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Research Article

Analysis of the Relationship between Real Effective Exchange Rate, Common Equity Tier 1 Ratio and Return on Equity: Evidence from Turkey

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ABSTRACT

The analysis of the relationship between exchange rate fluctuations, common equity and return on equity is of high importance to be able to improve adequate policies with the purpose of maintaining stability in foreign exchange rate, when it is taken into consideration that mentioned fluctuations lead to the loss in bank capital and profitability. Hence, the studies in the related literature have been increasing in great amount recently. The objective of this study is to investigate the relationship between real effective exchange rate, common equity and return on equity in the period of 2014:01 - 2018:09. The unit root properties of the series are tested by using Carrion-i Silvestre et al.(2009) unit root test and the cointegration relationship between the series is investigated by employing Maki(2012) cointegration test. Both tests take into account multiple structural breaks. The results indicate that there is only a long run relationship between real effective exchange rate and return on equity for Turkish Banking Sector with structural breaks.

Keywords: Real Effective Exchange Rate, Common Equity, Return on Equity, Turkish Banking Sector, Structural Breaks

1. Introduction

Turkish Banking Sector has shown a remarkable performance over the last fifteen years in terms of profitability. Although the November 2000 Banking and February 2001 Currency Crisis caused a severe deterioration in the sector's balance sheets, the Turkish Banking Sector has gained a solid financial structure as a result of the restructuring process and structural reforms carried out in the sector after the crisis. Indicators such as ROA (Return on Asset), ROE (Return on Equity) and NIM (Net Interest Margin) related to profitability and ratios related to capital adequacy have taken high values (Bank Association of Turkey; 2017). Therefore, the Turkish Banking Sector has not been stressed in terms of capital adequacy, asset and equity profitability in the period of global crisis.

In the literature, the factors that determine the profitability of the banking sector are divided into internal and external factors. While internal factors focus on bank-specific features and are heavily influenced by management decisions and policy objectives, external factors which are associated with sectoral and macroeconomic characteristics reflect the economic and legal atmosphere affecting the activities and profitability of financial institutions regardless of the bank's management (Sufian and Kamarudin; 2012). Internal factors are factors that include asset size and quality, capital structure and adequacy, cost efficiency, non-traditional activities of banks, management quality, liquidity, credit portfolio and credit risk, bank size and portfolio diversification. On the other hand, external factors which are categorized as sectoral and macroeconomic factors encompass monetary policy, foreign exchange rate, economic growth, money supply, inflation, financial depth, financial crisis, regulatory and supervisory mechanisms as well as market interest rates (Sufian and Chong; 2008, Athanasoglou, Brissimis and Delis; 2008, Rao and Lakew; 2012).

The foreign exchange risk which arises when the ratio of foreign currency liabilities is high in the bank balance sheets affects banks' asset quality and capital level because of the fluctuations in exchange rates. If the expectations for the future are uncertain and full hedging is not achieved, the pressure of foreign exchange risk on the balance sheets increases. The volatility in the exchange rates significantly increases the risk that the Turkish Banking Sector is exposed to as a result of these fluctuations, as it is in other emerging market economies. When leveraged foreign exchange transactions are included, the cost becomes higher.

The exchange rate risk directly or indirectly can have impact on the profitability of the banks. The direct effect arises when foreign exchange denominated assets and liabilities take part in asset and liability sides in balance sheets. However, if the value of foreign exchange denominated assets and liabilities is equal, the direct effect disappears. On the other hand, indirect effects can have impacts on capital and profitability through cash flows, credit demand, borrowers' balance sheets, import-export and direct investments.

In the periods when exchange rates do have an upward trend, the increase in Turkish Lira value of foreign exchange denominated assets in banking sector balance sheets causes the risk weighted assets to increase and the capital adequacy ratio to move downward. Namely, capital adequacy ratio is called legal equity/risk weighted assets and is affected by the items both upside and downside of the ratio. The first of the

factors which increase the legal equity is the positive contribution coming from new capital inflows and profitability. Moreover, the increase in foreign exchange rate as a result of almost all of the debt instruments such as subordinated debt which is included in the foreign exchange denominated legal equity lead to the increase of the legal equity. The low share of capital backed debt within legal equities limits this increase. The increases in average risk weights and the increase in the total assets lead to an increase in risk-weighted assets and hence a decrease in the capital adequacy ratio (Central Bank of the Republic of Turkey; 2017a).

