

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 countries. As mentioned by Doukas and Switzer [14], any investigation of exchange rates that takes into account only domestic news will be problematic since the exchange rate is the relative

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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. [5]).

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

Since the main goal of this study is to find if interest rate announcements have any impact on foreign exchange volatility, two main issues discussed in the existing literature are relevant for our purposes: Firstly, the impact of public announcements concerning macro economic fundamentals on asset returns and their volatility, and secondly the impact of central bank policies and activities on economy, asset returns and their volatility.

2.1 Impact of Announcements

There is a rich literature focusing on the impact of the announcements which is mainly led by Andersen and Bollerslev (inter alia, Bollerslev et al. [12], Andersen et al. [4], Andersen et al. [5], Yang [40], Batten and Ellis [9], Longmore and Robinson [33], Guo et al. [22], Jiang et al. [24], Melvin and Peiers [36], Kellard et al. [25], Fleming and Remolona [20], Bomfim [13], Rangel [38], Emir et al. [15]). In some of these papers, the main subject of research is the effect of macroeconomic announcements on exchange rate volatility (inter alia, Kim and Kow [26], Bask [8], Markiewicz [34], Stancik [39], Bauwens et al. [10], Kim et al. [27], Goeij and Marquering [21]), or exchange rate futures volatility (inter alia, Doukas and Switzer [14]). They classified the announcements by country, by type, by content etc.; they further differentiated between scheduled and unscheduled announcements, bad and good announcements according to their perception by the market participants (inter alia, Emir et al. [15]), announcements with news (which means there is difference between the market expectation and the realized announcement) and no news (which means that the content of the announcement totally matches the expectations) (inter alia, Lahaye et al. [32]).

Another main section of literature focuses on the impact of announcements on exchange rate. According to Evans and Lyons [17], this literature has two branches: one focusing on the direction of exchange-rate changes (first moments), another one focusing on exchange rate volatility (second moments). Andersen et al. [3] mention 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 the "purely anticipated jump" which occurs when unexpected news hits the market. Goeij and Marquering [21] 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 [18] 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. [5] find that announcement surprises 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. [10] 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 [30] and Laakkonen [31] 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 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 et al. [27] not only investigate the effect of an announcement itself but also the news content by including market expectations in the model. It is found that the news content is considered to be important by the market, rather than the release of an announcement, in the search for the effect of six macroeconomic announcements, excluding interest rate announcements, on Dow Jones Index, JPY/USD, DEM/USD and bond market between 1986 and 1998.

Kim and Kow [26] investigate the role of public information in Japan, and one of their findings was the release of macroeconomic figures increases volatility in financial markets.

Kim and Nguyen [28] 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 [29] 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 the Czech Crown/USD returns in the period five and ten minutes after the announcement.

Stancik [39] finds that the 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.

The focus of Melvin and Peiers [36] is on volatility spillovers. Two hypotheses are tested. The first is the “heat wave” hypothesis — the volatility of the previous day affects today’s volatility, and the second is the “meteor shower” hypothesis — earlier volatility in other regions affects today’s volatility. It is found that “heat wave” has more explanatory power than “meteor shower”.

Faust et al. [19] find that for several real US macro announcements better news than expected appreciates the dollar on the announcement day.

Similar to Evans and Lyons [17], Bacchetta and Wincoop [7] use order flows for explaining the determination of exchange rates. Order flow is the net of buyer-initiated and seller-initiated orders while the initiation of a transaction is the trader who acts based on new information. They show that the implications of information dispersion are rich, and heterogeneity of investors is key to understanding exchange rate dynamics.

2.2 Impact of Central Bank

There is also a quiet rich literature which focuses on the effect of monetary policy announcements and also on the effect of policy instruments. Mishkin [37] summarizes the goals of central banks as price stability, high employment, economic growth, stability of financial markets, interest rate stability, and stability in foreign exchange markets. The policy instruments used by monetary authorities in order to meet these goals are interest rates, open market operations, capital requirements, reserve requirements, exchange requirements, and margin requirements.

Faust et al. [5] put forth the conventional view on the monetary policy transmission mechanism with the following explanation: a shock to FED funds rate affects demand through its effect on long term interest rates. If these rates are insensitive to shocks, then monetary policy is either ineffective or must work through other channels.

