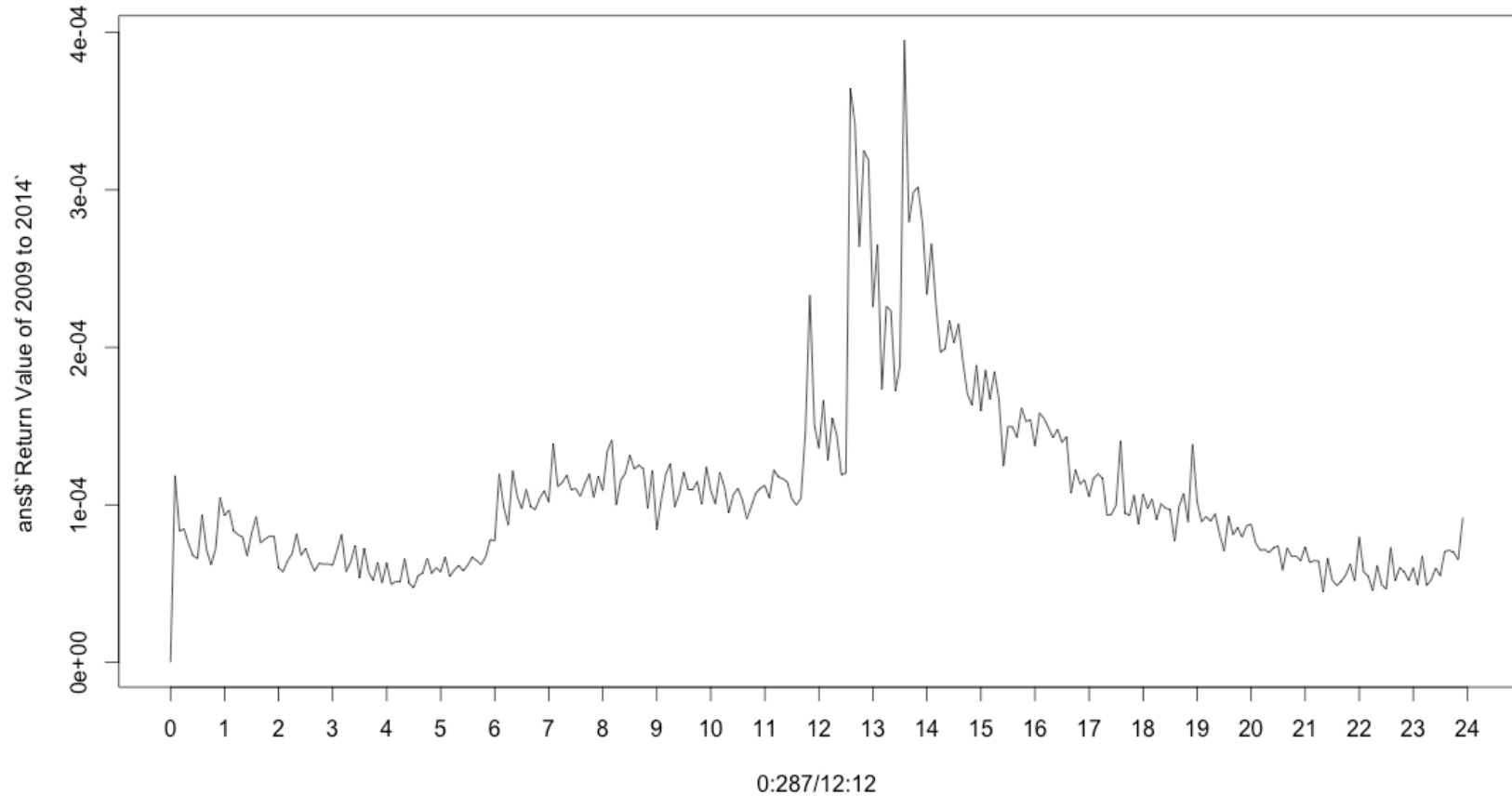
Average absolute 5min EUR-USD return for 2004-2006



Average absolute 5min EUR-USD return for 2007-2008



Average absolute 5min EUR-USD return for 2009-2014



2. Volatility pattern

Average absolute 5min EUR-USD return for different period
(return with 3 largest volatility is marked by red, green and blue)

HOUR	MINUTE	2004-2014	2004-2006	2007-2008	2009-2010
13	30	0.00017487	0.00017714	0.00013210	0.00018806
13	35	0.00030223	0.00017816	0.00019995	0.00039492
13	40	0.00024841	0.00015940	0.00028095	0.00027960
13	45	0.00024961	0.00020893	0.00016058	0.00029850
13	50	0.00024394	0.00018279	0.00015662	0.00030193
13	55	0.00022978	0.00015388	0.00018949	0.00027905
14	0	0.00022396	0.00020771	0.00021767	0.00023373
14	5	0.00026014	0.00025819	0.00024534	0.00026600
14	10	0.00020327	0.00015183	0.00020412	0.00022728
14	15	0.00018476	0.00017538	0.00016148	0.00019696
14	20	0.00019159	0.00015871	0.00021560	0.00019911
14	25	0.00017456	0.00011537	0.00013153	0.00021686
14	30	0.00020379	0.00020191	0.00020976	0.00020269
14	35	0.00018240	0.00012629	0.00016424	0.00021496
14	40	0.00017177	0.00011662	0.00019263	0.00019086
14	45	0.00014889	0.00008368	0.00017691	0.00017035
14	50	0.00014530	0.00010432	0.00014926	0.00016333
14	55	0.00016189	0.00011374	0.00014972	0.00018869

