Theoretical and Applied Economics
Volume XXII (2015), No. 4(605), Winter, pp. 133-144

The Interest Rate Corridor as a Macroprudential Tool to Mitigate Rapid Growth in Credits: Evidence from Turkey

Umit BULUT
Ahi Evran University, Kirsehir, Turkey
ubulut@ahievran.edu.tr

Abstract. *The Central Bank of the Republic of Turkey (CBRT) has utilized the interest rate corridor as a macroprudential tool to mitigate rapid credit growth in Turkey since October 2011. This paper examines whether the interest rate corridor can be used as a macroprudential tool to affect credits in Turkey. According to the findings of the paper, the uncertainty about the funding amount and the funding cost created by the CBRT through the interest rate corridor has statistically significant impacts on credits. Eventually, upon its findings, the paper asserts that the interest rate corridor can be utilized as a macroprudential tool to affects credits and aggregate demand in Turkey.*

Keywords: The Central Bank of the Republic of Turkey; macroprudential tool; the interest rate corridor; the difference between the upper bound of the corridor and the policy rate.

JEL Classification: C22, E51, E52, E58.

1. Introduction

Following the 2008 global financial crisis, central banks of advanced countries reduced interest rates and implemented quantitative easing policies to reduce the effects of the crisis. These policies led to the appreciation of the official currency of Turkey (TL) and to rapid credit growth in Turkey beginning from 2010. Therefore, the current account deficit of Turkey increased and the quality of financing of the deficit decreased. According to Akcelik et al. (2013), in such an economic environment, the implementation of new policy framework was inevitable. The Central Bank of the Republic of Turkey (CBRT), whose primary objective is to achieve and maintain price stability, designed a new monetary policy framework towards the end of 2010 to alleviate these macro-financial risks by including financial stability as an additional and supportive objective (Akcelik et al., 2013; Binici et al., 2013; Ermisoglu et al., 2014). The CBRT notably focused on exchange rates and on credits to achieve financial stability and employed both policy rate (one-week repo rate) and macroprudential tools to achieve price stability and financial stability.

Macroprudential tools have been increasingly utilized since the global financial crisis. They include regulations towards the overall financial system. Borio (2003) remarks that a macroprudential approach aims at limiting the risk of episodes of financial distress that may cause significant losses in the real output. Besides, according to International Monetary Fund (IMF, 2011), macroprudential policy aims at limiting systemic risk by minimizing the occurence of disruptions in the provision of financial services that can have serious effects on the real economy. Claessens (2014) review seven macroprudential instruments: caps on loan-to-value and debt-to-income ratios (for borrowers), limits on credit growth and foreign lending and reserve requirements (for financial instutions' assets or liabilities), dynamic provisioning and counter-cyclical requirements (for building buffers). Cerutti et al. (2015) examine the use of macroprudential policies in 119 countries over the period 2000-2013 and remark that emerging economies usually use foreign exchange related policies while advanced economies use borrower-based policies more.

