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Intraday exchange rate volatility transmissions across QE announcements

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ABSTRACT

This paper examines the effects of quantitative easing (QE) announcements by the European Central Bank (ECB), the Bank of England (BoE) and the Bank of Japan (BoJ) on the intraday volatility transmissions among EUR, GBP and JPY. The empirical results indicate: (i) an increased volatility transmission from EUR to JPY and GBP around the ECB announcements, and from GBP to EUR over the BoE announcements, (ii) the ECB and BoE announcements significantly increase the volatility of EUR and JPY, and (iii) a "calming down" impact on the volatility of EUR and GBP from the BoJ and the ECB announcements, respectively.

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1. Introduction

There is a large body of literature investigating the effects of unconventional monetary policy tools on macroeconomic variables and financial markets as a response to the 2007–2009 global financial crisis (for a survey see Joyce et al., 2012; Kenourgios et al., 2015). Most of these studies find a reduction on long-term yields and significant positive effects on the economic activity and several financial market indicators around the QE announcements (e.g., D'Amico et al., 2012; Christensen and

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Rudebusch, 2012; Berkmen, 2012). Other studies find a significant reduction on the currency of the central bank that follows QE policies (e.g., Glick and Leduc, 2012; Kenourgios et al., 2015). In this paper, we extend the above literature by examining the effects of QE announcements on exchange rate volatility transmissions.

Our analysis focuses on the impact of QE announcements by three central banks (ECB, BoE and BoJ) on the conditional volatilities of three major exchange rates (EUR/USD, GBP/USD, JPY/USD), derived from the Asymmetric Power ARCH (APARCH) model, using intraday (1-h) data for the period February 2009–December 2012. The investigation of short-term interrelationships among currencies' volatilities provides useful insights for traders and policy makers, since these patterns may signal potential informational inefficiency and possible asset mispricing.

In contrast to the study of Kenourgios et al. (2015) which focuses on each currency's mean and volatility separately, we assume that QE announcements by one central bank may also have effects on other countries' currencies. Therefore, our study contributes by capturing the volatility transmission from one currency to another across several time horizons (in terms of hours) before and/or after the QE announcements using appropriate dummy variables.

2. Data and methodology

The data comprises intraday (1-h) dollar exchange rates expressed in EUR, GBP, and JPY (in log differences).[1] The 1-h interval data set spans a period from 3rd February 2009 until 31st December 2012 in order to take into account a sufficient number of QE announcements by the three central banks. Descriptive statistics for the exchange rates returns are presented in Table 1. All returns exhibit high values of kurtosis, so we assume student-t distributed innovations. The Jarque–Bera statistic rejects normality at the 1% level for all currencies. Also, the exchange rates returns are stationary, $I(0)$, while they exhibit strong ARCH effects, supporting the selection of a GARCH family model for further econometric analysis.

The following announcements are examined in this study: (i) the enhancement of monetary easing by the BoJ, which includes outright purchases of corporate bonds and commercial papers, expansion of outright purchases of Japanese government bonds, fixed rate fund supplying operations, a fund provisioning measure to support growth, and the new asset purchase program (Comprehensive Monetary Easing) covering corporate bonds, commercial paper, exchange-traded funds, and real estate investment trusts (20 announcements), (ii) the BOE increases the size of asset purchase programme by an amount greater than £25 billion (6 announcements), and (iii) the ECB's long-term refinancing operations (LTROs) with allotted amount greater than €100 billion, as the equivalent of QE followed by the BoE and the BoJ (12 announcements).[2]

Our methodology follows two steps. Firstly, we estimate the conditional volatility of each currency via the APARCH(1,1) model (Ding et al., 1993) in order to account for possible asymmetric response of currencies' volatility to positive and negative shocks (leverage effect). This model is a flexible extension of the GARCH model (Bollerslev, 1986), since it includes a large number of alternative GARCH specifications. It also increases the flexibility of the conditional variance specification by allowing the data to determine the power of returns for which the predictable structure in the volatility pattern is the strongest. The volatility equation has the following general form:

$$\sigma_t^{\delta} = \omega + \alpha(|\varepsilon_{t-1}| - \gamma\varepsilon_{t-1})^{\delta} + \beta\sigma_{t-1}^{\delta} \tag{1}$$

where ε_t is the vector of zero mean white noises from the return equation, $\gamma(-1 < \gamma < 1)$ represents the leverage effect, while the power term parameter δ is a Box-Cox transformation of standard deviation σ_t and takes finite positive values.

Secondly, the exchange rates are treated as a sample of pairs (i, j) in order to quantify the impact of QE announcements on the volatility of each currency. We create four dummy variables, which are

[1] The data is sourced from Dukascopy Swiss Forex Bank.

[2] All QE announcements are expressed at GMT time. The QE announcements along with the announcement dates and hours are sourced from the official sites of the three central banks. These announcements have been also used in Kenourgios et al. (2015).

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