Monetary Authorities and Exchange Rate Volatility: Turkey and other Cases*

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Abstract

Do interest rate announcements made by national monetary authorities measurably impact the volatility of exchange rates between currencies? We investigate the daily movements of four exchange rates, namely the US-American dollar versus the Canadian dollar (USD/CAD), versus the British pound (USD/GBP), versus the New Zealand dollar (USD/NZD), and versus the Turkish lira (USD/TRY) under the influence of interest rate announcements made between January 2005 and March 2010. Methodologically, a dummy variable indicating those days on which an announcement is made is shifted, modeling anticipation or aftereffect of an announcement, and plugged into a combined regression/GARCH specification to analyze the conditional expectation and volatility of exchange rates changes. It is found that announcements made by the US Federal Reserve Bank (FED) affect the volatility of three (except USD/TRY) exchange rates significantly, particularly prior to the announcement, that is, the announcement is anticipated. However, no similar effect was found for announcements made by local central banks. The volatility of USD/TRY exchange rates appears rather immune against announcements either by the FED or by the Central Bank of Turkey.

Key words: Interest rate announcements; FED; central bank; modified dummy variables; exchange rate volatility; GARCH with covariates.

1 Introduction

One of the functions of central bank, reserve bank or monetary authority is to set the official interest rate and to use this interest rate to manage both the inflation and the exchange rate. Since interest rate announcements are most of the time pre-scheduled events, an increase in exchange rate volatility can be observed just before the announcement due to position taking of the market participants, based on their expectations about the content of the announcement (see the literature review below). Once the announcement is released, there can also be an increase in volatility, if a difference occurs between the market expectations and the released announcement.

In this paper, the main goal is to investigate the effects of interest rate announcements made by monetary authorities on the volatility of exchange rates between currencies of several

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countries. As mentioned by Doukas and Switzer [10], any investigation of exchange rates that takes into account only domestic news will be problematic since the exchange rate is the relative price of a currency with respect to another currency. Thus, we shall take into account not only announcements of the corresponding local central bank, but also announcements of FED.

The volatilities of USD/CAD (Canadian dollar), USD/GBP (British pound), USD/NZD (New Zealand dollar), and USD/TRY (Turkish lira) are the focal issue of the present paper. The reason for examining these four exchange rates is that the monetary authorities of these four countries use the tool of inflation targeting as their main policy. All of them also announce their interest rates after scheduled meetings. The main focus in our investigation is not the content of the announcement, but the announcement itself.

We chose these currencies' exchange rates to the USD since the USD is the "world currency", and the United States interest rate plays the role of the "world interest rate" (Andersen et al. [4]).

In this project, regression models with exchange rate changes as endogenous variable and dummy variables indicating interest rate announcements as exogenous variables (possibly modified in order to specify the timing of the impact) are used; their residuals are analyzed using a GARCH(1,1) process, again with dummy variables.

This paper is organized as follows. Section 2 reviews existing literature both for the impact of announcements and central banks. The data we use in this paper are described in Section 3. The model structure is defined in Section 4. Empirical results are presented in Section 5. Finally, we draw some conclusions in Section 6.

2 Literature Review

The impact of announcements on exchange rate volatility has been researched extensively. In line with the main goal of this study, we focus on the impact of central bank policies and activities on exchange rate volatility.

Concerning high-frequency data, Andersen et al. [3] discuss that there are two types of jumps in the return process, the first being "predictable jumps" which can be linked to the release of information through predetermined schedule, the second being "purely anticipated jumps" which occurs when unexpected news hits the market. Goeij and Marquering [15] explain two aspects of the effect of announcements on volatility as follows: The first is the "pre-announcement effect" — since the market participants know beforehand that there will be news, there is a higher volatility before it is released; the second is the "news effect" — after the news is released, the market participants process this news, and if market participants have different expectations on this news, volatility increases.

Evans and Speight [13] focus on the effect of international macroeconomic announcements on intraday EUR exchange rate volatility and find that Federal Reserve (FED) interest rate announcements cause the largest instantaneous jump in volatility. European Central Bank (ECB) interest rate announcements also generate volatility reaction for EUR/GBP and EUR/USD, but not as much as FED announcements. On EUR/JPY volatility, FED interest rate announcements again have the largest effect. ECB announcements have also more effect than Bank of Japan announcements.

Andersen et al. [4] find that announcement suprises produce conditional mean jumps, and they also find important spillover effects among foreign and US equity markets. They observe the interaction of actively-traded assets around announcement releases. They find that only the simultaneous effect of the release is significant.