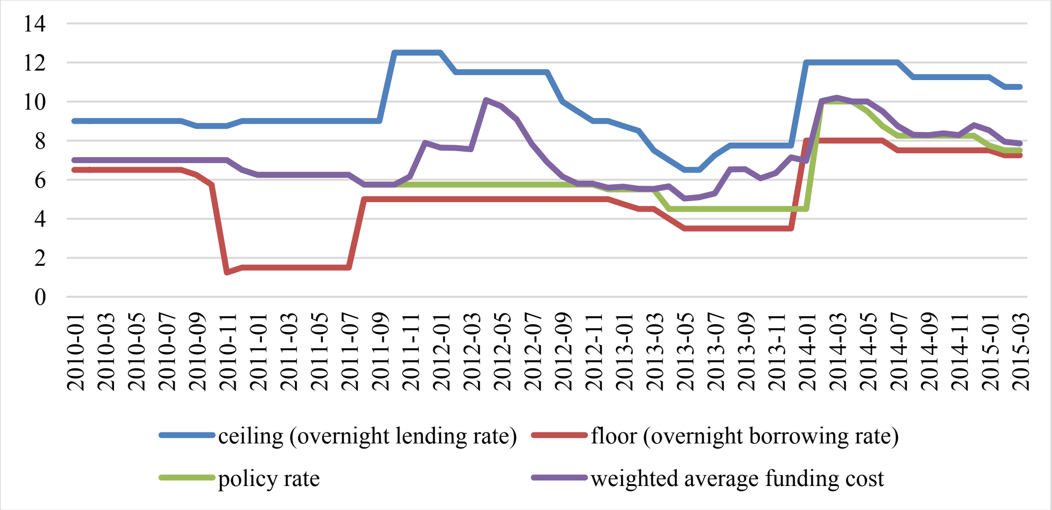
The three macroprudential tools that the CBRT have used so far are reserve requirements, reserve option mechanism (see Alper et al., 2013; Degerli and Fendoglu 2015), and the interest rate corridor. The CBRT has used the interest rate corridor not only to decrease the volatility in exchange rates but also to prevent rapid credit growth. This paper aims at examining whether the interest rate corridor can be used as a macroprudential tool to affect credits and aggregate demand in Turkey. The rest of the paper is organized as follows: Section 2 examines the use of the interest rate corridor as a macroprudential tool to mitigate rapid growth in credits. Section 3 presents model, data, and methodology. Estimation results are reported in section 4. Section 5 concludes the paper with a summary of main findings and some policy implications.

2. The use of the interest rate corridor to mitigate rapid credit growth

In a corridor system, a central bank offers two standing facilities to keep the overnight interest rate in money markets fairly close to the (target) policy rate: a lending facility by which the central bank is ready to supply funds overnight at a given lending rate against collateral and a deposit facility by which banks can make overnight deposits to earn a deposit rate (Berentsen et al., 2010; Kahn, 2010; Aysan et al., 2014, 2015). The interest rate corridor is the distance between the lending rate (the upper bound of the corridor/the ceiling) and the deposit rate (the lower bound of the corridor/the floor) (Binici et al., 2013; Aysan et al., 2014, 2015). Under the traditional inflation targeting regime, central banks implement a symmetric and narrow band around the policy rate to adjust the overnight rate in money markets (Binici et al., 2013; Aysan et al., 2014, 2015). Thus central banks affect long-term interest rates to achieve price stability by steering overnight rates.

The CBRT has utilized the interest rate corridor to prevent rapid credit growth in Turkey. Accordingly, the CBRT, which lent to banks on one-week repo rate until October 2011, extended the interest rate corridor upwardly in October 2011 and began to lend to banks on both one-week repo rate and on the upper bound of the corridor. Thus the CBRT let the weighted average cost of the CBRT funding that means the average interest rate of the debt that banks borrow from the CBRT be different from the policy rate. Because, the CBRT aimed at increasing the uncertainty about the funding amount and the funding cost and thus discouraging banks to borrow from the CBRT to extend credits.[1]

Figure 1. *Interest rate corridor, policy rate, and weighted average funding cost*



Source: CBRT.

Figure 1 depicts the interest rate corridor, policy rate, and the weighted average cost of the CBRT funding. As seen, the CBRT extended the corridor upwardly in October 2011, the weighted average funding cost has usually been greater than policy rate from October 2011 to the second quarter of 2015, and the difference between weighted average funding cost and policy rate has varied from period to period. Therefore, one may argue that i) the CBRT makes some part of the funding on the overnight lending rate, ii) the CBRT changes shares of one-week funding and overnight funding and thus weighted average funding cost from period to period, and iii) the CBRT is able to create uncertainty about the funding amount and the funding cost.

3. Model, data, and methodology

3.1. Model and data

As denoted previously, the CBRT aims at creating uncertainty about the funding amount and the funding cost by employing the interest rate corridor to mitigate rapid credit growth. The difference between the upper bound of the corridor and the policy rate refers to uncertainty for banks that depend on the CBRT funding. Therefore, this paper aims at examining whether the difference between the upper bound of the corridor and the policy rate affects quantity of credits negatively in Turkey as the CBRT expects. Hence this paper employs the function as follows:

$$RC_t = \beta_0 + \beta_1\left(I^u - I^p\right)_t + \varepsilon_t \tag{1}$$

where RC_t denotes real domestic credits, $(I^u - I^p)_t$ represents the difference between the upper bound of the corridor and the policy rate, and ε_t depicts error term, respectively. To obtain real credits, firstly, the effects of exchange rates are removed, and secondly, credits are divided by the consumer price index. The data are monthly, cover the period 2011:10-2015:1, and are obtained from the Banking Regulation and Supervision Agency (BRSA) and the CBRT.