Markiewicz [34] 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 transmission of monetary policy in Turkey. They find that the expected part of the announcements has no effect, while the surprise 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, no significant impact of CBRT announcements on volatility could be observed.

Zettelmeyer [41] 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 more little reaction to the policy in Chile.

Andersson [6] 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 US and EUR area 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 by the well anticipation of US monetary decisions by the market participants and perception of 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. [5].

3 Data

In this study, the focus is on the interest rate announcements between January 2005 and March 2010. 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. In this period the committee had 64 scheduled

and 3 unscheduled meetings. The dates of the announcements are taken from the official web site of CBRT.

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. In some circumstances, the committee can also have unscheduled meetings. In this period the committee had 42 scheduled and 12 unscheduled meetings. The dates of the announcements are taken from the official web site of the FED.

In New Zealand, official cash rates are announced after Monetary Policy Statement meetings. This committee has pre-scheduled meetings once in every six weeks. In some circumstances, the committee can also have unscheduled meetings. But in this period the committee had no unscheduled meetings and 42 scheduled meetings. The dates of the announcements are taken from the official web site of Reserve Bank of New Zealand. There are only two announcements made at weekends, one is by FED and one is by CBRT. For these days, 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 [17]. 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. [35], 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 the following model:¹

$$r_t = c + b_{\text{FED}}d_{\text{FED}} + b_{\text{local}}d_{\text{local}} + \epsilon_t, \quad (1)$$

$$\epsilon_t = \nu_t \cdot \sqrt{h_t}, \quad (2)$$

$$h_t = \alpha_0 + \alpha_1\epsilon_{t-1}^2 + \beta h_{t-1} + \gamma_{\text{FED}}d_{\text{FED}} + \gamma_{\text{local}}d_{\text{local}}, \quad (3)$$

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:

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

¹Equation (3) is the conditional variance specification of a GARCH(1,1) process, see Engle [16], Bollerslev [11], with dummy variables added on.

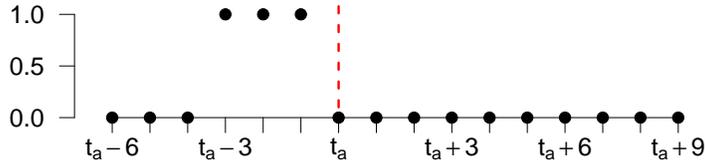


Figure 1: Modified dummy variable

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 $s = \pm 1, \pm 2, \dots$ 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 $m = 1, 2, \dots$ 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 of FED announcements on volatility is displayed in Table 1. 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 project aims to detect the impact of interest rate announcements on foreign exchange volatility. Although the recent literature uses high frequency data in order to detect this impact, daily data is used in this project since martingale property does not apply to intraday prices due to mean reversion.

Two countries who use inflation targeting tool are included in the study since it is mentioned by Markiewicz 2008 [34] that reduced uncertainty about interest rates implied by inflation tar-

currency		α_0	α_0	β	γ_{FED}	SC
CAD	est.	0.0001	0.0471	0.9422	0.1123	(-1, 1)
	std. err.	0.0014	0.0088	0.0096	0.0337	
	t value	0.0709	5.3441	98.4033	3.3273	
GBP	est.	0.0001	0.0373	0.9553	0.0239	(-3, 3)
	std. err.	0.0010	0.0073	0.0080	0.0092	
	t value	0.1006	5.1019	120.0010	2.5971	
NZD	est.	0.0022	0.0462	0.9362	0.3311	(-7, 1)
	std. err.	0.0034	0.0105	0.0124	0.0770	
	t value	0.6617	4.4116	75.4111	4.2989	
TRY	est.	0.0236	0.1418	0.8382	—	—
	std. err.	0.0069	0.0217	0.0236	—	
	t value	3.4030	6.5284	35.5668	—	

Table 1: Exchange rate volatility: Fitted GARCH models

getting strategy made interest rates a more useful variable for predicting the exchange rate movements.