Nevertheless, the increase in the exchange rate can affect the bank's capital and profitability positively. For instance, as the value of Turkish lira against U.S Dollar falls, the export volume of the country will increase. The relatively expensive imports can create a motive to reduce exports. Therefore, the increase in the exchange rate will be a positive contribution to the increase in the foreign currency incomes of the commercial banks through especially increase in export revenues (Simiyu and Ngile; 2015). Similarly, net interest marjin which is another indicator of profitability and defined as net income from non-interest activities/total assets ratio can be influenced from the movements in foreign exchange rates. Non-interest activities include incomes such as overdraft fees, deposit and loan transaction fees, direct investments revenues and foreign exchange rate incomes. Therefore, an increase in bank foreign exchange rate revenues could trigger upward movement on the net interest margin.

The purpose of this study is to analyze the relationship between real effective exchange rate, common equity and return on equity for the Turkish banking sector by using monthly data of 2014:01 - 2018:09. The contribution of this paper to the literature is that we use Carrion-i Silvestre et al. (2009) unit root test and Maki (2012) cointegration test by considering the effects of structural breaks in the analysis. These techniques have the noticeable advantage of enabling us to test for unit root and cointegration while allowing for up to five structural breaks in the series. This provides greater confidence in the results.

The remaining of the paper is constructed as follows: The next section gives the literature review, the third section presents the unit root test of Carrion-i Silvestre et al. (2009) and the cointegration test of Maki (2012), the fourth section describes data and reports empirical results. Finally, the last section concludes the paper.

2. Literature Review

The number of the studies which investigate the impacts of foreign exchange rate risk on incomes and performance in banking sector has been increasing. In the academic literature of economics, there are studies which examine the relationship between foreign exchange rate and banking sector profitability and reach the conclusion that the foreign exchange rates have both positive and negative impacts on banking sector profitability. On the other hand, it is seen that there are few studies which test the relationship between exchange rate risk and capital adequacy. The studies regarding these relationships between foreign exchange rate-profitability and foreign exchange rate-capital adequacy are mentioned briefly below.

Chamberlain et al (1997) examined the foreign exchange exposure of a group of U.S bank holding companies and Japanese banks by using both daily and monthly data. They constructed estimates of the exchange rate sensivity of the equity returns of the U.S bank holding companies and compare them with Japanese banks. They indicated that exchange rate changes had an significant impact on U.S bank holding companies stock returns, while few of the Japanese banks were affected by exchange rate changes. They also found evidence of a negative relationship between the net foreign asset position of a bank holding company and its foreign exchange exposure.

Atindéhou ve Gueyie (2001) found that bank stock returns were sensitive to exchange rate fluctuations in their study in which they analysed the sensivity of Canadian banking sector to exchange rate risk for the period of 1988-1995 through estimating the three-factor asset pricing model (exchange rate, market, interest rate). Aburime (2008) investigated the determinants of the banking sector profitability in Nigeria for the period of 1980-2006 and found that inflation, monetary policy, real interest rates and foreign exchange rate had significant impacts on banking sector performance.

Wong et al (2008) investigated the exposure of foreign exchange of Chinese banking sector by using the Capital Market Approach and equity-price data of 14 listed Chinese banks for the period of 2005-2008. Their results implied that there was a positive correlation between foreign exchange exposure and bank size and they also found that an appreciation of national currency had the potential to reduce equity values for larger Chinese banks thus hampering the banking sector's performance. Jokipii and Milne (2010) studied the data belonged to U.S bank holding companies and commercial banks in the period of 1986-2008 and tested the relationship between short-term capital buffers and portfolio risk adjustments in their research. Their findings implied that there were positive and significant relationships between capital buffer and risk adjustments over time and also showed that management of short-term adjustments to capital and risk was dependent on the degree of bank capitalization.

Kasman et al (2011) examined the impacts of interest rate and foreign exchange rate changes on Turkish banking sector equity returns by employing the OLS and GARCH estimation models and using the data of 13 Turkish commercial banks for the period of 1999-2009. Their results indicated that only changes in foreign exchange rates and interest rates had negative and significant impacts on the conditional bank stock return but also the volatility in foreign exchange rates and interest rates were the major determinants of the conditional bank stock return volatility.