Bauwens et al. [7] observe that the volatility increases before scheduled events in the euro-dollar foreign exchange market between May and November 2001. They explain this "pre-announcement effect" by anticipatory trades. Laakkonen [20, 21] also finds that news increased

USD/EUR volatility between October 2003 and January 2004. But it is found that both the announcements with the surprise and with no surprise cause jumps in the volatility right after the announcement. She explains this observation with the volume of trade which is low before the announcements and high right after the news release, causing an increase in volatility. She also finds that only news from the US increases volatility significantly.

Kim and Kow [17] investigate the role of public information in Japan, and one of their findings is that the release of macroeconomic figures increases volatility in financial markets.

Kim and Nguyen [18] find that the Reserve Bank of Australia's overnight cash rate announcements have statistically significant impact on the spot and forward USD/AUD exchange rate returns, and their effect is stronger in the short-term. They observe an increase in volatility in cases where unexpected changes occur. They also observe that FED target interest rate news significantly reduced the volatility in the Australian markets by reducing the degree of uncertainty in US markets and by transmitting this lower volatility environment to Australia.

Kopecky [19] finds that the volatility of Czech Crown/USD returns does not increase following the US announcements, but surprises in the announcements have a significant effect on Czech Crown/USD returns in the period of five and ten minutes after the announcement.

Stancik [25] finds that interest rate news has large effect on exchange rate volatility in Hungary, Slovakia and Slovenia, while the exchange rate volatility of Poland and the Czech Republic is only slightly affected by the news.

Faust et al. [14] find that for several real US macro announcements better than expected news appreciates the dollar on the announcement day.

Markiewicz [22] mentions that reduced uncertainty about interest rates implied by inflation targeting strategy makes interest rate a more useful variable for predicting exchange rate movements. He also finds that there is also an immediate decrease in the volatility of the GBP/USD returns after the Bank of England changed its strategy to inflation targeting.

Aktaş et al. [2] focus on the transmission of monetary policy in Turkey. They find that the expected part of the announcements has no effect, while the suprise part has statistically significant effect on EUR but not on USD. But this effect on EUR is very low. Their explanation for this small effect refers to the adverse effects on the appreciation of TRY. For example, when the Central Bank of the Republic of Turkey (CBRT) increases the interest rates more than expected, it causes TRY to appreciate, but since this increase also heightens the risk premium of Turkey due to high debt of the country, it causes TRY to depreciate. Since these effects can cancel each other out, it is possible that no significant impact of CBRT announcements on exchange rate volatility can be observed.

Zettelmeyer [26] examines the impact of monetary policy actions on the Chilean peso/USD exchange rate on the day of policy announcements. He finds that the Chilean peso/USD exchange rate shows a significant reaction to monetary policy in the US and a lesser reaction to the policy in Chile.

Andersson [5] focuses on the reaction of FED and ECB monetary policy decisions on financial markets using intraday data between April 1999 and May 2006. His findings are as follows: Firstly, the volatility of stock and bond markets in the US and the EUR areas is strongly increasing at the time of the release of a decision. Secondly, FED target and path surprises have larger effect on volatility than the ECB surprises. He explains the latter finding in terms of the anticipation of US monetary decisions by the market participants and the perception of the US as the main engine of the global world. Similar perception of the USD being the world currency and US interest rate being the "world interest rate" is also mentioned by Andersen et al. [4].

3 Data

In this study, the focus is on the interest rate announcements between January 2005 and March 2010. Dates of announcements were taken from the official websites of the monetary authorities; the daily closing quotations of exchange rates were taken from Bloomberg.

In Turkey, overnight interest rates are announced after Monetary Policy Committee meetings. This committee has pre-scheduled meetings once a month. In some circumstances, the committee can also have unscheduled meetings; see Table 1 for the number of meetings held during the period we consider.

country	scheduled	non-scheduled
Canada	42	0
United Kingdom	63	0
New Zealand	42	0
Turkey	64	3
USA	42	12

Table 1: Scheduled and unscheduled meetings of monetary authorities

In the US, federal funds target rates are announced after Federal Open Committee meetings. This committee has pre-scheduled meetings once in every six weeks, and there may be unscheduled meetings as well (see Table 1). In Canada, targets for overnight cash rates are announced after Bank of Canada's Governing Council meetings. This council has pre-scheduled meetings once every six weeks. In the UK, bank rates are announced after Monetary Policy Committee meetings. The committee has a pre-scheduled meeting once a month. In New Zealand, official cash rates are announced after Monetary Policy Statement meetings. This committee has pre-scheduled meetings once every six weeks.

On 2007-12-16, the FED, the Reserve Bank of New Zealand, as well as the Bank of Canada made announcements; and on 2005-08-09, both the FED and the Reserve Bank of New Zealand made announcements. There are only two announcements made at weekends, one is by FED and one is by CBRT. For these days, the following Monday is taken as the announcement date.

