Fear of Floating and Inflation Targeting in Turkey

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Abstract

The objective of this paper is to test empirical validity of Fear of Floating hypothesis for Turkey after the adoption of Inflation Targeting. We start applying methodologies developed by Calvo and Reinhart (2002) and Ball and Reyes (2004, 2008) to check the probabilities of changes in exchange rate and monetary policy instruments before and after inflation targeting regime. We then use a VAR model to estimate exchange rate pass-through and response of monetary policy instruments to exchange rate shocks before and after inflation targeting regime. VAR model helps to understand the impacts of switch in monetary policy regime on exchange rate pass-through and foreign exchange market interventions. The paper concludes that after the adoption of inflation targeting regime, the exchange rate pass-through still matters for the attainment of inflation targets and the monetary policy do not exhibit a fear of floating practices.

Keywords: Fear of floating, fear of inflation, exchange rate pass-through, free floating exchange rate

JEL Classification: F31, E31, E58

1.   Introduction

After the severe financial crisis of the late 1990s and early 2000, a growing number of emerging economies moved away from exchange rate rigidity and adopted a combination of flexible exchange rates and Inflation Targeting (IT). However reluctance of countries to allow free fluctuations in their exchange rates has led to the case of "fear of floating" in economic literature, following Calvo and Reinhart (2002). According to Calvo and Reinhart (2002), many countries claim to float but actually use their policy instruments to prevent large fluctuations in their currency's value and term such behavior "fear of floating" (FF). Since the FF tends to arise in times of financial crises, it is considered as intervention response to exchange rate depreciations (Levi-Yeyati and Sturzenegger, 2007).

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Many authors, such as Goldfajn and Werlang (2000), Schmidt-Hebbel and Tapia (2002) and Fraga, Golfajn and Minella (2003) have shown that the exchange rate pass-through (ERPT) degree of emerging countries is greater than that of developed economies. High ERPT effect for emerging economies implies a greater difficulty for their attainment of the inflation targets. Calvo and Reinhart (2002) argue that lack of credibility of monetary authorities combined with high ERPT to domestic prices leads to FF phenomenon in emerging economies. Moreover, according to Eichengreen (2002), Calvo and Mishkin (2003) and Mishkin (2004), the reasons of the reluctance of emerging economies against free fluctuations in their nominal exchange rates are weak fiscal institutions, low credibility of monetary institutions, liability dollarization, high ERPT into domestic prices, vulnerability to sudden stops and etc. Because of such problems, monetary authorities of developing countries are likely to display a reluctance to allow free fluctuations in their nominal exchange rates, i.e. a FF.

Various studies have shown that a shift towards more credible monetary policy regimes plays an important role in reducing ERPT into domestic prices. Taylor (2000) was the first to support this view and put forth the hypothesis that low and stable inflation environment leads to a low ERPT to domestic prices. Choudhri and Hakura (2001), Campa and Goldberg (2002), Devereux and Yetman (2002), Devereux, Engel and Storgaard (2003), Baqueiro, de Leon and Torres (2003), Cagnon and Ihrig (2004), and Bailiu and Fujii (2004) provided evidence on Taylor (2000)'s hypothesis. Their studies show that lower ERPT is caused by lower persistence of price and cost changes which tend to be reduced in an environment where inflation is low and monetary policy is more credible. That is the countries with relatively stable and hence credible monetary policies will have relatively low exchange rate pass through into domestic prices, while countries with relatively high volatility of money growth will have relatively high pass through-rates. Credibility of monetary policy as well as competitive markets plays an important role in reducing ERPT. Hence, ERPT is endogenous to the monetary policy regime.

Turkish economy is still in the transition to a low and stable inflation environment, consolidating its macroeconomic stability. Over the 1990s the Turkish economy has experienced large exchange rate depreciations and high inflation. High exchange rate depreciations are likely to cause inflationary pressures in this period. The Central Bank of The Republic of Turkey (CBRT) used crawling peg regime as a nominal anchor to hold the inflation under control, but this system failed to bring down the inflation and caused high ERPT. However, the adoptions of IT regime and free floating exchange rate system in the early 2001 have decreased the inflation rate and exchange rate pass through, providing macroeconomic stability. After the adoption of IT regime and free floating exchange rate system, Turkish economy experienced rapid disinflation process that lasted until the beginning of 2004 and eventually achieved to low and stable inflation environment and still is trying to maintain announced yearly inflation target.

Our study tests empirical validity of FF hypothesis in Turkey during the targeting period by using Calvo and Reinhart (2002) and Ball and Reyes (2004, 2008) methodologies and by comparing monetary policy reactions against exchange rate developments between

pre-targeting and targeting periods. In particular, we follow Nogueira Jr and Léon-Ledesma (2009) who formalized Calvo and Reinhart (2002) and Ball and Reyes (2004, 2008) methodologies and applied it to the Brazilian data. To the best of our knowledge, this is the first study to examine FF issue for Turkish economy by using Calvo and Reinhart (2002) and Ball and Reyes (2004, 2008) methodologies that is explained in detail in the third section. We then use VAR model to test whether the ERPT effect has indeed decreased after the adoption of IT regime. Thus, our paper helps to understand the impact of switch in monetary policy regime on ERPT. Using VAR model, we check for the reaction of international reserves and interest rates to changes in the exchange rate to evaluate foreign exchange market interventions in the IT regime, and check for the reaction of interest rates and international reserves to inflation shocks before and after the adoption of IT regime to see the importance of inflation stability in the IT regime. We also compare VAR results with the results obtained from the methodology of Calvo and Reinhart (2002) and its modified version proposed by Ball and Reyes (2004) in order to confirm accuracy of our empirical result.