In this project, it is found that FED interest rate announcements have significant impact on the volatility of USD/NZD one day before the announcement while, Reserve Bank of New Zealand interest rate announcements have no significant impact. Both FED and CBRT interest rate announcements have no significant impact on the volatility of USD/TRY. Although the impact is insignificant, the effect is highest one day before the announcement. These findings are similar to the findings of Kim and Kow 2004 [26]. They find that aggregated news dummy did not significantly affect the exchange rate. But also they show that announcements in general led to a higher volatility due to creating additional uncertainty. Akinci et al. 2005a [1] also mentions that the investors perceived an increase in interest rate, as an increase in overall risk in the economy and a decrease perceived as the opposite. Therefore, a change in interest rates actually give rise to unexpected fluctuations in the foreign exchange market. Aktaş et al. 2008 [2] mentions that if CBRT goes to an increase in interest rates, it results with an appreciation in TRY, but it also results with a depreciation in TRY since it is perceived as an increase in risk. These two effects can cancel out each other in highly indebted countries like Turkey. This information can be used in order to explain the reason for the one of the results found in this project which is CBRT interest rate announcements has no statistically significant impact on the volatility of USD/TRY.

In contrary to the findings of this project, Evans and Speight 2007 [18] finds that largest reactions of volatility on the exchange rates occurred as a response to FED interest rate announcements. They generated largest instantaneous jumps in volatility and often the largest cumulative response right after the announcement. Laakkonen 2004 [30] and Laakkonen 2007 [31] also finds a jump in volatility right after the announcement and explains this with the increase in trading volume right after the announcement. Andersson 2007 [6] also mentions that trading volume increases at the time of macroeconomic announcements and monetary policy decisions. Evans and Lyons 2004 [17] also finds that news arrivals induce changes in trading behavior, and these changes in trading remain significant for days. Andersen et al. 2007 [5] also finds announcement surprises produce conditional mean jumps. Rangel 2006 [38] also finds news component to be important. He also finds no evidence of a structural change in the persistence of a jump component of volatility on announcement days. This contradiction with the literature can be explained with the data period taken in this project. Since the post-announcement effect is explained by the news component of the announcements, it can be said that the expectations on the interest

rate announcements are mostly realized and there were not many surprises. The reason for that can be that the monetary authorities really pay attention in order not to make surprises. For example they all mention in each of their announcements what their planned actions will be in the future. Furthermore, in the period that is subject to this project, most of the monetary authorities are in a trend of decreasing interest rates. This decrease trend is also reflected in expectations. So unless extraordinary situations are occurred, the market expectations and the content of the announcements will be in line with each other. It can be said that there were not enough extraordinary situations occurred in this period to show these surprises as a post-announcement effect. As mentioned by Hayo and Neuenkirch 2009 [23], inflation targeting regime also leaves little room for policy surprises.

Our findings are in line with the previous literature who found the pre-announcement effect more significant on volatility. Bauwens et al. 2005 [10] finds that the release of scheduled news leads to a pre-announcement rise in volatility and explains this feature by the traders who wish to make anticipatory trades. They also find that most of the news announcements in their study have not been followed by significant volatility changes. Kopecky 2004 [29] also notes that magnitude of effects in the post announcement period is very small, almost negligible. Bomfim 2000 [13] finds that pre-announcement effect is significant and conditional volatility is about 1/2 of its typical level on the day before scheduled announcements which leads to a calm before storm effect. This result can be considered as it is in line with our findings since it also finds the pre-announcement effect to be significant on volatility but it also contradicts with our findings since he finds a decrease in volatility while here is found a rise in volatility in the pre-announcement period.

Lastly, as it is also found by most of the existing literature (inter alia. Evans and Speight 2007 [18], Laakkonen 2004 [30] and Laakkonen 2007 [31], Kim and Nguyen 2008 [5] and Kopecky 2004 [29]) US announcements has the greatest effect on foreign exchange volatility. This explains why US announcements has significant effect on the volatility of USD/NZD while New Zealand announcements has no significant effect. Since USD is perceived as the world currency and US interest rate is perceived as the "world interest rate", this leads FED to be perceived more dominant than the other monetary authorities which makes market participants to be fully aware of its announcements while the others considered to be less important.

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