Most of the existing literature investigating the impact of announcements on volatility uses intra-day data. We use daily data in the present study, however. Although the impact of announcements is harder to detect in daily data, there is an advantage of daily data analysis, as put forth by Evans and Lyons [12]. Daily data ensures a solid indication of price effects at lower frequencies, because the daily frequency is the highest at which the nominal exchange rate can be reliably described as a martingale. A martingale is a stochastic process such that the conditional expectation of an observation at time t, given all the observations up to some earlier time s, is equal to the observation at that earlier time s. This martingale property does not apply to intraday prices due to mean reversion. As phrased by Melvin et al. [23], the daily data provides a "bird's eye view" of market behaviour around the meetings, which can be exploited by using a GARCH framework.

4 The Model

The idea of this investigation is that an interest rate announcement can have an effect on the expectation of the return on foreign exchange, as well as on its volatility. This leads us to using

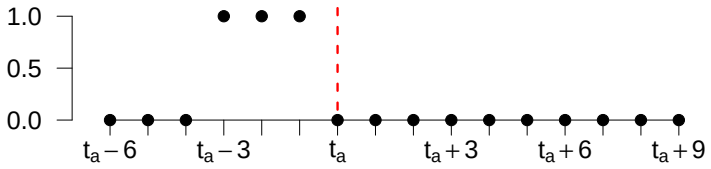

Figure 1: Modified dummy variable

the following model:[1]

$$
\begin{aligned}
r_t &= c + b_{\text{FED}} d_{\text{FED}} + b_{\text{local}} d_{\text{local}} + \epsilon_t, && (1)\\
\epsilon_t &= \nu_t \cdot \sqrt{h_t}, && (2)\\
h_t &= \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta h_{t-1} + \gamma_{\text{FED}} d_{\text{FED}} + \gamma_{\text{local}} d_{\text{local}}, && (3)
\end{aligned}
$$

where (r_t) is the series of daily returns in percent on foreign exchange, and (d_{it}) is the series of (possibly modified, see below) dummy variables for interest rate announcements. Equation (1) specifies the conditional expectation of r_t, with the dummy variables as regressors. Equations (2) and (3) specify the conditional variance of r_t, where (ν_t) is Gaussian white noise with $\text{var}(\nu_t) = 1$. The conditional variance of r_t is also allowed to depend on the dummy variables. The dummy variables are:

$$
\begin{aligned}
d_{\text{FED},t} &= \begin{cases} 1 & \text{interest rate announcement by the FED on day } t, \\ 0 & \text{no such FED announcement on day } t, \end{cases} \\
d_{\text{local},t} &= \begin{cases} 1 & \text{interest rate announcement by the local central bank on day } t, \\ 0 & \text{no such central bank announcement on day } t \end{cases}
\end{aligned}
\qquad (4)
$$

A dummy variable indicating a day of announcement can be modified in the following way to reflect anticipation or an aftereffect of an announcement. Firstly, each "1" in the sequence (d_t) can be shifted by $s = \pm 1, \pm 2, \ldots$ days, a negative s denoting a backward shift (the announcement is anticipated) and a positive s denoting a forward shift (there is an aftereffect of the announcement). Secondly, each "1" will be duplicated several times, so that there are $m = 1, 2, \ldots$ 1s in a row, providing a model for the persistence of the impact for m days. We call the modification (s, m) a scenario. An example of a modified dummy variable is shown in Figure 1. The day on an announcement is designated by t_a. The scenario in this figure is $(s, m) = (-3, +3)$: The initial impact of the announcement is three days before the announcement is made ($s = -3$), and the effect lasts three days ($m = +3$).

The modified dummy variable is then plugged into the model equations (1) and (3). Different modifications are allowed for each equation. We use the Akaike information criterion (AIC) in the search for a good model.

5 Empirical Findings

We fitted the model defined by (1), (3) and (2) to daily data from January 2005 through March 2010 (about 1350 days) for the currencies CAD, GBP, NZD, and TRY. In none of these cases, there is a scenario such that b_{FED} or b_{local} in equation (1) turn out to be significantly different from 0. In other words, there is no evidence that the expected return on the exchange rate is affected by either a local central bank or a FED interest rate announcement.