3. Regression result

Regression of different time interval return on announced key interest rate

	<i>Dependent variable:</i>					
	X5retof1345	X10retof1345	X15retof1345	X5retof1430	X10retof1430	X15retof1430
	(1)	(2)	(3)	(4)	(5)	(6)
actual	-0.0001*** (0.00002)	-0.0001*** (0.00002)	-0.0001** (0.00003)	-0.00001 (0.00001)	-0.00002 (0.00002)	-0.00001 (0.00002)
Constant	0.0003*** (0.00003)	0.0005*** (0.0001)	0.0006*** (0.0001)	0.0002*** (0.00003)	0.0003*** (0.00004)	0.0003*** (0.00004)
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)	0.0002	0.0003	0.0004	0.0002	0.0002	0.0003
F Statistic (df = 1; 128)	12.4219***	9.6958***	5.3158**	0.5194	1.4721	0.1782

Note:

$p < 0.1$; $p < 0.05$; $p < 0.01$

1. Key interest rate has significant effect on return from 13:45. React more to press release
2. Coeff of 5min regression is biggest. P value increases as time interval goes bigger. More precise relation in small interval

Regression of 5min return on announced key interest rate, different periods

	<i>Dependent variable:</i>					
	X5retof1345			X5retof1430		
	(1)	(2)	(3)	(4)	(5)	(6)
actual	-0.0001 (0.0001)	-0.00005 (0.0001)	-0.0001 (0.0001)	0.00004 (0.00004)	-0.0004*** (0.0001)	-0.0004*** (0.0001)
Constant	0.0004** (0.0002)	0.0003 (0.0003)	0.0003*** (0.0001)	0.00003 (0.0001)	0.0017*** (0.0003)	0.0017*** (0.0003)
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	0.0002 (df = 32)	0.0001 (df = 22)	0.0002 (df = 70)	0.0001 (df = 32)	0.0002 (df = 22)	0.0002 (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:

p<0.1; *p*<0.05; *p*<0.01

Positive and negative surprise

1. Event study approach

Positive interest rate surprise: announced value $>$ expected value

Negative interest rate surprise: announced value $<$ expected value

2. Short run relationship

Appreciation of home currency – a surprise monetary tightening – positive interest rate surprise

Depreciation of home currency – a negative monetary easing – negative interest rate surprise

Regression of return on key interest rate surprise, different periods

	<i>Dependent variable:</i>					
	X5retof1430 (1)	X10retof1430 (2)	X15retof1430 (3)	X5retof1430 (4)	X10retof1430 (5)	X15retof1430 (6)
diff	-0.00005 (0.0001)	-0.0001 (0.0001)	0.0001 (0.0001)	0.0011*** (0.0003)	0.0003 (0.0004)	0.0009* (0.0005)
Constant	0.0002*** (0.00003)	0.0002*** (0.00003)	0.0003*** (0.00004)	0.0001*** (0.00003)	0.0002*** (0.00004)	0.0003*** (0.00005)
Observations	69	69	69	61	61	61
R ²	0.0047	0.0040	0.0061	0.1657	0.0074	0.0562
Adjusted R ²	-0.0101	-0.0109	-0.0088	0.1515	-0.0094	0.0402
Residual Std. Error	0.0002 (df = 67)	0.0002 (df = 67)	0.0002 (df = 67)	0.0002 (df = 59)	0.0002 (df = 59)	0.0003 (df = 59)
F Statistic	0.3168 (df = 1; 67)	0.2690 (df = 1; 67)	0.4080 (df = 1; 67)	11.7160*** (df = 1; 59)	0.4399 (df = 1; 59)	3.5116* (df = 1; 59)
Note:	<i>p</i> <0.1; <i>p</i> <0.05; <i>p</i> <0.01					

1. Look at coefficient of key interest rate surprise , consistent with previous relationship
2. Significant effect show on press conference

Conclusion

I have studied the impact of ECB communication on EUR-USD exchange rate by focusing on its key interest rate news and explanation.

Overall picture is a strong, visible, quick impact effect of key interest rate news. And this effect pattern is quite different before the recession, during most nervous year 2007-2008 and years after 2008.

When comes to positive and negative surprise, it is consistent with the reaction function.

Problems & further work

1. Noise in interest rate forecast
? Exchange rate future
2. Only key interest rate news
? Classify other stuff in introductory statement
3. Better visible graph to show the result
4. Coding skills needed to be improved
5. Not too much result

What I have learned

1. Knowledge on the topic
2. Paper reading
3. Coding
4. Data searching, filtering and analysis
4. Start from simplest idea, do what is approachable and reasonable first
5. Time management, give myself time for bugs
6. Don't be frustrated when result is not perfect