Table 1: Descriptive statistics and correlation matrix for RC and $(I^u - I^p)$, 2011:10-2015:1

	RC	$(I^u - I^p)$
Descriptive Statistics		
Mean	3995.46	3.79
Median	4064.65	3.25
Maximum	4724.23	6.75
Minimum	335.05	2.00
Std. deviation	440.49	1.56
Observations	40	40
Correlation Matrix		
RC		-0.73
$(I^u - I^p)$	-0.73	

Descriptive statistics and correlation matrix are presented in Table 1. One notes that the all descriptive statistics of RC are greater than those of $(I^u - I^p)$. One may notice, as well, that there is a negative correlation between RC and $(I^u - I^p)$. Descriptive statistics are of course are to provide one with some initial and/or preliminary inspection. However, beyond table observations, one may need to consider, as well, some statistical methodologies to observe the long run relationship such as unit root and cointegration estimations.

3.2. Estimation methodology

3.2.1. Unit root tests

Specifying the order of integration of variables is the first step in time series analyses since one may experience spurious regression problem when regarding analyses employ conventional ordinary least squares (OLS) estimations.

Unit root tests developed by Dickey and Fuller (1981, hereafter ADF) and Phillips and Perron (1988, hereafter PP) are commonly utilized in econometrics literature. The main shortcoming of these tests is that they do not take into account possible structural breaks in series. However, it should be considered that series may have structural breaks before a long-term relationship among variables is investigated. Hence it is recommended to employ unit root tests which regard structural breaks. Carrion-i Silvestre et al. (2009) develop a unit root testing procedure by (i) allowing for an arbitrary number of changes in level and the slope of the trend function, (ii) adopting the so-called quasi-generalized least squares (quasi-GLS) detrending method suggested by Elliott et al. (1996) to test to observe if local asymptotic power functions close to the local asymptotic Gaussian power envelope, (iii) considering a variety of tests, in particular the class of M-tests introduced in Stock (1999) and analyzed in Ng and Perron (2001). Carrion-i-Silvestre et al. (2009) assert that simulation experiments justify that their procedures offer improvements over commonly used methods in small samples. Therefore, this paper will perform the quasi-GLS unit root tests by Carrion-i-Silvestre et al. (2009) for the series in this paper.

Carrion-i-Silvestre et al. (2009) obtain structural break points using the algorithm of Bai and Perron (2003) through quasi-GLS method and dynamic programming process minimizing sum of squared residuals. Let y_t be a stochastic process generated according to

$$y_t = d_t + u_t \tag{2}$$

$$u_t = \alpha u_{t-1} + \upsilon_t, \quad t = 0,\ldots,T \tag{3}$$

where $\{u_t\}$ is an unobserved mean-zero process assuming that $u_0 = 0$, though the results generally hold for the weaker requirement that $E\left(u_0^2\right) < \infty$. The disturbance term υ_t is defined by $\upsilon_t = \sum_{i=0}^{\infty} \gamma_i \eta_{t-i}$ with $\sum_{i=0}^{\infty} i\left|\gamma_i\right| < \infty$ and $\left\{\eta_t\right\}$ a martingale difference sequence adapted to the filtration $F_t = \sigma$ -field$\left\{\eta_{t-i};\ i \geq 0\right\}$. The long-run and short-run variance as $\sigma^2 = \sigma_\eta^2 \gamma(1)^2$ and $\sigma_\eta^2 = \lim_{T\to\infty} T^{-1} \sum_{t=1}^{T} E\left(\eta_t^2\right)$, respectively. Carrion-i-Silvestre et al. (2009) generate five test statistics to test for the null hypothesis for a unit root under multiple structural breaks. The first one is as follows:

$$P_T^{GLS}\left(\lambda^0\right) = \left\{S\left(\bar{\alpha}, \lambda^0\right) - \bar{\alpha} S\left(1, \lambda^0\right)\right\} / s^2\left(\lambda^0\right) \tag{4}$$

where P_T^{GLS} denotes the feasible optimal statistic, λ^0 gives the estimate of the vector of break fractions, and $s^2(\lambda^0)$ yields an estimate of the spectral density at frequency zero of υ_t. Following Ng and Perron (2001) and Perron and Ng (1998), Carrion-i-Silvestre et al. (2009) consider an autoregressive estimation defined in Equation (5).

$$s(\lambda^0)^2 = s_{ek}^2 \,/\, \left(1-\sum_{j=1}^{k}\hat{b}_j\right)^2 \tag{5}$$

where $s_{ek}^2 = (T - k)^{-1} \sum_{t=k+1}^{T} \hat{e}_{t,k}^2$ and $\{\hat{b}_j, \hat{e}_{t,k}\}$ obtained from the OLS regression as given in Equation (6).

$$\Delta\tilde{y}_t = b_0\tilde{y}_{t-1} + \sum_{j=1}^{k} b_j\Delta\tilde{y}_{t-j} + e_{t,k} \tag{6}$$

with $\tilde{y}_t = y_t - \hat{\psi}' z_t(\lambda^0)$ where $\hat{\psi}$ minimizes the objective function demonstrated as indicated in Equation (7).

$$S^*(\psi,\bar{\alpha},\lambda^0) = \sum_{t=1}^{T}\left(y_t^{\bar{\alpha}} - \psi' z_t^{\bar{\alpha}}(\lambda^0)\right)^2 \tag{7}$$

The order of the autoregression k term in Equation (5) is selected using the modified information criteria suggested by Ng and Perron (2001) and modified by Perron and Qu (2007).

Following Perron and Rodriguez (2003), Carrion-i-Silvestre et al. (2009) also use the M-class of tests analyzed in Ng and Perron (2001) allowing for multiple structural breaks as given in Equations (8), (9), and (10).

$$MZ_{\alpha}^{GLS}(\lambda^0) = \left(T^{-1}\tilde{y}_T^2 - s(\lambda^0)^2\right)\left(2T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2\right)^{-1} \tag{8}$$

$$MSB^{GLS}(\lambda^0) = \left(s(\lambda^0)^{-2}T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2\right)^{1/2} \tag{9}$$

$$MZ_{t}^{GLS}(\lambda^0) = \left(T^{-1}\tilde{y}_T^2 - s(\lambda^0)^2\right)\left(4s(\lambda^0)^2T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2\right)^{-1/2} \tag{10}$$

with $\tilde{y}_t = y_t - \hat{\psi}' z_t(\lambda^0)$, where $\hat{\psi}$ minimizes Equation (7) and $s(\lambda^0)^2$ is defined in Equation (5). The next monitored statistic, following Ng and Perron (2001), is a modified feasible point optimal test defined by Equation (11).

$$MP_{T}^{GLS}(\lambda^0) = \left[\bar{c}^2T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2 + (1-\bar{c})T^{-1}\tilde{y}_T^2\right]/s(\lambda^0)^2 \tag{11}$$

Equation (11) is based on the same motivation that leads to the definition of the M-tests in Stock (1999). The $MP_T^{GLS}(\lambda^0)$ is a crucial statistic because its limiting distribution coincides with that of the feasible point optimal test.

The asymptotic critical values are generated through the bootstrap approach. If the calculated tests statistics are lower than critical values, the null hypothesis is rejected, and the rejection of the null hypothesis suggests the absence of a unit root in series (See Carrion-i-Silvestre et al., 2009 for details).

3.2.2. Cointegration tests

After determining the order of integration of variables, the next step is to examine whether there is a cointegration relationship among variables.

Engle and Granger (1987) and Johansen (1988, 1991) cointegration tests which are widely employed in econometric analyses do not take into consideration structural break in series. In the event there are one or more structural breaks, standart cointegration tests may not be convenient (Westerlund and Edgerton, 2006). Maki (2012) produces a cointegration test that regards structural breaks up to five different points in time. According to this cointegration test, every period in the sampling period is a possible breaking point and corresponding statistics are computed for each period. Then, the lowest t-statistics determine the break points of time series period. Maki (2012) considers the following regression models to test for possible cointegration relation for multiple breaks as given in Equations (12) to (15).

Model 0:

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \beta' x_t + u_t \tag{12}$$

Model 1:

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \beta' x_t + \sum_{i=1}^{k} \beta_i' x_t D_{i,t} + u_t \tag{13}$$

Model 2:

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \gamma t + \beta' x_t + \sum_{i=1}^{k} \beta_i' x_t D_{i,t} + u_t \tag{14}$$

Model 3:

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \gamma t + \sum_{i=1}^{k} \gamma_i t D_{i,t} + \beta' x_t + \sum_{i=1}^{k} \beta_i' x_t D_{i,t} + u_t \tag{15}$$

where t =1,2,…,T. y_t and $x_t = (x_{1t},\dots,x_{mt})'$ denote observable I(1) variables, and u_t is the equilibrium error, y_t is a scalar, and $x_t = (x_{1t},\dots,x_{mt})'$ is an (mx1) vector. Maki (2012) assumes that an (nx1) vector z_t is generated by $z_t = (z_t, x_t')' = z_{t-1} + \varepsilon_t$, where ε_t are i.i.d. with mean zero, positive definite variance-covariance matrix Σ, and $E|\varepsilon_t|^s < \infty$ for some $s>4$. μ, μ_i, γ, γ_i, $\beta' = (\beta_1,\dots,\beta_m)$, and $\beta_i' = (\beta_{i1},\dots,\beta_{im})$ are true parameters. $D_{i,t}$ represents dummy variables taking a value of 1 if $t > T_{Bi}$ (i=1,…,k) and of 0 otherwise, where k is the maximum number of breaks and T_{Bi} denotes the time period of break. Equation (12) has the model with level shifts. Equation (13) allows for structural breaks of level and regressors. Equation (14) extends Equation (13) with a trend. The Equation (15) includes structural breaks of levels, trends, and regressors employed.

The critical values are generated through the Monte Carlo simulation. If the calculated tests statistics are greater than critical values, the null hypothesis is rejected, and the rejection of the null hypothesis indicates a cointegration relationship among variables.

3.2.3. Estimation of long-term coefficients

When the cointegration relationship is obtained among variables, the following process is to estimate long-term coefficients through the dynamic ordinary least squares (DOLS) approach produced by Stock and Watson (1993). Stock and Watson (1993) estimate a long-run dynamic equation that includes explanatory variables along with the leads and lags of differences of explanatory variables. The DOLS approach can be employed irrespective of the order of integration of the independent variables (purely I(0), purely I(1) or mutually-cointegrated), but the dependent variable must be integrated of order 1 (Katircioglu, 2014). This method corrects the possible endogeneity and serial correlation problems in the OLS estimation (Esteve and Requene, 2006). The DOLS model, then, can be written as indicated by Equation (16).

$$y_t = \alpha_0 + \alpha_1 t + \alpha_2 x_t + \sum_{i=-q}^{q} \delta_i \Delta x_{t-i} + \varepsilon_t \qquad (16)$$

where y, t, x, q, Δ, and ε represent dependent variable, time trend, independent variable(s), optimum leads and lags, the difference operator, and error term, respectively.

4. Estimation results

Table 2 and Table 3 report the results of unit root tests. Accordingly, the test statistics for the first differences reject the null hypotheses and indicate that series are stationary in first differences. In other words, the series are integrated of order 1, [I(1)].

Table 2. ADF and PP unit root tests

Variable[a]		**ADF test statistic**		**PP test statistic**	
		Intercept	**Intercept and trend**	**Intercept**	**Intercept and trend**
RC		-0.05	-2.56	0.03	-2.70
$(I^u - I^p)$		-1.95	-1.13	-1.95	-1.17
ΔRC		-6.51^b	-6.44^b	-6.54^b	-6.46^b
$\Delta(I^u - I^p)$		-5.38^b	-5.69^b	-5.39^b	-5.72^b
Critical values	1%	-3.61	-4.21	-3.61	-4.21
	5%	-2.93	-3.52	-2.93	-3.52
	10%	-2.61	-3.19	-2.61	-3.19

Notes:

[a] Δ is the first difference operator.

[b] Illustrates 1% statistical significance.

Table 3. Carrion-i-Silvestre et al. (2009) unit root test[a]

Variable[b]	P_T^{GLS}	MP_T^{GLS}	MZ_α^{GLS}	MSB^{GLS}	MZ_T^{GLS}	**Break dates**
RC	22.57 [9.33]	23.03 [9.33]	-19.40 [-46.90]	0.16 [0.10]	-3.10 [-4.82]	2012:04, 2012:12, 2013:09, 2014:01, 2014:05
$(I^u - I^p)$	24.39 [9.27]	24.32 [9.27]	-18.95 [-47.80]	0.15 [0.10]	-2.95 [-4.87]	2012:01, 2012:08, 2013:06, 2013:12, 2014:05
ΔRC	4.68^b [5.54]	4.91^b [5.54]	-18.84^b [-17.32]	0.16^b [0.17]	-3.05^b [-2.89]	
$\Delta(I^u - I^p)$	4.83^b [5.54]	4.96^b [5.54]	-18.86^b [-17.32]	0.16^b [0.17]	-3.04^b [-2.89]	

Notes:

[a] Values in brackets are critical values at 5% level of significance. They are obtained from the bootstrap approach of Carrion-i-Silvestre et al. (2009).

[b] Δ is the first difference operator.

[c] Illustrates 5% statistical significance.

The results for Johansen (1988, 1991) and Maki (2012) cointegration tests are depicted in Table 4 and Table 5, respectively. According to the results of Johansen (1988, 1991) cointegration test, the null hypothesis of no cointegration is rejected by trace statistic.

Besides, there is a cointegration relationship according to the model 0 of Maki (2012) cointegration test. Therefore, it can be claimed that there is a cointegration relationship between variables and that real credits converge to its long-run equilibrium by correcting any possible deviations from this equilibrium in the short run.

Table 4. Johansen (1988, 1991) cointegration test[a,b]

Null hypothesis	Alternative hypothesis	Trace statistic	Critical value (5%)	Null hypothesis	Alternative hypothesis	Max-eigen statistic	Critical value (5%)
r=0	r>0	20.41[c]	20.26	r=0	r=1	15.64	15.89
r≤1	r>1	4.76	9.16	r=1	r=2	4.76	9.16

[a] All model selection criteria indicate 1 as the lag length. There are not serial correlation and heteroskedasticity problems for this lag length.

[b] r is the number of the cointegrating vector.

[c] Illustrates 5% statistical significance.

Table 5. Maki (2012) cointegration test

Model	Test statistic	Critical values[a]			Break dates
		1%	5%	10%	
0	-5.64[b]	-5.95	-5.42	-5.13	2012:09, 2013:01, 2013:03, 2013:09, 2014:02
1	-4.29	-6.19	-5.69	-5.44	2012:02, 2012:05, 2012:08, 2013:07, 2014:08
2	-5.48	-6.91	-6.35	-6.05	2012:05, 2012:09, 2013:05, 2014:02, 2014:11
3	-5.58	-8.00	-7.41	-7.11	2012:05, 2013:04, 2013:09, 2014:02, 2014:09

Notes:

[a] Critical values are obtained from Table 1 in Maki (2012).

[b] Illustrates 5% statistical significance.

Dummy variables of breaking periods obtained from Maki (2012) cointegration test are included to the model to obtain long-term coefficients. The long-term coefficients estimated through the DOLS approach are denoted in Table 5. As seen in the table, the coefficient of the difference between the upper bound of the corridor and the policy rate is negative and significant. Thereby, one may claim that the difference between the upper bound of the corridor and the policy rate gas has statistically significant and negative impacts on real credits. Therefore, it can be argued that the uncertainty about the funding amount and the funding cost that is created by the CBRT has negative effects on credits in Turkey.

Table 6. Estimation of the long-term coefficients[a]

Dependent variable: RC

Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.00)

Regressor	Coefficient	Standard error	p-value
$(l^u - l^p)$	-221.55[b]	51.93	0.00
d1	-279.34	493.02	0.57
d2	-449.01	493.92	0.37
d3	-619.23	502.64	0.22
d4	134.78	493.92	0.78
d5	-122.20	502.64	0.80
Intercept	4869.36	219.26	0.00
Adj. R^2 = 0.55			

Notes:

[a] Break dates are selected based on model 0 in Maki (2012).

[b] Illustrates 1% statistical significance.

To the best of my knowledge, the only study on the effectiveness of the interest rate corridor belongs to Binici et al. (2013). They yield that loan rates are more sensitive to the upper bound of the corridor while deposit rates mostly respond to the policy rate. They also find that loan-deposit spread is positively related to the difference between the upper bound of the corridor and the policy rate. Thus they remark that the interest rate corridor can be an effective instrument to control loan-deposit spread. Therefore, the findings of this paper conform to those of Binici et al. (2013). Both papers reveal that the interest rate corridor can be utilized as a macroprudential tool in order to affect credits and aggregate demand.

5. Conclusion

In the aftermath of the 2008 global financial crisis, low interest rates and quantitative easing policies of central banks of advanced countries to reduce the effects of the crisis led to the appreciation of TL and to rapid credit growth in Turkey. As a result, the current account deficit of Turkey increased and the quality of the financing of the deficit decreased. The CBRT designed a new monetary policy framework in the last quarter of 2010 in order to achieve financial stability along with price stability. In addition to the policy rate, the CBRT began to utilize macroprudential tools to achieve these goals. The three macroprudential that the CBRT have used so far are reserve requirements, reserve option mechanism, and the interest rate corridor.

The interest corridor is employed as a macroprudential tool by the CBRT not only to decrease the volatility in exchange rates but also to mitigate rapid credit growth. Accordingly, the CBRT began to lend to banks not only on the policy rate but also on the upper bound of the corridor in October 2011. The CBRT aims at creating uncertainty about the funding amount and the funding cost by employing the interest rate corridor to alleviate rapid growth in credits. Accordingly, the CBRT expects a rise in the difference between the upper bound of the corridor and the policy rate to increase uncertainty for banks which depend on the CBRT funding. Thus the CBRT aims at discouraging banks to extend credits rapidly. This paper examines whether this difference affects the quantity of credits negatively in Turkey as the CBRT expects. After conduncting ADF, PP, and Carrion-i-Silvestre et al. (2009) unit root tests, the paper employs Johansen (1988, 1991) and Maki (2012) cointegration tests. Then, the paper follows the DOLS estimator to obtain long-term coefficients. The DOLS estimator yields that real domestic credits are negatively related to the difference between the upper bound of the corridor and the policy rate. Based on the empirical findings, this paper argues that the interest rate corridor can be utilized as a macroprudential tool to affect credits and aggregate demand in Turkey.

Notes

(1) It must be noted that the CBRT has utilized the interest rate corridor also to decrease the volatility in exchange rates. For example, in response to the appreciation of the TL, the CBRT extended the corridor dawnwardly towards the end of 2010 to mitigate short-term capital inflows to Turkey as a wider corridor creates more uncertainty about short-term yields. Additionally, the CBRT funded banks on the upper bound of the corridor and on the policy rate not only to prevent rapid credit growth but also to reduce the depreciation pressure on the TL. The CBRT has denominated the funding on the upper bound of the corridor as "additional monetary tightening" beginning from June 2013. See Ermisoglu et al. (2014) to examine the effects of the additional monetary targeting on exchange rates.

References

Akcelik, Y., Aysan, A.F. and Oduncu, A., 2013. Central banking in making during the post-crisis world and the policy-mix of the Central Bank of the Republic of Turkey. *Journal of Central Banking Theory and Practice*. 2. pp. 5-18.

Aysan, A.F., Fendoglu, S. and Kilinc, M., 2014. Managing short-term capital flows in new central banking: unconventional monetary policy framework in Turkey. *Eurasian Economic Review*. 4. pp. 45-69.

Aysan, A.F., Fendoglu, S. and Kilinc, M., 2015. Macroprudential policies as buffer against volatile cross-border capital flows. *CBRT Working Papers*. 4.

Bai, J. and Perron, P., 2003. Computation and analysis of multiple structural change models. *Journal of Applied Econometrics*. 181. pp. 1-22.

Banking Regulation and Supervision Agency, http://www.bddk.org.tr/ (Last reached on May 21, 2015).

Berentsen, A., Marchesiani, A. and Waller, C.J., 2010. Channel systems: why is there a positive spread? *Institute for Empirical Research in Economics University of Zurich*. 517.

Binici, M., Erol, H., Kara, H., Ozlu, P. and Unalmis, D., 2013. Interest rate corridor: a new macroprudential policy tool. *CBRT Research Notes in Economics*. 20.

Borio, C. (2003). Towards a macroprudential framework for financial supervision and regulation? *CESifo Economic Studies*. 49. pp. 181-215.

Carrion-i-Silvestre, J.L., Kim, D. and Perron, P., 2009. GLS-based unit root tests with multiple structural breaks under both the null and the alternative hypotheses. *Econometric Theory*. 25. pp. 1754-1792.

Central Bank of the Republic of Turkey, http://www.tcmb.gov.tr/, (Last reached on May 21, 2015).

Cerutti, E., Claessens, S. and Laeven, L., 2015. The use and effectiveness of macroprudential policies: new evidence. *IMF Working Paper*. 61.

Claessens, S., 2014. An overview of macroprudential policy tools. *IMF Working Paper*. 214.

Degerli, A. and Fendoglu, S., 2015. Reserve option mechanism as a stabilizing policy tool: evidence from exchange rate expectations. *International Review of Economics & Finance*. 35. pp. 166-179.

Dickey, D.A. and Fuller, W.A., 1981. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*. 49. pp. 1057-1072.

Elliott, G., Rothenberg, T.J. and Stock, J.H., 1996. Efficient tests for an autoregressive unit root. *Econometrica*. 64. pp. 813-836.

Engle, R.F. and Granger, C.W.J., 1987. Co-integration and error correction: representation, estimation, and testing. *Econometrica.* 55. pp. 251-276.

Esteve, V. and Requena, F., 2006. A cointegration analysis of car advertising and sales data in the presence of structural change. *International Journal of the Economics of Business.* 13. pp. 111-128.

Ermisoglu, E., Akcelik, Y., Oduncu, A. and Taskin, T., 2014. Effects of additional monetary tightening on exchange rates. *Eurasian Economic Review.* 4. pp. 71-79.

International Monetary Fund, 2011. Macroprudential policy: an organizing framework. *Staff Report.*

Johansen, S., 1998. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*. 12. pp. 231-254.

Johansen, S., 1991. Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica.* 59. pp. 1551-1580.

Kahn, G.A., 2010. Monetary policy under a corridor operating framework. *Federal Reserve Bank of Kansas City Economic Review.* 95. pp. 5-34.

Katircioglu, S., 2014. Testing the tourism-induced EKC hypothesis: the case of Singapore. *Economic Modelling.* 41. pp. 383-391.

Maki, D., 2012. Tests for cointegration allowing for an unknown number of breaks. *Economic Modelling.* 29. pp. 2011-2015.

Ng, S. and Perron, P., 2001. Lag length selection and the construction of unit root tests with good size and power. *Econometrica.* 69. pp. 1519-1554.

Perron, P. and Ng, S., 1998. An autoregressive spectral density estimator at frequency zero for nonstationarity tests. *Econometric Theory.* 14. pp. 560-603.

Perron, P. and Rodriguez, G., 2003. GLS detrending, efficient unit root tests and Structural change. *Journal of Econometrics.* 115. pp. 1-27.

Perron, P. and Qu, Z., 2007. A simple modification to improve the finite sample properties of Ng and Perron's unit root tests. *Economics Letters.* 94. pp. 12-19.

Phillips, P.C. and Perron, P., 1988. Testing for a unit root in time series regression. *Biometrika.* 75. pp. 335-346.

Stock, J.H. and Watson, M.W., 1993. A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica.* 61. pp. 783-820.

Stock, J.H., 1999. A class of tests for integration and cointegration. In: Engle, R., White, H. (Eds.). *Cointegration, Causality and Forecasting: A Festschrift for Clive W. J. Granger.* Oxford: Oxford University Press. pp. 135-167.

Westerlund, J. and Edgerton, D.L., 2007. New improved tests for cointegration with structural breaks. *Journal of Time Series Analysis*. 28. pp. 188-224.