Concerning conditional volatility, interest rate announcements of local central banks were not found to have any significant impact for any scenario for any of the four currencies. The effect

[1] Equation (3) is the conditional variance specification of a GARCH(1,1) process, see Engle [11], Bollerslev [8], with dummy variables added on.

currency		α_0	α_0	β	γ_{FED}	sc
CAD	est.	0.0001	0.0471	0.9422	0.1123	$(-1, 1)$
	p-value	0.9435	0.0000	0.0000	0.0009	
GBP	est.	0.0001	0.0373	0.9553	0.0239	$(-3, 3)$
	p-value	0.9199	0.0000	0.0000	0.0094	
NZD	est.	0.0022	0.0462	0.9362	0.3311	$(-7, 1)$
	p-value	0.5082	0.0000	0.0000	0.0000	
TRY	est.	0.0236	0.1418	0.8382	—	—
	p-value	0.0007	0.0000	0.0000	—	

Table 2: Exchange rate volatility: Fitted GARCH models

of FED announcements on volatility is displayed in Table 2. We found no effect in the case of Turkey. There is, however, strong evidence for anticipation (negative first entry in the scenario column) in the other three cases. The currencies CAD, GBP and NZD differ with respect to the length of the time interval with elevated volatility prior to the announcement (the first entry in the scenario column) as well as with respect to the magnitude of the impact. The impact is strongest in the case of NZD. The reason for the longer interval of anticipation in the latter case may be that the central bank of New Zealand often schedules interest rate announcements three or four days before FED announcements, so that the impact described by the scenario $(-7, 1)$ actually accounts for local central bank announcements as well for FED announcements. When looked at in isolation, the impact of the former is on the verge of significance at the 5% level.

6 Conclusions

This study aims to detect the impact of interest rate announcements on foreign exchange volatility measured on the basis of a GARCH with dummy variables fitted to daily return data. Our study focuses on four countries using inflation targeting, in line with Markiewicz [22] who argues that reduced uncertainty about interest rates implied by an inflation targeting strategy makes interest rates a more useful variable for predicting the exchange rate movements.

We find that FED interest rate announcements have significant impact on the volatility of USD/GBP, USD/CAD, as well as USD/NZD, before the announcement, while local monetary authorities' interest rate announcements have no significant impact. These findings are similar to the results of Kim and Kow [17] who find that an aggregated news dummy does not significantly affect the exchange rate. But also they show that announcements in general led to a higher volatility due to creating additional uncertainty. Akıncı et al. [1] also mention that the investors perceived an increase in interest rate as an increase in overall risk in the economy, and a decrease as the opposite. Therefore, a change in interest rates actually give rise to unexpected fluctuations in the foreign exchange market. Aktaş et al. [2] argue that if CBRT resolves to increase in interest rates, it will result in an appreciation of the TRY on the one hand, but also in a depreciation on the other, since it is perceived as an increase in risk. These two effects can cancel each other in highly indebted countries like Turkey. This is a possible explanation why CBRT interest rate announcements were not found to have a statistically significant impact on the volatility of USD/TRY.

Contrary to the results in the present study, Evans and Speight [13] find that the largest reactions of volatility to exchange rates occurred *as a response* to FED interest rate announcements, generating the largest instantaneous jumps in volatility and often the largest cumulative response right after the announcement. Jumps in volatility right after the announcement are explained by Laakkonen [20, 21] with the increase in trading volume right after the announcement.

Likewise, Andersson [5] mentions that trading volume increases at the time of macroeconomic announcements and monetary policy decisions. Further studies pointing towards an aftereffect of announcements on volatility include Evans and Lyons [12] (changes in trading behaviour remain significant for several days), Andersen et al. [4] (announcement surprises produce conditional mean jumps), and according to Rangel [24], there is no evidence of a structural change in the persistence of a jump component of volatility on announcement days.

The contradiction of our results with the abovementioned studies can be explained in terms of the idiosyncrasies of the data period selected in this project. Since the post-announcement effect is due to the news component of an announcement, its absence can be interpreted as an indication that expectations concerning interest rates announcements were mostly realized, and there were not many surprises. Apart from the care taken by monetary authorities to avoid surprising markets, monetary authorities were mostly in a phase of decreasing interest rates during the time period considered in our study, thus enabling market expectations to be in line with the content of announcements. Indeed, as Hayo and Neuenkirch [16] worked out, an inflation targeting regime leaves little room for policy surprises.

On the other hand, our findings are in line with those studies which find the pre-announcement effect on volatility more significant. Bauwens et al. [7] explain the pre-announcement rise in volatility in terms of anticipatory trades, and find no evidence of significant post-announcement volatility changes. Similarly, Kopecky [19] also notes that the magnitude of effects in the post-announcement period is almost neglible. Bomfim [9] finds that pre-announcement effect is significant, and conditional volatility is about one half of its typical level on the day before scheduled announcements, which leads to a "calm before storm" effect.

Lastly, and again in line with our results, very many studies (inter alia, Evans and Speight [13], Laakkonen[20, 21], Kim amd Nguyen [4], Kopecky [19]) find that US announcements — and not those of local monetary authorities — have the greatest effect on foreign exchange volatility. Since the USD is perceived as the world currency, and consequently the US interest rate as the "world interest rate", the FED is perceived as more dominant than other monetary authorities.

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