The paper is organized as follows. Section 2 discusses theoretical framework to explain the IT country's response to exchange rate shocks in emerging countries. Section 3 applies Calvo and Reinhart (2002) and Ball and Reyes (2004) methodologies to test for the exchange rate flexibility and the FF hypothesis. Section 4 uses data and VAR method to examine FF hypothesis. Section 5 concludes.

2. ERPT, FF and IT in Emerging Countries

Eichengreen (2002), Edwards (2002), Ball and Reyes (2004), Mishkin (2004) and Nogueira Jr and Léon-Ledesma (2009) argue that when an inflation targeting monetary authority increases interest rates to prevent exchange rate movements, it should not be concluded that it cares about exchange rate but it should be considered that it may care about inflation and everything that affects it. In this sense, Baqueiro, de Leon and Torres (2003) argue that if exchange rate shocks have an impact on inflation, foreign exchange market interventions can be interpreted as "fear of inflation" rather than "fear of floating".

Following Ball and Reyes (2004), this part of the paper introduces a simple theoretical framework to explain the IT country's response to exchange rate shocks. According to Ball and Reyes (2004), the country's price level consists of both traded and non-traded goods prices. This means the nominal exchange rate enters directly in an IT regime. The price level for this economy is a combination of non-traded and traded good prices, P_H and P_T respectively.

$$P = P_H^\alpha P_T^{1-\alpha} \tag{1}$$

From equation (1) we can derive an inflation equation for the economy, where π is the general inflation:

$$\pi = \alpha\pi_H + (1-\alpha)\pi_T \tag{2}$$

Assuming relative purchasing power parity and constant world prices equation (2) can be written as:

$$\pi = \alpha\pi_H + (1-\alpha)\Delta e \tag{3}$$

Here Δe denotes percentage change in nominal exchange rate and captures the effect of exchange rate depreciation on general inflation. Thus, in an IT country when setting inflation target the central bank must also consider nominal exchange rate depreciation. In order to show the Central Bank's reaction to exchange rate movements in terms of Taylor reaction function in IT country, we use the following Taylor rule:

$$i_t = i^* + \lambda(\pi_t - \pi^*) + \beta(y_t - y^*) \tag{4}$$

Where i_t is the nominal interest rate, y_t is the output level, y^* is the equilibrium output level, π^* is the inflation target. Constant i^* can be defined as the equilibrium interest rate. Substituting (3) in (4) yields:

$$i_t = i^* + \lambda\left[(\alpha\pi_{Ht} + (1-\alpha)\Delta e_t) - \pi^*\right] + \beta(y_t - y^*) \tag{5}$$

It is clear from equation (5) that, although the central bank doesn't care about the exchange rate, it must respond to nominal exchange rate movements as it influences the general inflation rate. The term $(1-\alpha)$ in equations (3) and (5) shows ERPT effect. The greater this effect, the greater the response of monetary policy to the exchange rate movements[1]. As mentioned in Ball and Reyes (2004), $(1-\alpha)\Delta e_t$ term in (5) is the source of confusion that allows one mistakenly classify IT regimes as FF ones.

3.   FF and Free Floating Exchange Rates

Calvo and Reinhart (2002) (henceforth C&R) analyze FF by comparing the variability of interest rates, exchange rate and international reserves for countries that claim to follow a free-floating regime. They compare their results in terms of the probability of observing monthly percent changes within a certain range for exchange rate, international reserves and interest rates. The ranges suggested are +/- 2.5 percent changes in exchange rates and international reserves, and +/- 400 basis points change in interest rates. However, Ball and Reyes (2004, 2008) use +/- 50 basis points change for interest rates in their analysis. Nogueira Jr and Léon-Ledesma (2009) formalized C&R's proposition as follows:

$$P\left[\left|\Delta E\right| < x \,/\, peg\right] > P\left[\left|\Delta E\right| < x \,/\, float\right] \tag{6}$$

$$P\left[\left|\Delta R\right| < x \,/\, peg\right] < P\left[\left|\Delta R\right| < x \,/\, float\right] \tag{7}$$

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[1]   Us (2007) analyzes alternative monetary policy rules in Turkey under IT regime and finds that an extended open-economy Taylor rule which takes into account exchange rates stabilizes economy much more quickly, and thus is preferable.

$$P\left[\left|\Delta i\right| < y \mathbin{/} peg\right] < P\left[\left|\Delta i\right| < y \mathbin{/} float\right] \tag{8}$$

Where x is equal to 2.5 percent, y is equal to 50 basis points, ΔE and ΔR are the percent changes in nominal exchange rate and international reserves respectively, and Δi is the change in nominal interest rates. According to C&R's analysis, in the case of FF, the variability of exchange rates should be low, while the variability of interest rates and international reserves should be high, as interest rate and international reserves are used to preserve the exchange rate stability. However, for a free-floating regime the opposite results should be hold.

Ball and Reyes (2004, 2008) (henceforth B&R) argue that the case of FF proposed by Calvo and Reinhart (2002) is not good enough because their proposition does not take into account the fact that many countries now target inflation and under this regime some response to exchange rate movements is required. Thus, Ball and Reyes (2004, 2008) suggest some modifications on C&R's FF approach. First, instead of using nominal interest rates they use real interest rates in their analysis. The second modification is the inclusion of the variability of inflation, so as to check if the central bank cares more about stability in inflation or in exchange. The third modification is that arbitrary ranges of each variable are changed by their standard deviations. Nogueira Jr and Léon-Ledesma (2009) formalized B&R's proposition as follows:

$$P\left[\left|\Delta E\right| > sd \mathbin{/} FF\right] < P\left[\left|\Delta E\right| > sd \mathbin{/} IT\right] \tag{9}$$

$$P\left[\left|\Delta R\right| > sd \mathbin{/} FF\right] > P\left[\left|\Delta R\right| > sd \mathbin{/} IT\right] \tag{10}$$

$$P\left[\left|\pi\right| > sd \mathbin{/} FF\right] > P\left[\left|\pi\right| > sd \mathbin{/} IT\right] \tag{11}$$

$$P\left[\left|\Delta r\right| > sd \mathbin{/} FF\right] \leq P\left[\left|\Delta r\right| > sd \mathbin{/} IT\right] \tag{12}$$

Where π is the inflation rate, Δr is the change in real interest rate and sd stands for standard deviation. According to B&R approach, under an IT regime the probability of exchange rate changes should be high, the probability of inflation and the probability of international reserve changes should be low than under a FF regime. Regarding real interest rates, the expected results from B&R's analyses show that there is no clear association between real interest rate changes and FF practices. The general belief is that the probability of large changes in real interest rates under IT should be greater or equal to a FF regime (Nogueira and Ledesma, 2009). Moreover, the "timing" of interest rate-inflation and interest rate-exchange rate changes is also important to classify the country as the IT regime or the FF regime. This is done by checking if the probability of large changes (defined as changes greater than their own standard deviation) in real interest rates and international reserves is more associated with changes in inflation or nominal exchange rates.

$$P\left[\left|\Delta r\right| > sd / \left|\pi\right| > sd / IT\right] > P\left[\left|\Delta r\right| > sd / \left|\Delta E\right| > sd / IT\right] \tag{13}$$

$$P\left[\left|\Delta R\right| > sd / \left|\pi\right| > sd / IT\right] > P\left[\left|\Delta R\right| > sd / \left|\Delta E\right| > sd / IT\right] \tag{14}$$

Equations (13) and (14) state that we expect large changes in domestic real interest rates and international reserves to be more associated with large changes in inflation rate than with the nominal exchange rate (Ball and Reyes 2004).

3.1   Data and Results of the Calvo-Reinhart and Ball-Reyes Methodology

The data are monthly and covers full sample period of 1992:01-2012:12. For the purpose of our analysis, the data are divided into two sub-periods: 1992:01-2001:12 period refers to before IT and 2002:01-2002:12 period refers to after IT. The data includes monthly percent changes of consumer price index, exchange rate, nominal interest rate and international reserves and obtained from the electronic data delivery system (EDDS) of the CBRT. Exchange rate is defined as numbers of Turkish Lira per unit of US Dollar and overnight interest rate is used as a policy interest rate[2]. Thus, we can see how the switch in monetary policy regime affected variability of interest rates, exchange rate, international reserves and inflation suggested in the FF literature.

Table 1: C&R's FF analysis (%)

	ΔE	ΔR	Δi
Before IT (1992:01-2001:12)	20.17	30.25	11.76
After IT (2002:01-2012:12)	55.73	56.49	68.70

Note: The numbers show the probabilities falling inside the ranges expressed in (6)-(8). Ranges for exchange rate and international reserves are +/- 2.5 percent, and for nominal interest rate is +/- 0.50 percent.

The results of Calvo and Reinhart's (2002) FF analysis are reported in Table 1. According to the results, the probability of exchange rate changes falling inside the range of +/- 2.5% increased from 20.17% to 55.73% after the adoption of IT. That is the flexibility of exchange rate decreased after IT. This result contradicts with C&R's proposition (6). However, after the adoption of IT, probability of changes of international reserves and interest rate falling inside the ranges increased from 36.25% and 11.76% to 56.49% and 68.70% respectively. These are the expected results of C&R propositions (7) and (8).

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[2]   Overnight interest rate was used as a short-term policy interest rate of The CBRT before May 2010. After May 2010, one week interest rate was used as a policy rate of the CBRT.

Table 2: B&R's FF analysis (%)

	ΔE	ΔR	Δr	π
Before IT (1992:01-2001:12)	29.41	24.37	6.78	82.35
After IT (2002:01-2012:12)	21.38	26.71	18.46	42.75

Note: The numbers show the probabilities falling outside the ranges expressed in (9)-(12).

Table 2 shows the results of B&R's FF analysis. As in C&R's analysis the flexibility of exchange rate changes decreased in the IT regime. Further, the probability of international reserve changes increased in the IT regime as compared to that of the pre-IT period. These results contradict with B&R's propositions (9) and (10). However, variability of real interest rate increased and variability of inflation decreased in the IT period which means that the probability of changes in real interest rate and inflation are in line with B&R's propositions (11) and (12).

Table 3: B&R's analysis of policy instruments' response to inflation and exchange rate changes in IT   (%)

	Δr	ΔR
π	8.46	12.21
ΔE	5.38	3.82

Table 3 shows the analysis of the "timing" of the monetary policy instruments. The test results in the Table 3 show that the probability of large changes of real interest rates and international reserves in moments when inflation is increasing is higher than the probability of large changes of these instruments when the exchange rate level is changing. These results are in line with B&R's propositions (13) and (14).

The test results from Table 1 and Table 2 suggest that, after the adoption of IT the exchange rate variability decreased in the IT period. Moreover, B&R's metric shows that the variability of policy instruments increased after the regime change, while C&R's metric shows that the variability of policy instruments decreased to a great extent after the regime change. Thus, the results are mixed. On the other hand, Table 3 reveals that the variability of real interest rates and international reserves are more related to inflation changes rather than to exchange rate changes in the IT period.

We can get two conclusions from these test results: one, the exchange rate has not been freer to float in the IT regime and two, although some interventions in foreign exchange market still to occur, policy interventions are more related to inflation rather than to foreign exchange market. In the next section we will setup a VAR model for analyzing the response of monetary policy instruments to inflation and exchange rates changes in order to better investigate the case of FF in Turkey.

4. VAR Model Estimation Results

Following the above discussion on FF literature, we use VAR model to check the responsiveness of inflation, interest rates and international reserves to different shocks before and after IT, and analyze error variance decompositions of those variables. The advantage of using a VAR model over the results presented in the previous section is that it looks at relations between instruments and targets of monetary policy. Data sources and definitions are the same as in the previous section. Only we add the seasonally adjusted industrial production index as a proxy for output to the analysis. We use data on output (IPI), consumer prices (CPI), exchange rates (EX), international reserves (IRSV) and overnight interest rates (IR) to setup the general structure of the economy and check the responsiveness of inflation, exchange rate and international reserves to exchange rate changes. All variables except interest rates are in logs.

Before estimating the VAR model, ADF, DF-GLS and KPSS unit-root tests were performed to test the stationarity of these variables. With the exception of nominal interest rate in the first period, all level variables are I(1), and we used first differences of these variables to get stationary variables.

The innovations of the VAR model were orthogonalized using a Choleski decomposition of the covariance matrix. Ordering of the variables is as follows: output growth, exchange rate depreciation, inflation, international reserves changes and interest rate[3]. With this ordering output shocks contemporaneously affect other variables, and other variables affect output with a lag. The exchange rate depreciation has a contemporaneous impact on inflation, international reserves and interest rate, but it has a lagged effect on output. The international reserves and interest rate are ordered last, allowing for the central bank to react to all other variables in the model which is in line with the policy rule equation (5)[4].

The optimal lag lengths of the model are determined by the AIC criteria. Then a series of diagnostic tests (autocorrelation and heteroscedasticity) are conducted in order to assure the whiteness of residuals. Thus, we estimated the model with minimum optimal lag length of 8 lags for the period before IT, and 7 lag for the period after IT. Before analyzing the dynamic structure of the system, we checked the residual correlation matrixes of the standard form VAR. The residual correlation matrixes show that residual correlations are quiet low and therefore VAR results are robust to the ordering of the variables.

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[3] We have also estimated the VAR model using output gap (obtained using the difference between output level and HP-filtered output level) instead of output growth. The results are very similar and we have decided to report here those obtained from using output growth. The reason for this is to avoid eliminating valuable information from the data.

[4] In our model we implicitly assume that the Central Bank uses its international reserves instrument to directly intervene in foreign exchange.

Table 4: Unit root test statistics

| Variables	ADF (c,t,lag)	DF-GLS (c,t,lag)	KPSS (c,t)	Result
1992:01-2001:12				
IPI	-1.884 (c,t,1)	-2.57 (c,t,1)	0.178* (c,t)	I(1)
ΔIPI	-6.83*** (c,3)[5]	-3.57*** (c,2)	0.34*** (c)	I(0)
EX	-2.32 (c,t,2)	-2.21 (c,t,2)	0.20* (c,t)	I(1)
ΔEX	-6.97*** (c,1)	-6.84*** (c,1)	0.09*** (c)	I(0)
CPI	-0.52 (c,t,2)	-1.36 (c,t,6)	0.27 (c,t)	I(1)
ΔCPI	-3.51*** (c,5)	-3.53*** (c,5)	0.34*** (c)	I(0)
RSV	-0.78 (c,t,13)	-1.25 (c,t,13)	0.22 (c,t)	I(1)
ΔRSV	-3.55*** (c,12)	-2.77*** (c,2)	0.13*** (c)	I(0)
IR	-5.30*** (c,3)	-4.94*** (c,3)	0.07*** (c)	I(0)
2002:01-2012:12				
IPI	-2.28 (c,t,1)	-1.68 (c,t,1)	0.173 (c,t)	I(1)
ΔIPI	-13.79*** (c,0)	-4.81*** (c,2)	0.116*** (c)	I(0)
EX	-2.05 (c,t,4)	-2.12 (c,t,4)	0.244 (c,t)	I(1)
ΔEX	-6.24*** (c,0)	-6.05*** (c,3)	0.07*** (c)	I(0)
CPI	-2.54 (c,t,14)	-1.13 (c,14)	0.226 (c,t)	I(1)
ΔCPI[6]	-4.61*** (c,t,11)	-3.78*** (c,t,2)	0.145*** (c,t)	I(0)
RSV	-1.91 (c,t,3)	-1.26 (c,t,3)	0.296 (c,t)	I(1)
ΔRSV	-3.93*** (c,7)	-2.10* (c,2)	0.063*** (c,t)	I(0)
IR	-3.37* (c,t,1)	-0.81 (c,t,1)	0.217 (c,t)	I(1)
ΔIR	-5.62*** (c,0)	-5.61*** (c,0)	0.153** (c,t)	I(0)

We use 95% error bands to measure the statistical significance of the impulse responses. These error bands are computed by a Monte Carlo integration following Sims and Zha (1999). They argue that the conventional error bands with one or two standard

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[5] All level variables are in logs except interest rates. The asterisks indicate a rejection of the null hypothesis at the 1 percent (***), the 5 percent (**) or the 10 percent (*) levels for ADF and DF-GLS tests. The asterisks for KPSS test indicate the opposite of these percent levels.

[6] We used seasonally adjusted inflation rate for the period 2002:01-2012:12

errors can be misleading as impulse responses have highly asymmetrical distributions. Following their suggestion, we generate 1000 Monte Carlo draws from the posterior distribution of the coefficients of the model and use 0.025 and 0.975 fractiles instead of a two standard deviation band to compute the true uncertainty of forecast error.

Figure 1: Impulse responses of inflation to exchange rate and output growth shocks

(1992:01-2001:12)   **(2002:01-2012:12)**
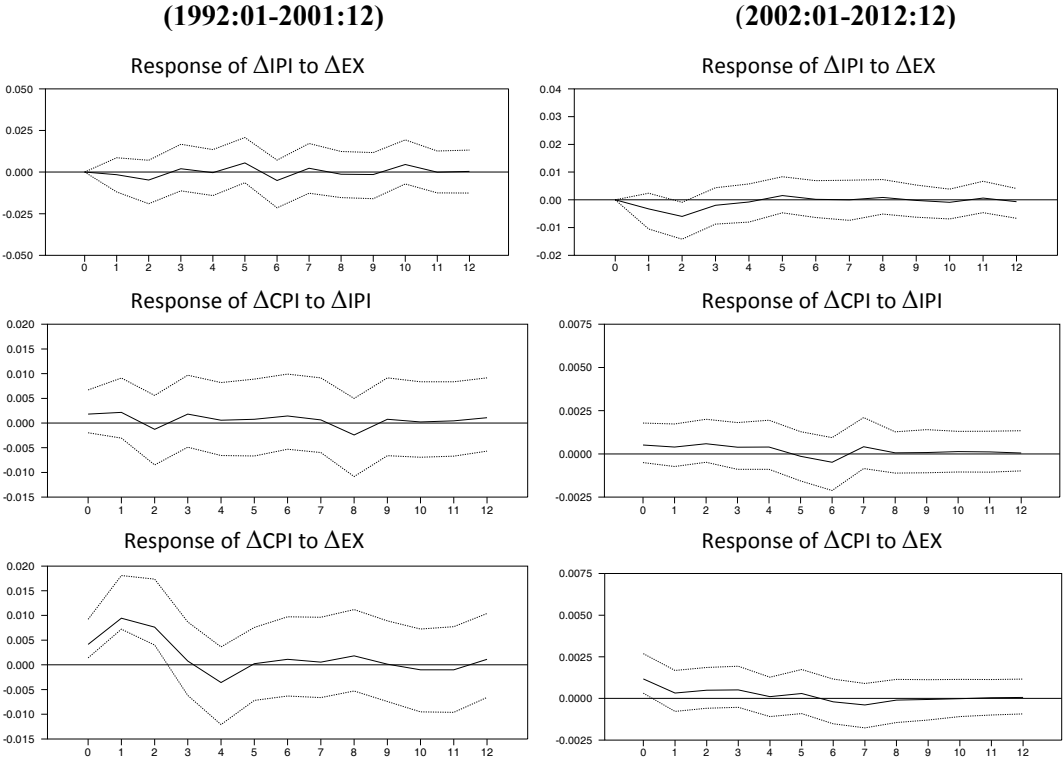
Impulse response functions in Figure 1 show that although inflation reacts positively to output shocks for one month in the pre-IT period and for four months in the targeting period, these results are statistically insignificant within 95% band. On the other hand, exchange rate shock leads to a large increase in inflation in the pre-IT period. This is the evidence of high ERPT to domestic prices in the pre-IT period. However, this effect decreased largely in the targeting period and it shows that although inflation increases immediately in response to an exchange rate shock, this response is marginally significant only for the first month. The reaction of output growth to exchange rate shock remains insignificant in the first period and marginally significant only in the second month for the targeting period.

Figure 2: Impulse responses of interest rate and international reserves policy instruments
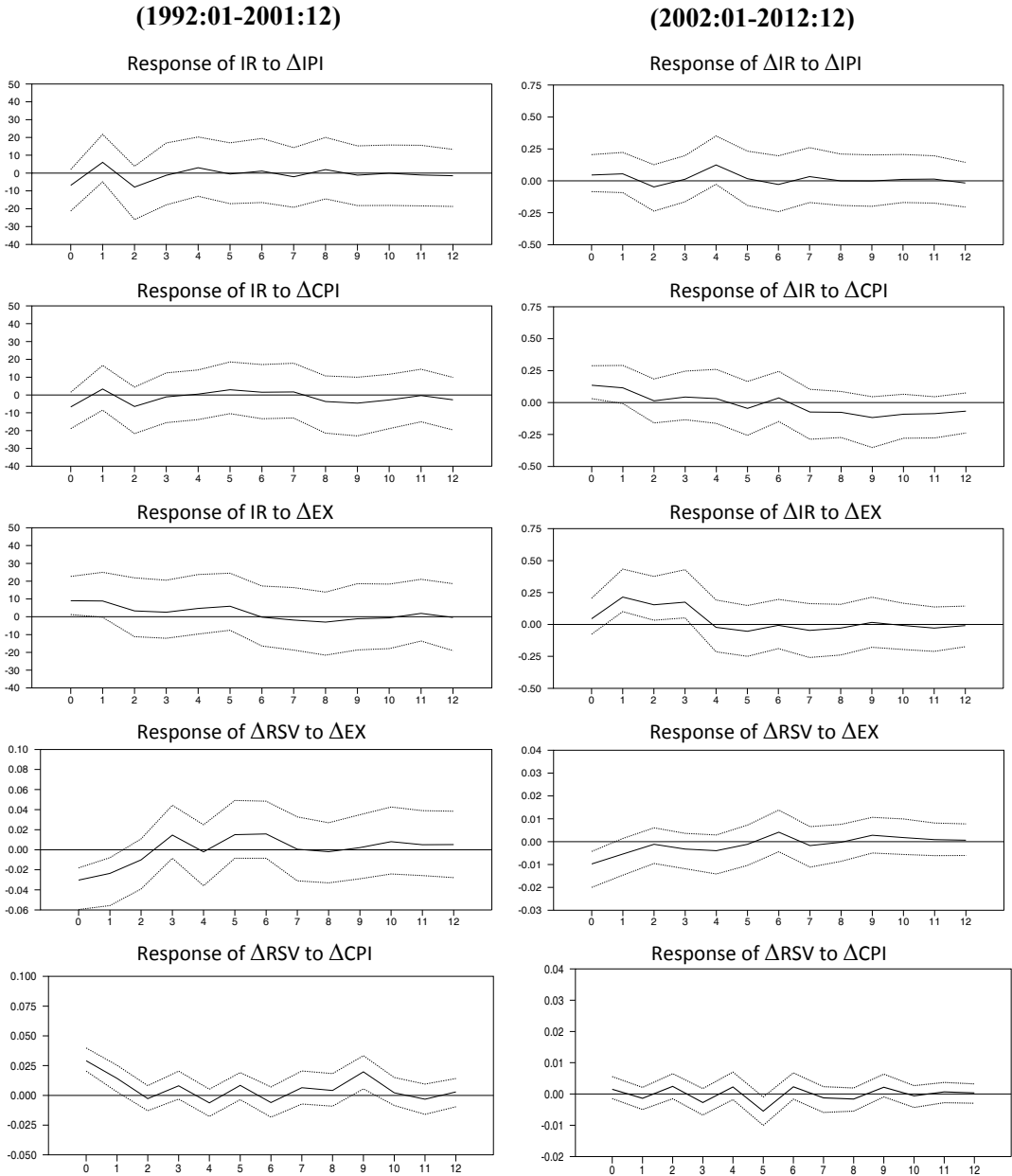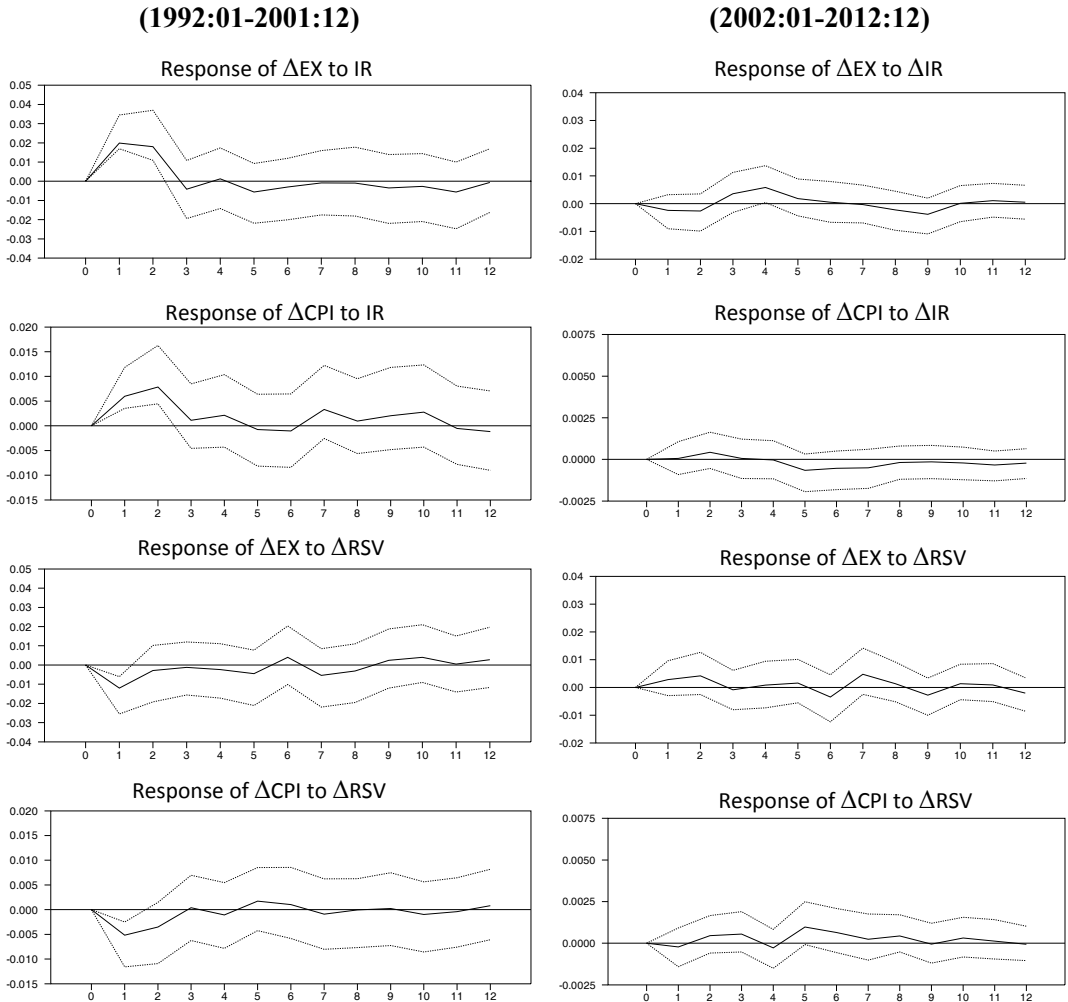
(1992:01-2001:12)

Response of IR to ΔIPI

Response of IR to ΔCPI

Response of IR to ΔEX

Response of ΔRSV to ΔEX

Response of ΔRSV to ΔCPI

(2002:01-2012:12)

Response of ΔIR to ΔIPI

Response of ΔIR to ΔCPI

Response of ΔIR to ΔEX

Response of ΔRSV to ΔEX

Response of ΔRSV to ΔCPI

Figure 2 shows the impulse response functions for interest rates. The reaction of interest rates to output shock is insignificant in both periods. Further, the response of interest rate to a positive inflation shock is insignificant in the pre-IT period. On the other hand, in the targeting period interest rate marginally reacts to inflation just for one month and then becomes insignificant. As described in Civcir and Akçağlayan (2010), the response of interest rate to inflation is consistent with forward looking inflation targeting which focuses on future inflation rate in the targeting period. So we can say that the CBRT marginally reacts to lagged and current inflation and focuses mostly on future inflation in the targeting period. Similarly, Yazgan and Yilmazkuday (2007) estimates forward-looking monetary policy for Turkey over the period 2001:08-2004:04 and concludes that forward looking monetary policy provides reasonable description of the CBRT behavior. Moreover, as shown in Figure 2, international reserves decreases in response to a positive exchange rate shock in the pre-IT period, while the size of this negative response decreased in the targeting period. This means that the CBRT doesn't use its international reserves as an active policy instrument to intervene in foreign exchange market in the targeting period as compared to the pre-IT period. Also, the response of international reserves to inflation becomes insignificant in the targeting period.

According to Figure 2, in the pre-IT period, the response of interest rate to positive exchange rate shock is marginally significant just for one month and then becomes insignificant. However, in the targeting period, the response of interest rate to exchange rate shocks increased to a great extent. Hence, monetary policy is highly driven by the developments in the exchange rate. These results indicate that moving to floating exchange rates in IT regime have increased vulnerability of domestic prices to exchange rate depreciations and therefore the CBRT prevents foreign exchange fluctuations by using its interest rate instrument in order to control inflation rather than to preserve exchange rate target. In other words, the main channel in feeding the inflation in Turkey is still the depreciation of the domestic currency. As mentioned by Reyes (2007), the pass-through effect is still relevant and therefore the Central Bank keeps on intervening in the foreign exchange rate market in order to comply with the inflation target.

Figure 3 shows that a positive interest rate shock leads to an increase in exchange rate in the pre-targeting period. Also, inflation increases in response to a positive interest rate shock. Considering the significant positive effect of exchange rate depreciation on inflation in Figure 1, this suggests that transmission of interest rate shock on inflation has occurred via the exchange rate shock. Figure 3 also indicates that both exchange rate and inflation decrease in response to a positive international reserve shock in the-pre-targeting period. The negative effect of international reserves on inflation rate occurs via the exchange rate decrease in response to a positive international reserve shock in the pre-targeting period.

However, in the targeting period, monetary policy shocks don't have any significant effect on inflation and exchange rate. This shows that the lower inflation environment and the enhanced credibility of the Central Bank has shifted inflation expectation and declined the exchange rate indexation behavior of agents in their price-setting so that the monetary policy shocks don't have any influence on exchange rate and inflation in the targeting period.

Figure 3: Impulse responses of exchange rate and inflation to monetary policy shocks

(1992:01-2001:12)   **(2002:01-2012:12)**

Response of ΔEX to IR   Response of ΔEX to ΔIR

Response of ΔCPI to IR   Response of ΔCPI to ΔIR

Response of ΔEX to ΔRSV   Response of ΔEX to ΔRSV

Response of ΔCPI to ΔRSV   Response of ΔCPI to ΔRSV

We computed ERPT effect as accumulated response of inflation following a one percent shock to the exchange rate and the results are shown in the Table 5[7]. Following a one percent depreciation shock in the pre-IT period, 66.8% of this shock is passed-through into consumer prices within twelve months, whereas for the IT period it is 7.8% in twelve

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[7] Kara and Öğünç (2008) and Yüncüler (2011) also explored ERPT into consumer prices both for IT and pre-IT periods in Turkey and conclude that the switch to the IT regime significantly declined ERPT. They argue that lower inflationary environment, enhanced credibility of the Central Bank and the resulting decline in the degree of exchange rate indexation behavior of agents in their price-setting in IT period are the main reason of lower ERPT.

months after a one percent shock. The computed pass-through coefficients in this study are also lower than that of found in Kara and Öğünç (2008) and Yüncüler (2011). As mentioned by Yüncüler (2009), the degree of pass-through falls steadily as years pass under the IT regime.

Table 5: Exchange rate pass-through (%)

	1 Month	6 Months	12 Months
Before IT	17.47	39.89	66.75
After IT	4.36	10.25	7.82

The results from error variance decompositions support the results of impulse response functions. Table 6 shows that, after the adoption of IT, the variance of interest rate explained by the variance of exchange rate after 12 months increased nearly twofold (from 8.8% to 17%) in the IT period in comparison to that of the pre-IT period. The results also show that the variance of interest rate explained by the variance of inflation rate twofold increased (from 5.4% to 12%) after IT in comparison to that of before IT. Moreover, Table 6 shows that the variance of interest rate explained by exchange rate is higher than that explained by interest rate. This result contradicts with the result of Table 3. Table 6 also indicates that the variances of international reserves explained by exchange rate and inflation variances decreased substantially in the IT period in comparison to the pre-IT period. This means that, while international reserves were actively used by the CBRT to intervene in foreign exchange market in the pre-IT period, these interventions decreased in the IT period.

Table 6: Error variance decompositions

Before IT					
Interest Rates			Reserves		
Period	Exchange Rate	Inflation	Period	Exchange Rate	Inflation
1	6.586	3.609	1	17.536	10.099
6	8.877	4.065	6	26.306	9.744
12	8.788	5.414	12	25.646	11.132
After IT					
Interest Rates			Reserves		
Period	Exchange Rate	Inflation	Period	Exchange Rate	Inflation
1	0.711	6.462	1	11.479	0.309
6	18.663	6.489	6	13.556	3.084
12	16.882	12.101	12	15.006	4.134

The traditional view is that, after the adoption of IT, the response of interest rate to inflation must be higher than the response of interest rate to exchange rate in order to ensure the non-existence of FF practice. However, in our analysis, the interest rate response seems to be more linked to the exchange rate than to the inflation rate. This is because Turkey is small and highly open economy where local currency pricing is not common and the effects of the nominal exchange rate on inflation are immediate and high under IT. But the pass-through data don't show it since the effects are being reduced by the central bank actions. As mentioned by Kara and Öğünç (2010), depreciation of Turkish Lira changes the domestic prices in a short period of time. During the IT period, the CBRT frequently announced that the monetary policy was conducted with forecasted future inflation target. Hence, the CBRT intervenes in response to temporary exchange rate shocks in order to comply with the future inflation target. As described by Civcir and Akçağlayan (2010), these actions are consistent with forward looking inflation targeting which focuses only on future inflation and the lagged and current inflation shocks have not been taking into consideration. As a result, CBRT reacts to immediate exchange rate shocks in order to maintain the future inflation target.

5.   Conclusion

The results from our analysis suggest that the Central Bank actively keeps on reacting exchange rate shocks and mostly focuses on future inflation target. This means that the Central Bank cares about future inflation and everything that affects it. In that sense, although the exchange rate pass-through decreased, it still matters for the attainment of the inflation targets. In other words, as mentioned by Reyes (2007), the pass-through effect is still high under IT regime, but the data don't show it since the effects are being reduced by the Central Bank's actions. Hence we can say that there is a link between the exchange rate depreciation and future inflation target, so the CBRT keeps on reacting to exchange rate depreciations in the targeting period.

Another result from Figure 2 and Table 6 is that the interest rates are mostly used to react to exchange rate shocks in IT period, while in pre-IT period international reserves are mostly used to react to exchange rate shocks. This result indicates that direct intervention in foreign exchange market has decreased in IT period.

Based on our results shown above, there is not any evidence of FF in Turkey in the IT regime. Given that Turkey is a small-open economy and trying to maintain low and stable inflation environment, exchange rate movements still matters for the attainment of the inflation target and foreign exchange market intervention can be interpreted as "fear of inflation" rather than "fear of floating".
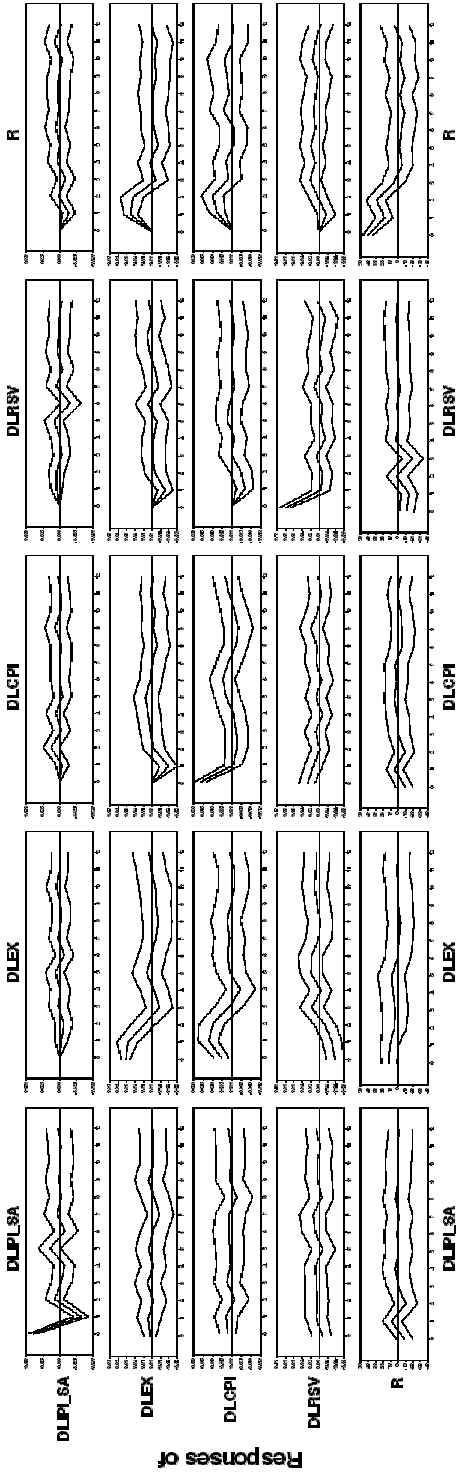
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Appendix: Impulse Response Functions with 95% error bands

A) **1992:01-2001:12 period**

B) **2002:01-2012:12 period**