Ogege et al (2012) tested the impact of capital adequacy on the banking sub-sector and macroeconomic variables in Nigerian economy by using the data set obtained from Central Bank of Nigeria statistical bulletin during the period of 1980-2010. They employed the error correction framework and cointegration techniques to test the relationship between bank capital base and macroeconomics variables. In their study, the real exchange rate was another significant determinant of capital adequacy base and they found that an increase in the real exchange rate would reduce the flow of foreign direct investment and so lead to decreases in capital adequacy base in Nigeria and vice versa.

Abba et al (2013) investigated the relationship between capital adequacy and banking risks for Nigerian banking industry over the period of 2007-2011. After using

risk-weighted asset ratio , deposit ratio and inflation rate, their findings showed that there was a significant negative relationship between risk and capital adequacy ratio of banks. Acaravci and Calim (2013) examined the bank-specific and macroeconomic determinants of profitability in Turkish banking sector for the period of 1998-2011. Their findings implied that although the bank-specific determinants had been more effective than macroeconomic factors, the real GDP and real exchange rate had impact on banking sector profitability in Turkey.

Taiwo and Adesola (2013) studied the impact of foreign exchange rate on banking sector performance in Nigeria for the period of 1970-2005. Their results showed that while there was a positive relationship between foreign exchange rate and loan losses/total loans which was used as the first measure of banking sector performance, there seemed no relationship between foreign exchange rate and capital/deposit ratio. He et al (2014) analysed the impact of foreign exchange rate on U.S banking sector performance by using data of 22 U.S commercial banks over the period of 1978-2008. The findings indicated that the value of the dollar relative to a basket of European currencies, a basket of Asian currencies and a basket of global currencies was positively related to the gains made by the largest U.S. based banks.

Moussa (2015) examined the relationship between bank capital and risk for the Tunisian banking sector over the period of 2000-2010 and found that while there was a negative relationship between capital and risk, there was positive relationship between risk and total loans. Simiyu and Ngile (2015) investigated the determinants of profitability in Kenya banking sector for the period of 2001-2012 and concluded that foreign exchange rate had positive impact on the profitability of commercial banks traded in stock market.

Ekinci (2016) examined the effects of credit and market risk such as interest rate and foreign exchange rate risk on the Turkish banking sector performance by employing the generalized autoregressive conditional heteroscedastic approach for the 01.2002-10.2015 period and using weekly data. The findings of analysis revealed that while both foreign exchange risk and credit risk had a positive and significant impact on banking sector profitability, interest rate did not have a siginificant effect. Combey and Togbenou (2017) analysed the relationship between real effective rate, GDP, inflation and banking sector profitability in Togo for the period of 2006-2015 and found that while macroeconomic variables had no impact on Return on Asset and Return on Equity in the short-run, there was negative relationship between real effective rate and Return on Asset in the long-run.

3. Methodology

This paper investigates the relationship between real effective exchange rate, common equity and return on equity by using recently developed Carrion-i Silvestre et al.(2009) unit root test and Maki(2012) cointegration test. As a first step, Carrion-i Silvestre et al.(2009) unit root test is applied for unit root properties of the series in addition to conventional unit root tests. Then, Maki(2012) cointegration test is used for long run relationships between real effective exchange rate and common equity and also between real effective exchange rate and return on equity. Both tests account for up to five structural breaks for unit root and cointegration and provide us greater confidence in the results. Details of these tests are summarized in below.

3.1. Carrion-i Silvestre et al.(2009) unit root test with multiple structural breaks

Carrion-i Silvestre et al.(2009) introduced a new unit root test which takes into account for up to five structural breaks with the properties as follows: (i) their tests allow for an arbitrary number of changes in both the level and slope of the trend function; (ii) in identifying structural breaks, they use the algorithm of Bai and Perron(2003) through quasi-generalized least squares (quasi-GLS) method and dynamic programming process which minimizes the residual sum of squares; (iii) their test has the feasible point optimal statistic (Elliott et al., 1996) and M-class unit root tests presented in Stock(1999) and analyzed in Ng and Perron(2001). The Data Generating Process (DGP) of the test can be written as below:

$$y_t = d_t + u_t \tag{1}$$

$$u_t = \alpha u_{t-1} + v_t, \quad t = 0,1,....T \tag{2}$$

where u_t is an unobserved mean-zero process. The null hypothesis of unit root under multiple structural breaks is tested by using five different statistics. One of them is the feasible point optimal statistic given by:

$$P_T^{GLS}(\lambda^0) = \frac{\left\{S\left(\bar{\alpha},\lambda^0\right) - \bar{\alpha}S\left(1,\lambda^0\right)\right\}}{s^2\left(\lambda^0\right)} \tag{3}$$

Here, λ denotes the break fraction, $\bar{\alpha}$ equals to $1+\bar{c}/T$ with the $\bar{c}$ is the noncentrality parameter and $s^2\left(\lambda^0\right)$ denotes an approximate of the spectral density at frequency zero of v_t. In addition, following Perron and Rodriguez(2003), Carrion-i Silvestre et al.(2009) employ the M-class of tests analyzed in Ng and Perron(2001) permitting multiple structural breaks, as below:

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

$$MSB_T^{GLS}(\lambda^0) = \left(s\left(\lambda^0\right)^{-2}T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2\right)^{1/2} \tag{5}$$

$$MZ_T^{GLS}(\lambda^0) = \left(T^{-1}\tilde{y}_T^2 - s\left(\lambda^0\right)^2\right)\left(4s\left(\lambda^0\right)^2T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2\right)^{-1/2} \tag{6}$$

with $\tilde{y}_t^2 = y_t - \hat{\psi}' z_t(\lambda^o)$ where $\hat{\psi}$ minimizes the objective function and $s\left(\lambda^0\right)^2$ is an autoregressive estimation function (the detailed information on mentioned objective function and autoregressive estimation function can be found in Equation 4 and Equation 6 of Carrion-i Silvestre at al.(2009), respectively). Following Ng and Perron(2001), as a last statistic, Carrion-i Silvestre at al.(2009) use a modified feasible point optimal test identified by:

$$MP_T^{GLS}(\lambda^0) = \frac{\left[\bar{c}^2 T^{-2}\sum_{t=1}^{T}\tilde{y}_{t-1}^2 + (1-\bar{c})T^{-1}\tilde{y}_T^2\right]}{s(\lambda^0)^2} \quad (7)$$

Since its limiting distribution cohere with the feasible point optimal test, the $MP_T^{GLS}(\lambda^0)$ is important. The asymtotic critical values of the Carrion-i Silvestre et al. (2009) unit root test are obtained through bootstrap approach. If the calculated test statistics are smaller than the corresponding critical values, the null hypothesis is rejected meaning the absence of a unit root.

3.2. Maki (2012) test with multiple structural breaks

It is clear that structural breaks in a cointegration relationship significantly have an impact on the performance of the cointegration tests. Since standard cointegration tests including Engle and Granger (1987) and Johansen (1988, 1991) cannot find a cointegration relationship under structural breaks, new cointegration tests that allow for structural breaks are developed. The cointegration test introduced by Gregory and Hansen (1996) allows a single break. Then, Hatemi-J (2008) extends their test to two structural breaks. But, both of these tests give poor results when the number of breaks are more than three. Cointegration test introduced by Maki (2012) allows for an unknown number of breaks based upon the Bai and Perron(1998) test for multiple structural breaks and Kapetanios(2005) unit root test with m-structural breaks. Maki (2012) estimates following four different models to test for cointegration allowing for multiple breaks:

Model 1 stated below, with a break in the intercept and without trend:

$$y_t = \mu + \sum_{i=1}^{k}\mu_i K_{i,t} + \beta x_t + v_t$$

Model 2 stated below, with a break in the intercept and coefficients, and without trend:

$$y_t = \mu + \sum_{i=1}^{k}\mu_i K_{i,t} + \beta x_t + \sum_{i=1}^{k}\beta_i x_i K_{i,t} + v_t$$

Model 3 stated below, with a break in the intercept and coefficients, and with trend:

$$y_t = \mu + \sum_{i=1}^{k}\mu_i K_{i,t} + \gamma t + \beta x_t + \sum_{i=1}^{k}\beta_i x_i K_{i,t} + v_t$$

Model 4 stated below, with a break in the intercept, coefficient and trend:

$$y_t = \mu + \sum_{i=1}^{k}\mu_i K_{i,t} + \gamma t + \sum_{i=1}^{k}\gamma_i t K_{i,t} + \beta x_t + \sum_{i=1}^{k}\beta_i x_i K_{i,t} + v_t$$

In these models, K_i stands for dummy variables constructed as follows:

$$K_i = \begin{cases} 1 & \text{when} \quad t > T_B \\ 0 & \text{otherwise} \end{cases}$$

where T_B means time of break point. To test for the null hypothesis of no cointegration under structural breaks, critical values are computed by using Monte - Carlo simulations. The detailed information can be found in Maki (2012).

4. