Determinants of the Short-Run Interest Rate in Turkey: A Taylor Rule Approach

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Abstract

This study is investigated the determinants of the short run interest rate and validity of the Taylor Rule, using Two-Stage Least Squares (TSLS), Method of the Generalized Moments (GMM) and Relative Sensitivity Analyses (RSA) for 2002-2016 periods in Turkey. Results of the TSLS and GMM analyses are show that there are positive relationship between the interest rate, capacity utilization rate, exchange rate and inflation gap. According to the RSA results, there are stronger relationships between short run interest rate, capacity utilization rate and exchange rate than output gap. In this context, these two variables which are capacity utilization rate and exchange rate, can be effective indicators for predict to the short run interest rates in Turkey. Beside, according to TSLS and GMM results, interest rate smoothing parameter is meaningful and positive effect on the nominal interest rate. This result indicates that a sudden change in the short run interest rate was not made by the CBRT in this period.

Keywords: Taylor Rule, Short-Run Interest Rate, TSLS, GMM, RSA.

Introduction

Inflation targeting regime has been implemented in Turkey since 2002. In this context, the Central Bank of the Republic of Turkey (CBRT) has focused on the inflation rate as ultimate goal. CBRT is implementing an interest rate corridor in order to react more quickly to abnormal movements in the money market. As the monetary policy indicator is used the short run interest rates by CBRT. The developments the inflation and the interest rates can be observed from the Table 1, for the period 2002-2016 in Turkey. According to Table 1, actual inflation rate is lower than targeted for 2002-2005 and 2009-2010 periods. On the other hand, it is higher than targeted for 2006-2008 periods. Meanwhile, sort run interest rates were decreased continuously in these periods, except O/N repo interest rate in the 2008. For 2010-2013 periods, despite the increase gap between actual and target inflation, we can see that short run interest rates were continued to decrease. It is 11.05%-8.51% band in 2014, 10.67%-8.81% band in 2015 and 9.40%-8.31% band in 2016. Actual inflation rates are 8.2%-8.8% band in these periods. In this context, the main motivation of this study is determined to indicators of the short run interest rate in Turkey.

In the literature, about this issue, Taylor Rule is developed by John Taylor (1993) on the US economy. It is a forecasting model for the nominal interest rate. Taylor Rule is defined as in Equation 1:

\[ i_t = \pi_t + \pi_t^* + \alpha(\pi_t^* - \pi_t^*) + \beta(y_t^* - y_t^*) + \epsilon_t \]  

(1)

At the Equation 1, i is the nominal FED funds rate; \( \pi_t \) is the real FED funds rate, \( \pi_t^* \) is the actual inflation rate, \( \pi_t^* \) is the expected inflation rate, \( y_t \) is real outputgap, \( y_t^* \) is the potential outputgap, \( \alpha \) is the response coefficient of the interest rate to the inflation rate, \( \beta \) is the response coefficient of the interest rate to the outputgap gap. \( \epsilon \) is the error and it is fulfills the white noise properties and the t is denotes time. In this regard, Taylor (1993) defines the policy rate as a function of inflation gap and outputgap. If occurred a gap in the inflation rate and/or the outputgap, the central bank should intervene to the market by changing the nominal interest rate (Ball 1999: 130). Under the assumption open economy, Taylor's Rule is developed as follows (Greiber and Herz, 2000, 9).

\[ i_t = \pi_t + \pi_t^* + \alpha(\pi_t^* - \pi_t^*) + \beta(y_t^* - y_t^*) + \delta(e_t - e_t^*) + \epsilon_t \]  

(2)
According to the Equation 2, $e_i$ is the exchange rate, $e_i^*$ is equilibrium exchange rate, $\delta$ is the response coefficient of the interest rate to the exchange rate.

