The Impact of Macroeconomic Changes to the European Currency Market

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Abstract: *This paper consists in the analysis of the reaction of the FX market with respect to announcements concerning new macroeconomic data. The analysis consists in the study of the volatility of changes for a set of currency pairs that include the Euro at the moment of these announcements. A measure of the speed with which new information is included in prices is provided by means of a simple GARCH model fitted at each release. We found evidence that the currencies are immediately reacting to this new information.*

Keywords: event study, macroeconomic releases, impact in volatility, European FX market

JEL codes: E66, F31, G15

1. Introduction

Besides the fact that it is the currency of the euro area, the euro has a solid international occurrence, standing out strongly as a major international currency, second only to the US dollar. Euro is used increasingly more for billing and payment in international business, not only between the euro area and third countries but also, to a lower extent, between other countries, outside the euro zone.

The euro is now a currency used every day by over 300 million people in 19 countries representing the euro area (Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovenia, Slovakia, and Spain) and enrolled in a fierce competition to win supremacy of the US dollar in international financial markets.

Psychological moment of the euro's emergence was preceded by a time when the idea of the emergence of a new currency has been much discussed. Since the thought of a new currency was launched, there were discourses about the powerful influence that it will have on the future design of the international financial system. In addition, there was the idea that the euro will be able to emulate the US financial market that demands the right to be the largest and most liquid market in the world. The apparition of the euro on 1 January 1999 led to a strong demand for the new currency which has led to an appreciation against the dollar at $ 1.1668 (closing rate of ECU on 31 December 1998) to $ 1.18 for that day. Outright the boom shown for the euro, investors began to focus on uncertainties regarding divergent trends of economic growth in the US and the euro area.

Introduction of the euro has had a particularly important role in ensuring macroeconomic stability; its main role is to maintain price stability in the euro area (defined quantitatively by keeping inflation in the medium term, under, but close to 2%). The European Central Bank has implemented firmness the single monetary policy, leading to enforce trust in the euro, anchoring long-term price trends and activate preconditions for sustainable economic growth.

Currencies markets are highly volatile and do not necessarily reflect the economic basic principles. Lack of strength of the euro immediately after its launch in 1999, did not reflect the rise or differences between interest rates, but instead market uncertainty - both to the commitment of Member States and to the credibility of the policies of the new European

Central Bank. The force acquired later indicates that the currency has been accepted as a global currency, rather than demonstrating a more efficient growth.

Lately, the euro zone was shaken by financial crises that were transferred into the social area as well (Criste et al, 2012 and 2013), the political discords appeared quite often and the entire project is affected.

The financial crisis that has broken out in 2007, and spread throughout Europe since 2008, has been reflecting on the economic activity and employment, generating economic downturn. Gradually, the European crisis has turned into a social one, by transferring the financial problems into the social field. The objective of this article is to highlight some important effects arising from the financial crisis developments and have social and political implications across European countries. The view that the solution to the European crisis would be the application of the austerity policies has proved to be unsustainable, given that such measures have strained the relations between countries and also within countries. In the future, it remains the risk that the imbalances accumulation in the euro area, and more extended, in the European Union, would generate a polarization phenomenon in Europe by increasing the political dissensions between countries, and thereby would affect the default implementation of the European project

The reminder of this paper is structured in the following manner. Section II provides a succinct presentation of specific literature. Section III describes the data and the methodology used for the analysis. Section IV displays the results obtained and their interpretation and the last section concludes.

2. Literature review

In a globalization framework, international trade has in important role, influencing and being influenced by the exchange rates. Ample exchange rates changes can strongly affect the current and trade account balance, but also may increase the risk for companies and financial institutions.

A subject that is addressed very often in the literature in the last years is the issue of financial contagion that is affecting the exchange rates, stock prices, capital flows or sovereign spreads. An incursion in the subject was made by Dornbusch et al (2000), Forbes and Rigobon (2001), Lupu (2012) or Kaminsky and Reinhart (2000).

The theory of rationale expectations implies that unpredictable events, news, have an important role in influencing assets' performance and real variables changes. This hypothesis was adapted in the literature dealing with exchange rate determination. In this sense, it is supposed that present and future values of the significant macroeconomic variables are incorporated in exchange rates (Frenkel and Mussa, 1985; Obstfeld and Rogoff, 1996).

Trying to capture the relation between exchange rates and macroeconomic fundamentals, were built the monetary models (Frenkel, 1976; Mussa, 1976; Dornbusch, 1976) that demonstrated the presence of long run equilibrium between nominal exchange rate and relative money supplies and relative income.

The modelling of the foreign sector, that was considers before as an annex, is now considered a part of the open economy macroeconomics. Obstfeld and Rogoff (2003) added the imperfect competition and nominal rigidities to general equilibrium model in an open economy. Unfortunately, these models were not able to demonstrate an adequate relation between macroeconomic fundamentals and movements of the exchange rates on the short run (Frankel and Rose, 1995; Engel and West, 2005).

If the hypothetical theory suggests a direct relation of the exchange rates with macroeconomic variables, the empirical studies offer mixed results. For Conway et al (1998), disturbances of the exchange rate negatively affect the inflation. Ito and Sato (2008)

discovered that inflation and exchange rate fluctuations are related while Kara and Nelson (2002) detected a low correlation between inflation (CPI) and exchange rate movements. A positive relation between exchange rate fluctuation and interest rate was documented by Simon and Rajak (1999), while Lahari and Hnatrovaska (2008) reported a non-monotonic relation. For developing countries, Kendil (2004) raised out a significant concern regarding negative impact of currency depreciation on economic output.

As in the case of stock exchanges, the currency market has the advantage of offering intra-daily data that is allowing for many statistical analyses. Lupu et al. (2010) performed a research that is investigating the time series properties of a set of intra-day stock returns, intending to develop a methodology able to offer information on dependency patterns of stock returns distributional properties to frequencies.

Lupu and Dumitrescu (2010) built a research instrument for analyzing the relation between economic growth and capital market evolution. The proposed methodology is an event study to see the movement of capital market index in the vicinity of moments when were released communications regarding economic indicators by the national statistical institute.

While the anticipatory role of the exchange rate is justified by theory, the empirical implementation is quite difficile.

When studying the linkage between exchange rate and macroeconomic variables, appears one more hindrance – different frequencies for collected statistical data. More precisely, the frequency for available data on exchange rates is much higher than data for GDP or current account.

3. Data and Methodology

Data consists in five-minute changes for the main currency pairs that include Euro from September 2014 until January 2015. The currencies are the following: EURHUF, EURINR, EURNOK, EURPLN, EURSEK, EURZAR, EURILS. The set of macroeconomic indicators is presented in the following table:

Table 1: Macroeconomic data

PPI YoY
CPI Estimate YoY
CPI Core YoY
Retail Sales MoM
Unemployment Rate
Industrial Production SA MoM
Trade Balance SA
Trade Balance NSA
CPI YoY
GDP SA QoQ
Gross Fix Cap QoQ
Govt Expend QoQ
Household Cons QoQ

A standard GARCH model was fitted at each moment of the release for log-returns of the above mentioned currency pairs. The objective was to capture the changes in volatility (if they exist) in a time frame after each release.

The specification of the model follows the lines of the classical work of Bollerslev (1986), which was an extension of the seminal paper of Engle (1982). The conditional variances are following the dynamics described by the following equation:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{m} \alpha_i a_{t-i}^2 + \sum_{j=1}^{s} \beta_j \sigma_{t-j}^2$$

where:

$$\alpha_0 > 0, \alpha_i \geq 0, \beta_j \geq 0$$

For each event in our analysis we fitted this model for the intra-day series of log-returns computed for the above mentioned currencies.

The time frame of the release was considered to be of 30 intervals of five-minute log-returns after each release. The volatility model was fitted for a sample of 200 observations before the release and was used to produce forecast for the time interval following the release. The comparison between the forecast and the squared log-return (as a proxy for the actual level of variance) was performed and the significant values are saved and reported in the Results section.

$$ASqR_t = R_t^2 - \sigma_t^2$$

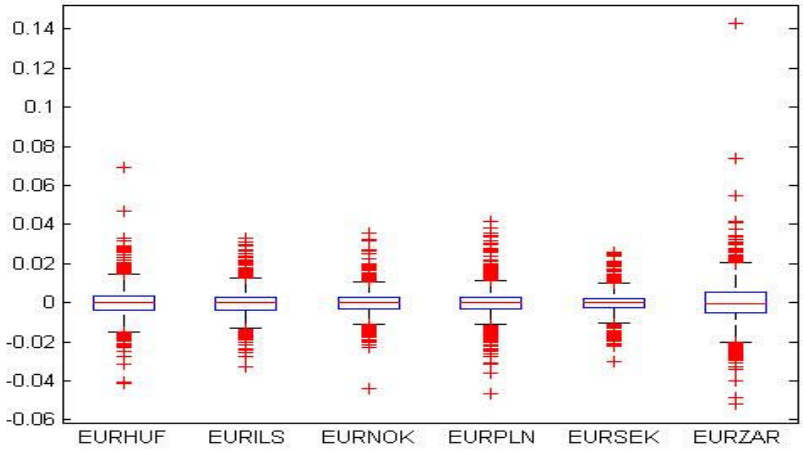
where $ASqR_t$ is the Abnormal Squared Return computed at moment t, where t counts the 30 intervals after each event. The significance of these abnormal squared returns is decided by measuring the average distance from the variances obtained from the GARCH fit in the period before each event and analyzing the extent to which the distances after each event are larger than twice this average distance, as in Albu et al (2014a) and Albu et al (2014b). We considered we capture a significant volatility reaction if we find at least one $ASqR_t$ larger than twice the average deviation.

The number of significant instances of these $ASqR_t$ was used for the computation of a measure that quantifies the volatility reaction for the respective currency pair as a result of the respective macroeconomic announcement. This gauge will be used in the measurement of the strength of volatility reaction and will be exhibited in the Results section for each currency pair.

4. Results

The descriptive statistics for the log-returns of the currency pairs are presented in the boxplots in the Figure 1 below. We can notice their fat-tail-ness and almost symmetrical dynamics for the whole period we are covering.

Figure 1: Boxplots for the log-returns of the currency pairs at the daily range



Source: Datastream data and author's calculations

The employment of the volatility event study as explained in the previous section provided the results presented in Table 2. Each cell provides the average volatility reaction for the currency pair stipulated on column, as generated by the macroeconomic event mentioned on the rows. For instance, during the time interval between September 2014 and February 2015, we notice that the EURHUF currency pair exhibited on average about 9.6% volatility reaction to PPI YoY event announced for the Euro currency region.

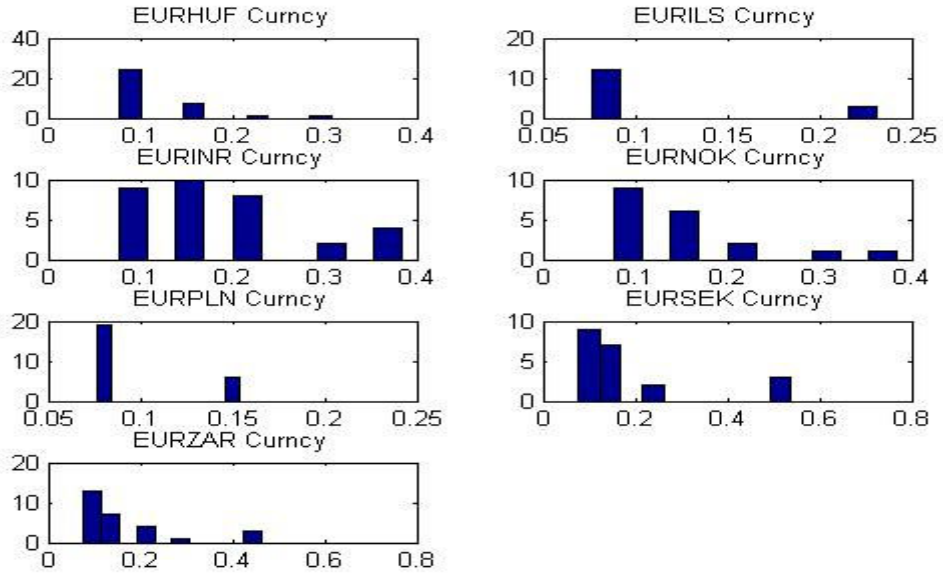
Table 2: Average volatility reaction to each event

Macroeconomic data	EURHUF	EURILS	EURINR	EURNOK	EURPLN	EURSEK	EURZAR
PPI YoY	0.096	0.128	0.169	0.077	0.090	0.212	0.200
CPI Estimate YoY	0.096	0.154	0.154	0.077	0.096	0.256	0.231
CPI Core YoY	0.077	0.077	0.179	0.115	0.077	0.115	0.103
Retail Sales MoM	0.077	0.077	0.231	0	0	0.154	0.154
Unemployment Rate	0.077	0.077	0.385	0	0	0	0
Industrial Production SA MoM	0.077	0.077	0.385	0	0	0	0
Trade Balance SA	0.077	0.077	0.385	0	0	0	0
Trade Balance NSA	0.192	0	0.077	0.385	0.154	0.154	0.077
CPI YoY	0.103	0	0.077	0.212	0.115	0.154	0.205
GDP SA QoQ	0.154	0.077	0.154	0.115	0.077	0.154	0.128
Gross Fix Cap QoQ	0.115	0.077	0.231	0.128	0.077	0.077	0.077
Govt Expend QoQ	0.103	0.077	0.231	0.128	0.077	0.077	0.077
Household Cons QoQ	0.096	0.154	0.154	0.077	0.096	0.256	0.231

Source: Author's Calculations

We observe that the largest values are obtained in the case of the EURNOK pair as a reaction to the Trade Balance NSA announcement, i.e. 38.5% of the intervals after this event exhibited squared log-returns that were larger than twice the average deviation of squared returns from the fitted GARCH model in the period before the event.

Figure 2: Histograms for the volatility reactions of each currency pair



Source: Author's Calculations

In order to better investigate the actual reaction of each currency to all the events in the sample, we built the histograms for all the significant reactions for each pair, presented in Figure 2. We notice that the size of these reactions is relatively similar across all currency pairs, with larger values for EURSEK and EURZAR and with smaller reactions for the EURHUF, EURILS and EURPLN. We could conclude that these countries show less connection to the respective macroeconomic events.

Table 3: Average volatility reaction according to the time of release

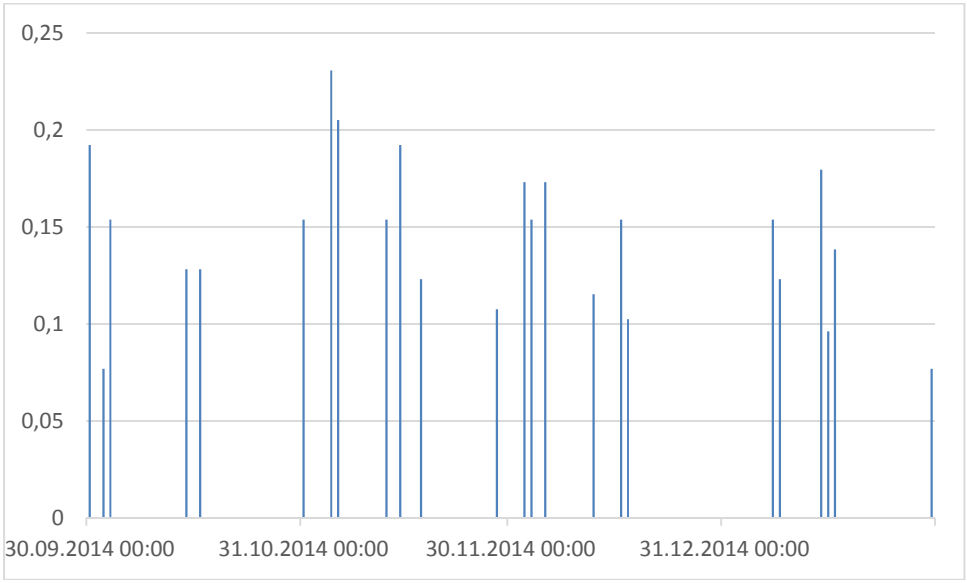
Time of Release	EURHUF	EURILS	EURINR	EURNOK	EURPLN	EURSEK	EURZAR
09/30/2014 9:00	0.15	0.23	0.23	0	0.15	0	0
10/02/2014 9:00	0.08	0	0	0.08	0	0	0.08
10/03/2014 9:00	0.08	0	0	0	0.15	0.23	0
10/14/2014 9:00	0.15	0	0.15	0.08	0	0	0
10/16/2014 9:00	0	0	0.23	0	0.08	0.08	0
10/31/2014 10:00	0.08	0.08	0.08	0	0.08	0.15	0.46
11/04/2014 10:00	0.08	0	0	0	0.08	0.54	0.23
11/05/2014 10:00	0.08	0	0	0.31	0	0.23	0
11/12/2014 10:00	0	0	0	0	0	0	0.15
11/14/2014 10:00	0.31	0	0	0	0	0	0.08
11/17/2014 10:00	0.08	0	0.23	0.15	0.08	0	0.08
11/28/2014 10:00	0.08	0	0.15	0.08	0.08	0	0.15
12/02/2014 10:00	0	0	0.08	0.23	0.15	0	0.23
12/03/2014 10:00	0.23	0	0.15	0	0.08	0.15	0
12/05/2014 10:00	0	0	0.08	0.38	0	0.15	0.08
12/12/2014 10:00	0.08	0	0.08	0	0	0.15	0.15
12/16/2014 10:00	0.15	0	0	0	0	0	0
12/17/2014 10:00	0	0	0.15	0	0	0.08	0.08
01/07/2015 10:00	0.15	0	0.08	0.23	0.08	0.08	0.31

01/08/2015 10:00	0	0.08	0.15	0.15	0.08	0	0.15
01/14/2015 10:00	0.08	0.08	0.38	0	0	0	0
01/15/2015 10:00	0	0	0.08	0	0.15	0.08	0.08
01/16/2015 10:00	0.08	0.08	0.31	0.15	0	0.08	0
01/30/2015 10:00	0	0.08	0	0.08	0.08	0	0.08

Source: Author's Calculations

Table 3 presents the results from another perspective – the time distribution of volatility reactions for each currency pair. We notice that larger reactions are observed in January 2015, and we can relate these reactions to the shift in monetary policy that we witnessed in this period for a large set of central banks.

Figure 3: Time distribution of average reactions



Source: Author's Calculations

A visual representation of Table 3 is realized in figure, where we can see the average dynamics of reactions across all currency pairs in time. We notice a possible clustering of these reactions as time passes, with concentrations around the beginning of November 2014, beginning of December 2014 and beginning of January 2015.

5. Concluding remarks

This paper provides an analysis of the reactions of a set of currency pairs that include the Euro currency to a set of macroeconomic data announcements. We use intra-day data from Reuters and macroeconomic events to build an event study around each such event. We measure the changes in volatilities as in Albu et al (2014b) and we produce a set of results for the volatility changes in the period post each event.

We noticed that the volatility reactions are relatively uniformly distributed across time and the set of currency pairs used in our analysis. A certain clustering phenomena seems to exists, as observed in figure 3, which provides the feeling that these reactions should be connected to the expectations in the monetary policy decisions on one hand and on the other

hand it is possible that the GARCH model used in our analysis does not capture all the clustering volatility effect.

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