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HAVE FINANCIAL STABILITY CONCERNS CHANGED THE PRIORITY OF THE CENTRAL BANK OF THE REPUBLIC OF TURKEY?

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Abstract:

This paper aims at analysing whether the Central Bank of the Republic of Turkey (CBRT), designing a new monetary policy framework to achieve financial stability in the last quarter of 2010, tries to pursue financial stability by putting price stability on the back burner. To this end, a forward-looking reaction function that is extended with nominal exchange rate gap and nominal domestic credits gap is estimated for the CBRT. The paper first performs unit root and cointegration tests and finds that the variables become stationary at first differences and that there is a cointegration relationship among variables. Then, the paper conducts the Kalman filter to obtain time varying parameters. The findings show that the coefficients of all explanatory variables did not change too much after the new monetary policy framework of the CBRT in the last quarter of 2010. Therefore, this paper asserts that the CBRT continues to pursue price stability as its primary goal and tries to achieve financial stability by using macroprudential tools. Thus this paper concludes that financial stability concerns have not changed the priority of the CBRT.

Key words: *The Central Bank of the Republic of Turkey, macroprudential policy, Kalman filter, time varying parameter*

1. Introduction

Main monetary policy tools of many central banks are short-term interest rates and these central banks try to stabilize both inflation and output irrespective of whether they adopt inflation targeting strategy. The goals of central banks are to affect long-term interest rates on credits, deposits, bonds, and thus to affect aggregate demand by

controlling short-term interest rates. In this context, the reaction function of a central bank shows how the central bank adjusts short-term interest rates with regard to economic developments. Since the pioneer paper of Taylor (1993), showing the interest rate adjustments of the FED according to the changes in inflation and in output gap (the difference between current output and potential output), many studies have been conducted on the reaction functions of central banks. The equation generated by Taylor (1993) is called the Taylor rule. Because Taylor (1993) uses current values of variables and does not take into account that monetary policy can affect the real economy with a lag, Clarida et al. (1998) produce a New Keynesian forward-looking reaction function that focuses on expected inflation. They suggest that while monetary policy can affect output in the short term, it has a long-term effect on inflation. Clarida et al. (2000) present a new monetary policy reaction function that focuses not only on expected inflation but also on expected output gap considering that monetary policy can affect output with a lag.

Some studies which added financial variables to central banks' reaction functions were conducted before the global financial crisis (Bernanke and Gertler, 2000; Cecchetti, 2003). However, the dominant view before the crisis was that i) central banks should be interested in financial variables as long as financial variables affect inflation and output and ii) central banks should not directly deal with financial stability and should intervene after the crisis emerges (Eichengreen et al., 2011). After the global financial crisis emerged, the responsibilities of central banks towards financial stability were discussed within the scope of both macroprudential policies and reaction functions. Castro (2011), Milas and Naraidoo (2012), and Lee and Son (2013) estimated reaction functions for central banks by adding financial variables to reaction functions in this regard.

The central banks of developed countries implemented quantitative easing policies and decreased interest rates to reduce the effects of the global financial crisis that began in 2008. These policies affected the Turkish economy just as they affected other developing countries. Accordingly, these policies resulted in rapid credit growth and put pressure on exchange rates in Turkey by leading to cheaper short-term financing facilities for the Turkish economy. Figure 1 shows the increases in real effective exchange rate and in total domestic credits during the period January 2009-October 2010.

As seen in Figure 1, both real effective exchange rate and total domestic credits grew considerably during the period January 2009-October 2010. Therefore, Turkish Lira (TL) appreciated, current account balance broke down, and the financing quality of current account deficit decreased in Turkey. Figure 2 depicts current account deficit and the financing of current account deficit for the same period in Turkey.

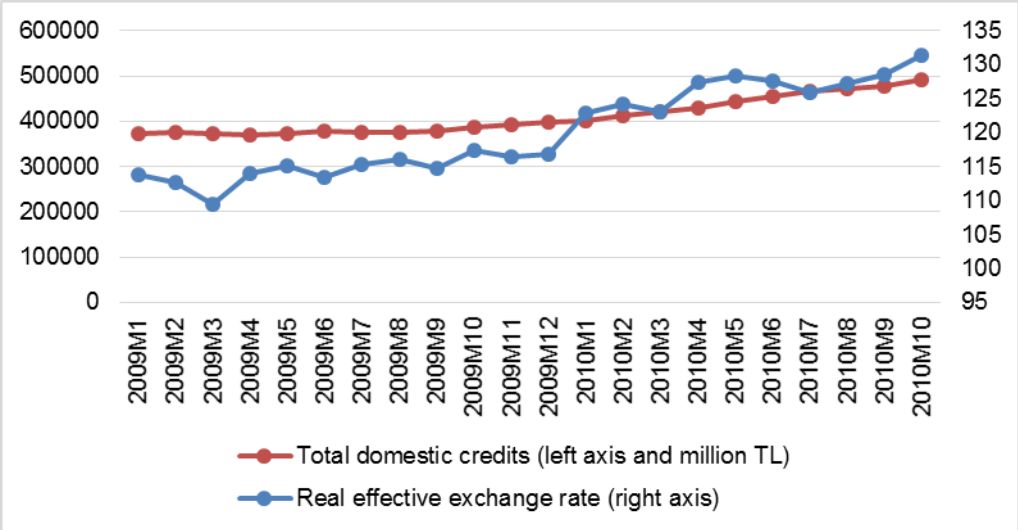

Figure 1: Total domestic credits and real effective exchange rate in Turkey, 2009:01-2010:10

Note: To obtain credit data, firstly, the effects of exchange rates are removed, and secondly, credits are divided by the consumer price index.

Source: CBRT and BRSA

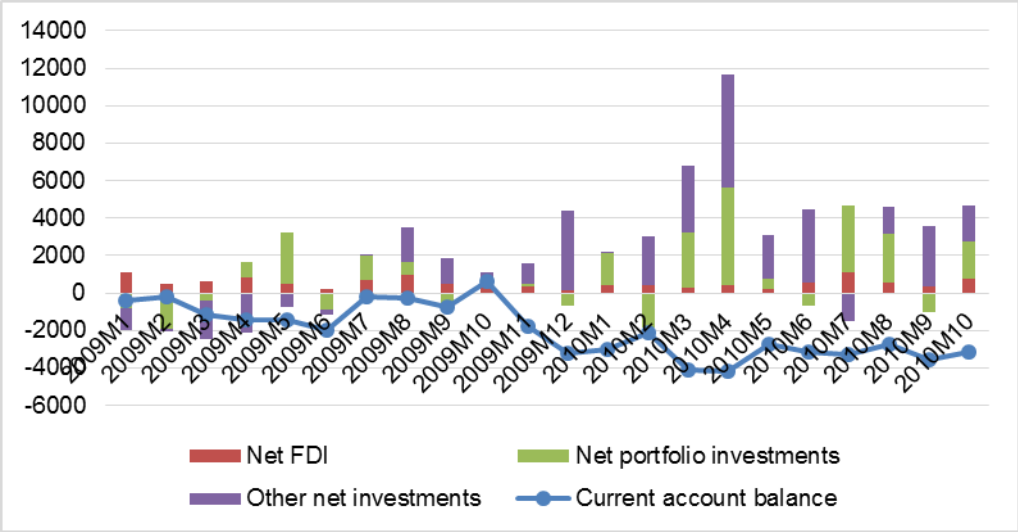

Figure 2: Current account balance and the financing of current account deficit in Turkey (million $), 2009:01-2010:10

Source: CBRT

As shown in Figure 2, the appreciation of TL and increases in domestic credits resulted in increases in the current account deficit of the Turkish economy. Figure 2 also depicts that the deficit was mainly financed by portfolio investments and other investments rather than by foreign direct investments (FDI). Because of the increase in current account deficit and the decrease in the quality of financing of the deficit, the Central Bank of the Republic of Turkey (CBRT) began to emphasize capital flows and macro financial risks and developed a new monetary policy framework to support financial stability in the last quarter of 2010. Hence the CBRT modified the conventional inflation targeting regime by embodying financial stability as a supplementary objective (Kara, 2016). In this new framework, the CBRT desired to prevent excessive appreciation of TL and to ensure more controlled growth of credits by restricting short-term capital flows. In this respect, the CBRT decreased policy interest rate (one-week repo rate), extended the interest rate corridor downwardly, and increased the required reserve ratio in the last quarter of 2010. The CBRT utilized the interest rate corridor and the required reserve ratio as the macroprudential tools in this period. The CBRT aimed at increasing the volatility in overnight interest rates and thus mitigating the short-term capital inflows by extending the interest rate corridor. Besides, the CBRT aimed at preventing the rapid credit growth by increasing the required reserve ratio. In addition to the interest rate corridor and required reserves, the CBRT designed a new macroprudential policy called the reserve option mechanism (ROM) in September 2011. The CBRT designed the ROM to weaken the link between capital inflows and domestic variables, especially exchange rates (Kara, 2016). The ROM is a mechanism allowing banks to hold a definite ratio of their TL reserve requirements in foreign exchange and/or gold (Alper et al., 2013). Accordingly, the CBRT expects banks to hold more TL reserve requirements in foreign exchange during an acceleration of capital inflows and expects banks to hold fewer TL reserve requirements in foreign exchange during a deceleration of capital inflows. Thus, the main purpose in designing the ROM is to decrease the volatility in exchange rates.

As Kara (2016) remarks, the main goals of the macroprudential policies in Turkey are to decrease current account deficit, to improve the quality of external finance, to slow down credit growth rate, and to decrease the sensitivity of domestic economy to volatility in capital flows. Kara (2016) reveals that the CBRT achieved all these goals.[1]

As Cecen et al. (2014) remark, the changing framework of monetary policy of the CBRT to guard financial stability may lead to market perceptions that the CBRT may have different objectives and priorities other than inflation. Because, as mentioned above, the CBRT, which adopted a new monetary policy framework to achieve both price stability and financial stability in the last quarter of 2010, has used both interest rates and macroprudential tools to achieve these goals. Thus this paper aims at analysing whether financial stability concerns have changed the priority of the CBRT.

[1] See Kara (2016) for the details of the implementation and the results of the macroprudential policies in Turkey.

In other words, this paper examines whether the CBRT tries to pursue financial stability by putting price stability on the back burner. To this end, the paper will estimate a forward-looking reaction function that is extended with nominal exchange rate gap and nominal domestic credits gap for the CBRT and will observe the coefficients of explanatory variables over time through the Kalman filter. In other words, the paper will follow time varying parameters of independent variables.

The contribution of this paper to the literature is threefold. First, there are many papers estimating the reaction function of the CBRT in the empirical literature (see e.g., Berument and Malatyali, 2000; Berument and Tasci, 2004; Yazgan and Yilmazkuday, 2007; Adanur-Aklan and Nargelecekenler, 2008; Erdem and Kayhan, 2010; Gozgor, 2012; Bulut, 2016). Among these papers, some add financial variables to the reaction function of the CBRT (Berument and Malatyali 2000; Berument and Tasci, 2004; Yazgan and Yilmazkuday, 2007; Erdem and Kayhan, 2010; Gozgor, 2012). However, they estimate the reaction function of the CBRT that incorporates financial variables as if Taylor (1993) and Clarida et al. (1998, 2000) used financial variables in their original models. Therefore, this paper includes financial stability debates within the scope of the reaction functions. Second, the paper provides new evidence on the priority of the CBRT related to the perceptions that the CBRT may have different priorities other than inflation. Third, to the best of the authors' knowledge, this is the first paper that estimates time varying parameters of explanatory variables in the reaction function for the CBRT.

The rest of the paper is organized as follows: Section 2 describes the model and data. Section 3 presents the methodology and findings. Section 4 concludes the paper with a summary of the main findings.

2. Model and data

Today, there is an agreement that monetary policy can affect inflation with a lag and thus a central bank must be forward-looking about inflation. Therefore, for the empirical model, this paper extracts 12-month ahead expected annual inflation rates presented on the CBRT's expectations surveys and obtains 12-month ahead inflation target for every period by utilizing the linear interpolation method. There are three alternatives concerning output gap. The first one is to use expected output gap data as Castro (2011) and Lee and Son (2013) do by assuming that monetary policy has a lagged effect on output and that expected positive (negative) output gap is an important indicator of inflationary (disinflationary) pressures. The second alternative is to use current data for output gap as Clarida et al. (1997), Berument and Malatyali (2000), and Yazgan and Yilmazkuday (2007) do. The third one is to use lagged data for output gap. The last two alternatives suppose that monetary policy can affect output in the short run and thus they indicate a new Keynesian perspective. Because the CBRT does not supply expected output or expected output gap data and we think that the CBRT is unable to precisely estimate current output gap, this paper uses lagged data for output gap to estimate the empirical model on the assumption that monetary

policy can affect output in the short run. Hence, we detrend seasonally-adjusted real GDP by employing the Hodrick-Prescott (HP) filter developed by Hodrick and Prescott (1997) and thus we acquire output gap. As mentioned previously, the CBRT particularly emphasized exchange rates and credit growth rates to achieve financial stability. Therefore, we detrend exchange rates using the currency basket ((1 EUR+1 USD)/2)[1] and nominal domestic credits[2] by running the HP filter and obtain nominal exchange rate gap and nominal domestic credits gap[3], respectively. While detrending the series, we consider percentage gaps for all three series. We also employ the method used by Yazgan and Yilmazkuday (2007). Accordingly, to obtain the value of the gap at t period, the series are detrended using the data ending in t. Similarly, the series are detrended using the data ending in t+1 to obtain the value of the gap at t+1 period. This process is repeated until the last value of the sample. In other words, we conduct the analysis by taking account of the gap that the CBRT might observe.

Based on the explanations above, the reaction function of the CBRT is as follows:

$$i_t = b_0 + b_1\left(\pi^e_{t+m} - \pi^t_{t+m}\right) + b_2 y^{gap}_{t-n} + b_3 exc^{gap}_t + b_4 ndc^{gap}_t + \varepsilon_t \qquad (1)$$

where

i_t = overnight interest rates (overnight TRLIBOR),
π^e_{t+m} = 12-month ahead expected annual inflation rate,
π^t_{t+m} = 12-month ahead annual inflation target,
y^{gap}_{t-n} = GDP gap at time t-n (%),
exc^{gap}_t = nominal exchange rate gap (%),
ndc^{gap}_t = nominal domestic credits gap (%),
ε_t = error term.

The data are quarterly and cover the period 2006:1-2016:2. Since we consider that the CBRT may react to changes in the difference between 12-month ahead expected inflation rate and inflation target, m is equal to 4. Besides, n is equal to 1 since data for GDP are announced in 2-3 months in Turkey. The data are obtained from the CBRT, Banking Regulation and Supervision Agency in Turkey, and The Banks Association of Turkey.

[1] An increase in the currency basket indicates the depreciation of TL.
[2] The effects of exchange rates are removed while calculating nominal domestic credits.
[3] We think that reacting to changes in exchange rate gap is much more realistic than reacting to changes in exchange rates. For example, a national currency may still be overvalued despite an increase in exchange rates. Under these circumstances, one may expect the central bank to decrease interest rates rather than to increase interest rates. Similarly, one may expect a central bank to react to changes in nominal domestic credits gap rather than to changes in nominal domestic credits as reacting to every change in credits is meaningless.

3. Methodology and Findings

The analyses in this paper consist of two stages. In the first stage, the paper examines the time series properties of the data. The paper employs Phillips and Perron (1988) unit root test and Johansen (1988, 1991) cointegration test to investigate the order of integration of the variables and to examine whether there is a cointegration relationship among variables, respectively. Table 1 depicts the results of the unit root and cointegration tests.

Table 1: Unit root and cointegration test

Panel A: Unit root test					
Variable	PP test statistic				
	Level		1st difference		
	Intercept	Intercept and trend	Intercept	Intercept and trend	
i_t	-1.41	-1.55	-6.17*	-6.13*	
$\pi^e_{t+4} - \pi^t_{t+4}$	-2.25	-2.21	-4.59*	-4.55*	
y^{gap}_{t-1}	-2.50	-2.51	-5.26*	-5.17*	
exc^{gap}_t	-3.23**	-3.16	-6.17*	-6.09*	
ndc^{gap}_t	-2.11	-2.09	-5.52*	-5.45*	
Panel B: Cointegration test					
Null hypothesis	Alternative hypothesis	Trace statistic	Null hypothesis	Alternative hypothesis	Max-eigen statistic
r=0	r>0	103.74*	r=0	r=1	46.74*
r≤1	r>1	57.01	r=1	r=2	25.65
r≤2	r>2	31.34	r=2	r=3	15.26
r≤3	r>3	16.08	r=3	r=4	11.50
r≤4	r>4	4.58	r=4	r=5	4.58

*Note: * and ** indicate 1% and 5% significance levels, respectively.*

As seen from the table, the null hypothesis of a unit root can be rejected at first differences for all variables. That is to say, the variables are integrated of order one. Therefore, whether there is a cointegreation relationship among variables can be examined in the paper. Accordingly, the null hypothesis of no cointegration can be rejected at 1% significance level. In other words, there is a cointegration relationship among variables.

In the second stage, the paper employs the Kalman filter to obtain time-varying parameters.

The state space form is a powerful tool that enables researchers to handle a large number of time series models (Harvey, 1989). The Kalman filter is a state space model which uses recursive estimation algorithms to examine the dynamic relationships among variables.

A linear state space presentation of the dynamics of the n x 1 vector y_t is depicted by the system of equations:

$$y_t = c_t + Z_t\alpha_t + \epsilon_t \quad (2)$$

$$\alpha_{t+1} = d_t + T_t\alpha_t + u_t \quad (3)$$

where α_t is an m x 1 vector of unobserved state variables, c_t, Z_t, d_t, and T_t are conformable vectors and matrices, and ϵ_t and u_t are vectors of mean zero and Gaussian disturbances. As seen in Equation (2), it is assumed that the unobserved state vector moves over time as a first-order vector autoregression (AR(1)).

The disturbance vectors, ϵ_t and u_t, are assumed to be serially independent and to have contemporaneous variance structure:

$$\Omega_t = \text{var}\begin{bmatrix}\epsilon_t \\ u_t\end{bmatrix} = \begin{bmatrix}H_t & G_t \\ G_t' & Q_t\end{bmatrix} \quad (4)$$

where H_t is an n x n symmetric variance matrix, Q_t is an m x m symmetric variance matrix, and G_t is an n x n matrix of covariances.

Using the Kalman filter, Equation (1) can be re-written as follows:

$$i_t = b_0 + b_{1,t}(\pi^e_{t+m} - \pi^t_{t+m}) + b_{2,t}y^{gap}_{t-n} + b_{3,t}exc^{gap}_t + b_{4,t}ndc^{gap}_t + \epsilon_t \quad (5)$$

$$b_{i,t+1} = b_{i,t} + u_{i,t} \quad (6)$$

where $b_{i,t}$ shows the time varying parameters that are used to examine the dynamic relationships among variables.

Figure 1 presents time varying parameters based on the estimation of Equation (5). The vertical lines in the graphs indicate the last quarter of 2010 when the CBRT changed the monetary policy framework in Turkey. When one observes the parameters one by one, he/she will observe that (i) the coefficient of the difference between expected inflation and inflation target seems to be stable from 2007 to 2016 after a sharp increase in 2006, (ii) the coefficient of one-period lagged output gap appears to be stable from 2009 to 2016 after fluctuations from 2006 to 2009, (iii) the coefficient of nominal exchange rate gap seems to be steady from 2009 to 2016 after a sharp decrease in 2006 and an increase in 2007, and (iv) the coefficient of nominal domestic credits has a tendency to decrease beginning from 2007. One can also observe that the only negative coefficient belongs to the one-period lagged output gap by 2016. This may indicate that the CBRT considers expected output gap while it is adjusting interest rates. However, for more reliable explanations, one should add expected output gap to the reaction function of the CBRT and should estimate this function. Based on these dynamics, it is with no doubt that the most important finding that Figure 1 displays is that the coefficients of all variables did not change dramatically

after the new monetary policy framework of the CBRT in the last quarter of 2010. Therefore, as the main monetary policy tool of the CBRT is short-term interest rate, this paper yields that financial stability concerns have not changed the priority of the CBRT and that the main goal of the CBRT is still to achieve price stability.

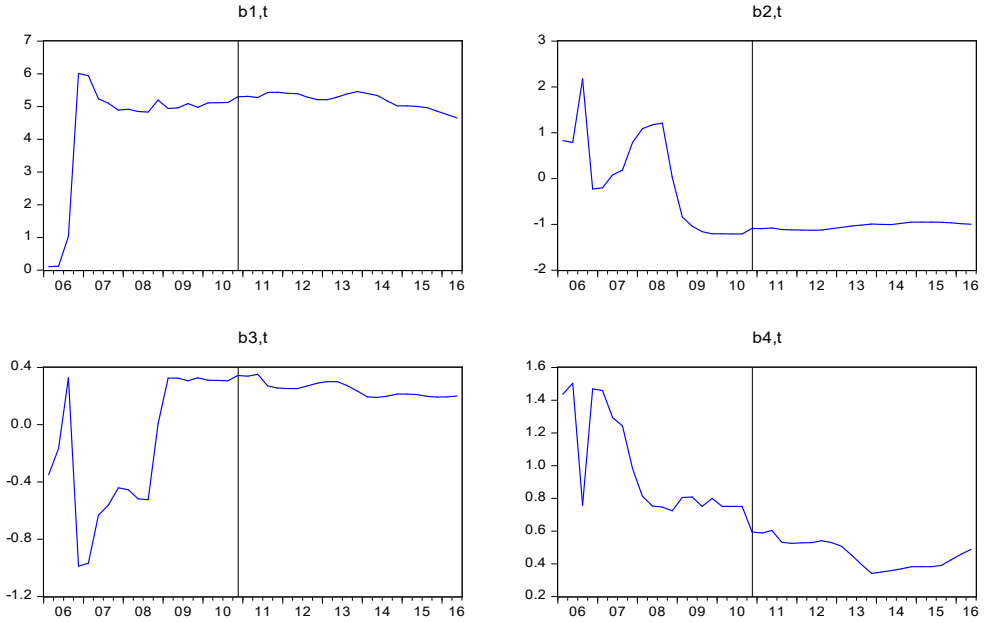

Figure 1: Time-varying parameters

4. Conclusion

This paper that utilizes quarterly data from 2006:1 to 2016:2 aims at investigating whether the CBRT tries to pursue financial stability by putting price stability on the back burner. To this aim, the paper estimates a forward-looking reaction function that is extended with nominal exchange rate gap and nominal domestic credits gap for the CBRT. After conducting unit root and cointegration tests, the paper employs the Kalman filter to observe the time varying parameters.

The findings show that the new monetary policy framework of the CBRT in the last quarter of 2010 does not have great effects on the responses of the CBRT in the changes of explanatory variables, namely the difference between expected inflation and inflation target, one-period lagged output gap, nominal exchange rate gap, and nominal domestic credits gap. Therefore, the paper finds that financial stability concerns have not changed the priority of the CBRT and that the main goal of the CBRT is still to achieve price stability since the CBRT's primary monetary policy tool is short-term interest rate.

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