### Table 1: Inflation Target-Actual and Sort Run Interest Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Target Inflation</th>
<th>Actual Inflation</th>
<th>Overnight Repo (O/N)</th>
<th>Average of O/N and (2-14 days) Repo</th>
<th>AOFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>35</td>
<td>29.7</td>
<td>56.78</td>
<td>58.58</td>
<td>57.68</td>
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<tr>
<td>2003</td>
<td>20</td>
<td>18.4</td>
<td>43.62</td>
<td>41.20</td>
<td>42.41</td>
</tr>
<tr>
<td>2004</td>
<td>12</td>
<td>9.3</td>
<td>30.14</td>
<td>-</td>
<td>30.14</td>
</tr>
<tr>
<td>2005</td>
<td>8</td>
<td>7.7</td>
<td>17.81</td>
<td>16.76</td>
<td>17.28</td>
</tr>
<tr>
<td>2006</td>
<td>5</td>
<td>9.7</td>
<td>-</td>
<td>18.26</td>
<td>18.26</td>
</tr>
<tr>
<td>2007</td>
<td>4</td>
<td>8.4</td>
<td>-</td>
<td>16.73</td>
<td>16.73</td>
</tr>
<tr>
<td>2008</td>
<td>4</td>
<td>10.1</td>
<td>19.81</td>
<td>16.58</td>
<td>18.20</td>
</tr>
<tr>
<td>2009</td>
<td>7.5</td>
<td>6.5</td>
<td>-</td>
<td>9.39</td>
<td>9.39</td>
</tr>
<tr>
<td>2010</td>
<td>6.5</td>
<td>6.4</td>
<td>-</td>
<td>6.92</td>
<td>6.92</td>
</tr>
<tr>
<td>2011</td>
<td>5.5</td>
<td>10.4</td>
<td>10.84</td>
<td>6.24</td>
<td>8.54</td>
</tr>
<tr>
<td>2012</td>
<td>5</td>
<td>6.2</td>
<td>10.94</td>
<td>6.42</td>
<td>8.68</td>
</tr>
<tr>
<td>2013</td>
<td>5</td>
<td>7.4</td>
<td>6.77</td>
<td>5.62</td>
<td>6.20</td>
</tr>
<tr>
<td>2014</td>
<td>5</td>
<td>8.2</td>
<td>11.05</td>
<td>9.01</td>
<td>10.02</td>
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<tr>
<td>2015</td>
<td>5</td>
<td>8.8</td>
<td>10.67</td>
<td>8.47</td>
<td>9.57</td>
</tr>
<tr>
<td>2016</td>
<td>5</td>
<td>8.5</td>
<td>9.40</td>
<td>8.28</td>
<td>8.84</td>
</tr>
</tbody>
</table>

* AOFM is calculated as a weighted average of the short term interest rates. Therefore, AOFM is obtainable indicator after 2011 from the CBRT, but not before 2011. So, as a short-run interest rate indicator was used average of the O/N and 2-14 days repo interest rate in the study.


Central banks often make small changes in the interest rates, not instantaneous. To identify this situation, interest rate smoothing parameter is added to the Equation 2 which is one lag of the interest rate indicator (Judd and Rudebusch, 1998).

$$i_t = \rho_i i_t + (1-\rho_i)(r_t^* + \pi_t^* + \alpha(\pi_t - \pi_t^*) + \beta(Ey_t - y_t^*) + \delta(e_t - e_t^*) + e_t)$$

Equations 1-3 are classic specifications of the Taylor Rule in an open economy. If monetary policy acts with a delay of k periods, it is called a forward looking Taylor Rule (Clarida et al., 1999):

$$i_t = \rho_i i_t + (1-\rho_i)(r_t^* + \pi_t^* + \alpha(\pi_t - \pi_t^*) + \beta(Ey_{t-k} - y_{t-k}^*) + \delta(e_{t-k} - e_{t-k}^*) + e_t)$$

In this mean, $E$ is the rational expectations operator at the equation 4. In this study is examined validity of the forward looking Taylor Rule approach which is specified in Equation 4.

There are various studies about the Taylor Rule in the literature; Clarida et al. (1999) have concluded that the Taylor Rule is valid in developed countries such as USA, Germany, Japan, France, Italy and England. Nelson (2000), Batini (2001) determined that the outputgap for the UK and the inflationary deficit were above the interest rate. Österholm (2003) concluded that the US acted similar to the Taylor Rule of nominal interest rates for Sweden, Austria. Astar (2009) investigated the Taylor Rule for OECD countries and observed that this rule is valid. Mohanty and Klau (2004) found out that the rate of interest rate on foreign exchange rates in some developing countries was higher than that of inflation and production. On the other hand, Savvides (1998) for Central African countries, Woglom (2003) for the period 1990-1999 for South African countries, Cote et al. (2002), Batini et al. (2001), Justiniano and Preston (2008) concluded that the Taylor Rule is not valid for the developing countries.

Studies in this field about Turkey can be divided two groups. In the first group were made before the inflation targeting regime, in the other words before 2002 years. In these studies have generally revealed that the Taylor Rule is invalid for Turkey’s interest policy. For example; the studies of Kaytancı (2005), Erdal and Güloğlu (2005), Aklan and Nargelecekenler (2008) are not compatible with Taylor Rule. Kesriyeli and Yalçın (1998) have concluded that the Taylor Rule is more effective for developed countries with low inflation than Turkey. Similarly, Ongan (2004) found no statistically significant relationship between the interest rate and the outputgap. In the studies in the second group generally consistent with the Taylor Rule such as Yapraklı (2007), Gökül and Songur (2016), Bal, Tanrıöver and Erdoğan’s (2016) studies. On the other hand, Ardor and Varlik (2014) have reached the conclusion that McCallum and Taylor-McCallum Rules are not valid for the period of study.

This study’s contribution to the literature can be summarized as follows: Firstly, the capacity utilization rate was used as a variable in the models which is measure total aggregate demand. Secondly, average of the overnight
and 2-14 days repo interest rate was used as a short run interest rate indicator. Thirdly, Relative Sensitivity Analysis (RSA) is used firstly in this area and it is provided a comprehensive explanation of the relationships between the variables.

**Variables and Methods**

This study is determined the validity of the Taylor Rule for 2003-2016 periods in Turkey which is using Two Stage Least Squares Method (TSLS), Method of Generalized Moments (GMM) and Relative Sensitivity Analysis (RSA). In this context, nominal interest rate function is expressed as;

$$ INT = f(OUTPUTGAP, CUTIL, INFGAP, REXC, INT(-1)) $$  

(5)

INT is the dependent variable which is the average of the overnight (O/N) and 2-14 days repo interest rate as an indicator of the short run interest rate. The independent variables are output gap (OUTPUTGAP), capacity utilization rate (CUTIL), inflation gap (INFGAP), real exchange rate (REXC) and interest smoothing parameters INT(-1). The trend value of the real GDP (potential GDP) is calculated used by Hodrik-Prescott (HP) Filter (lambda=1600). The OUTPUTGAP is then determined by the difference between actual and potential GDP. When the OUTPUTGAP value is positive, demand-side inflation rises in the economy and this situation triggers the nominal interest rate. Capacity utilization ratio (CUTIL) is prepared by the CBRT according to the Business Tendency Survey which is applied to establishments operating in manufacturing industry. A positive relationship is expected between capacity utilization rate and interest rate, like OUTPUTGAP. Inflation gap (INFGAP) is the calculated minus to consumer inflation rate from the expected inflation forecast for the current month. The positive relationship between the interest rate and inflation gap is expected. Real exchange rate (REXC) is calculated by CBRT for the base year 2000. The relationship between exchange rate and interest rate is also expected positive. INT(-1) is defined as the interest smoothing parameter. All variables are taken from the CBRT and adjusted seasonally using the exponential smoothing method.

After than Minimized Dickey-Fuller Test was used for determined whether a structural break or not at the variables. This test is applied when unknown the history of structural break. The null hypothesis is represented by Model 0.

**Model 0**: non-trending data with intercept break:

$$ y_i = \mu + 0 \ DU(T_b) + \alpha DT_i(T_b) + \gamma DT_i(T_b) + \theta T_i + \epsilon_i $$  

(6)

$ DU(T_b) $ is an intercept break variable, $ DT_i(T_b) $ is a trend break variable, coefficient $ \beta $ and $ \gamma $ to zero yields a test of a random walk against a trend stationary model with intercept break. The following three models are used for Minimized Dickey-Fuller test:

**Model 1**: trending data with intercept break

$$ y_i = \mu + \beta_1 + 0 \ DU(T_b) + \gamma DT_i(T_b) + \alpha DT_i(T_b) + \theta T_i + \epsilon_i $$  

(7)

**Model 2**: trending data with intercept and trend break

$$ y_i = \mu + \beta_1 + \gamma DT_i(T_b) + \alpha DT_i(T_b) + \theta T_i + \epsilon_i $$  

(8)

**Model 3**: trending data with trend break

$$ y_i = \mu + \beta_1 + \gamma DT_i(T_b) + \alpha DT_i(T_b) + \epsilon_i $$  

(9)

According to Model 1, 2, 3, if the calculated t-test value is greater than the critical t-test value, the null hypothesis is rejected. This shows that there is structural break in the data.

After this process three econometric analyses was used in the study which is the first Two Stage Least Squares Method (TSLS). TSLS method was developed by Theil (1953) and Basman (1957). This method is applied consistently and asymptotically to over-determined structural equations to obtain effective estimates. It also gives the same results as the indirect least squares method when applied to fully specified equations.

There are two distinct stages in TSLS. In the first stage, TSLS finds the portions of the endogenous and exogenous variables that can be attributed to the instruments. This stage involves estimating an OLS regression of each variable in the model on the set of instruments (Ramanathan 1995: 668).

$$ Y_i = \alpha_0 + \alpha_1 Y_{i1} + \alpha_2 Y_{i2} + \ldots + \alpha_n Y_{iN} + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_M X_{iM} + \epsilon_i $$  

(10)

$$ Y_{i1} = \pi_1 X_{i1} + \pi_2 X_{i2} + \ldots + \pi_M X_{iM} + \theta' \epsilon_i $$  

(11)

$$ Y_{i2} = \pi_1 X_{i1} + \pi_2 X_{i2} + \ldots + \pi_M X_{iM} + \theta' \epsilon_i $$  

(12)

$$ Y_{iM} = \pi_1 X_{i1} + \pi_2 X_{i2} + \ldots + \pi_M X_{iM} + \theta' \epsilon_i $$  

(13)

Due to this reduced equation predicts values of $ Y_i (Y') $. In the second stage, the Y variables are used as variables instead of Y variables in the structural Equation (14).

$$ Y_i = \alpha_0 + \alpha_1 Y_{i1} + \alpha_2 Y_{i2} + \ldots + \alpha_n Y_{iN} + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_M X_{iM} + \epsilon_i $$  

(14)

In this equation, the terms $ \alpha_i $ and $ \beta_i $ are calculated by the TSLS method.
Secondly, Generalized Method of Moments (GMM) is used in this study. GMM was presented and developed by Hansen (1982) and Arellano and Bond (1991). The advantage of GMM is that it allows formulating models and specific estimators without the need for strong distribution assumptions (Greene, 2002). Mean while the stationarity of variables and existence of the required moment conditions for estimation are enough for GMM analysis (Sahin and Genç; 2009:112). Beside this, the estimators will be extremely strong and robust when the use GMM method because this method is controls the problems of endogeneity in explanatory variables. And than GMM method is that it allows over-identification in the estimation of the parameters of the model.

Equation 15 is showed GMM estimator (Hall 2005, 14):

$$Q_0(\theta) = T^{-1} \sum_{t=1}^{T} f(v_t, \theta)^{\dagger} W_T T^{-1} \sum_{t=1}^{T} f(v_t, \theta)$$  (15)

$$Q_0(\theta)$$ is GMM estimator, T is observation frequency, $$W_T$$ is weigted matrix, $$v_t$$ is vector of random variables, $$f$$ is vector of the function.

Thirdly, Relative Sensitivity Analysis (RSA) is used in this study. The relationships between variables can be seen in a more comprehensive way with this method. RSA is utilized in various fields in theoretical and applied science such as medical science (Isenring et al. 2009). Beside this, several local and global sensitivity analyses applied to microeconomic and macroeconomic problems exist in the literature. By Borgonovo and Peccati (2004), absolute sensitivity analysis is applied to the equations regarding the investment decisions and then the elasticity of survival risk validation is investigated. Similarly, a global sensitivity analysis is performed on investment decisions in energy sector (Borgonovo and Peccati 2006).

In statistics, basically three types of sensitivities can be calculated in order to provide insight to the analysis, namely absolute sensitivity, semi-normalized sensitivity and the normalized (relative) sensitivity. Let the outcome of a model by $$y$$, which is a function of input variables such $$x_1, x_2,..., x_n$$ as shown in Equation 16:

$$y = f(x_1, x_2, ..., x_n)$$  (16)

Absolute sensitivity is defined as the absolute change in the $$y$$ with respect to the change in one of the input variables, $$x$$.

$$S_{abs} = \frac{\Delta y}{\Delta x_n}$$  (17)

Semi-normalized sensitivity includes the change in the output variable with the ratio of the changes of output and input variables as given in Equation (18).

$$S_{semi-norm} = \frac{y}{\Delta x_n} \frac{\Delta y}{\Delta x_n}$$  (18)

Absolute values and the rate of changes of both output and input variables exist in the definition of the relative sensitivity as formulated in Equation (19).

$$S_{relative} = \frac{y}{\Delta x_n} \frac{\Delta y}{\Delta x_n}$$  (19)

In this study was used relative sensitivity because relative it gives a better understanding of the effects of input variables on the output variables than absolute sensitivity which is merely a ratio of the change of input and output variables. Secondly, it is easier to obtain the time dependent sensitivity with the relative sensitivity concept.

Results

Application results are presented in this section. Thus, Minimized Dickey-Fuller Unit Root Test results are shown the Table 2.

### Table 2

<table>
<thead>
<tr>
<th>Variables</th>
<th>Breakpoint</th>
<th>Lag</th>
<th>t-table*</th>
<th>Prob.</th>
</tr>
</thead>
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<tr>
<td>INT (level)</td>
<td>2004Q12</td>
<td>4</td>
<td>-8.43</td>
<td>0.00</td>
</tr>
<tr>
<td>INFGAP (level)</td>
<td>2004Q10</td>
<td>3</td>
<td>-8.96</td>
<td>0.00</td>
</tr>
<tr>
<td>MPIGAP (first d.)</td>
<td>2009Q09</td>
<td>10</td>
<td>-6.89</td>
<td>0.01</td>
</tr>
<tr>
<td>CUTIL (level)</td>
<td>2008Q09</td>
<td>12</td>
<td>-6.54</td>
<td>0.01</td>
</tr>
<tr>
<td>REXC (first d.)</td>
<td>2007Q12</td>
<td>11</td>
<td>-5.66</td>
<td>0.01</td>
</tr>
</tbody>
</table>

* shows %1 significant values for t-table value. For lag selection criteria is used F statistics.
Minimized Dickey Fuller unit root test show that INT, INFGAP and CUTIL are stab at the level. Other side MPIGAP and REXC are stable at the first differences. For the TSLS and GMM analyses are used one lag values of the variables as the vehicle variables (Brouwer and Gilbert, 2005). These analyses results were showed in the Table 3.

Table 3
TSLS and GMM Analysis Results

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>54.75</td>
<td>9.48</td>
<td>5.77*</td>
<td>73.03</td>
<td>8.53</td>
<td>8.56*</td>
</tr>
<tr>
<td>INT(-1)</td>
<td>0.21</td>
<td>0.09</td>
<td>2.33*</td>
<td>1.17</td>
<td>0.25</td>
<td>4.68*</td>
</tr>
<tr>
<td>MPIGAP(-1)</td>
<td>0.04</td>
<td>0.05</td>
<td>0.91</td>
<td>0.03</td>
<td>0.09</td>
<td>0.93</td>
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<tr>
<td>CUTIL</td>
<td>0.66</td>
<td>0.17</td>
<td>3.88*</td>
<td>2.04</td>
<td>1.21</td>
<td>2.07*</td>
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<tr>
<td>REXC(-1)</td>
<td>0.13</td>
<td>0.03</td>
<td>4.45*</td>
<td>2.90</td>
<td>1.20</td>
<td>2.42*</td>
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<tr>
<td>DUMOUTPUT</td>
<td>-6.39</td>
<td>1.10</td>
<td>-5.08*</td>
<td>-4.39</td>
<td>1.46</td>
<td>-3.01*</td>
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<tr>
<td>DUMINT</td>
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<td>2.03</td>
<td>-3.07*</td>
<td>-4.23</td>
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<td>DUMINF</td>
<td>-2.46</td>
<td>2.07</td>
<td>-1.18</td>
<td>-3.60</td>
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<tr>
<td>DUMCUTIL</td>
<td>-4.19</td>
<td>1.74</td>
<td>-2.41*</td>
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<tr>
<td>DUMREXC</td>
<td>-0.10</td>
<td>1.08</td>
<td>-0.09</td>
<td>1.12</td>
<td>1.02</td>
<td>-1.10</td>
</tr>
</tbody>
</table>

R^2         | 0.89        | 0.86      |
Adjusted R^2 | 0.88        | 0.87      |
F-Statistic  | 459         | -         |
DW           | 1.95        | 2.01      |


Table 4 shows that according to these two analysis, interest rate is effected positively by the exchange rate, capacity utilization rate and inflation gap. Especially the relationship between the exchange rate and the interest rate seems strong. Secondly, capacity utilization rate is more effect on the interest rate than inflation gap. However, the interest rate adjustment parameter (INT(-1)) is statistically significant. This result shows that the CBRT has not made rapid changes in the short run interest rate and has followed policies consistent with the previous period. On the other hand, we can say that short run interest rate is not affected by the output gap because its coefficient is not statistically significant.

Figures 1-4 show the results of the RSA analysis. In these figures, the horizontal axis show the period, the vertical axis shows the relative sensitivity coefficients. Thus, the relative sensitivity coefficients between variables for each period can be explored.

Figure 1 show that the interest rate's sensitivities coefficients to the inflation gap are between 0-0.5. It has the highest positive value in the 24th period (2004: m11), lowest negative value in the 113th (2012: m04) and 124th (2013: m03) periods. Sometimes it’s relative sensitivity coefficients are negative because the actual inflation ratea are higher than expected inflation rates and the interest rate increases more slowly than the actual inflation rate in these years.
Figure 1
Relative Sensitivity of the Interest Rate to the Inflation Gap

Figure 2 shows the relative sensitivity of the interest rate to the GDP gap (OUTPUTGAP). The relationship between these two variables is usually positive and between 0-2. It’s highest positive value was appeared at the 2004: m12. On the other hand, it’s highest negative values was appeared at the 61st (2007: m12) and 74th (2009: m01) periods. The reason for these negative coefficients is the reversal relations in these periods. When positive output gap decreases or negative OUTPUTGAP increases, interest rate does not comply with these changes.

Figure 2
Relative Sensitivity of the Interest Rate to the Output Gap
In Figure 3 is shown the relations between interest rate and exchange rate. It seems that the relationship between these two variables is strong. This is evident from their high relative sensitivity coefficients. The direction of the relationship is largely positive in accordance with the expectation. Beside the relationship between these two variables is reached highest values 26th (2005: m01) and 114th (2012: m05) periods.

Figure 3
Relative Sensitivity of the Interest Rate to the Exchange Rate

Figure 4
Relative Sensitivity of the Interest Rate to the Capacity Utilization Rate
Figure 4 shows the relative sensitivity ratios between interest rate and capacity utilization rate. We can say that the relations between these variables stronger than other variables. The direction of the relationship is largely positive. The highest positive value at 47th (2006: m10), the lowest negative value at 133th (2013: m12) periods. Depending on the RSA results, the capacity utilization rate and the exchange rate can be guide indicators predict the sort run interest rate.

Conclusion

In this study is investigated the determinations of the short run interest rate under the Taylor Rule approach, for 2002-2016 periods in Turkey. The dependent variable is the interest rate and the independent variables are the production deficit, inflation deficit, the real exchange rate, the capacity utilization rate and the interest rate smoothing parameter. In testing the stability of the variables was used Minimized Dickey-Fuller unit root test. According to this test results was seen structural breaks at the all variables so were used dummy variables these breaks at the models. TSLS, GMM and RSA analyses were used as the application methods. These methods’s results show that there are positive relationship between interest rate, capacity utilization rate, exchange rate and inflation gap. In the addition this, TSLS and GMM results show that the interest rate smoothing parameter is meaningful and positive effect on the interest rate. This result is indicates that CBRT was not make a sudden change in the short run interest rate in this period. In this sense, we can say CBRT was maintained a stabil policy for the interest rate. Beside, according to the RSA results, relative sensitivity of the interest rate to the capacity utilization rate and exchange rate are high. Finally, it seem that capacity utilization rate and exchange rate are important variables are effect on the interest rate and than may be guide indicators estimate for the future short run interest rates value.

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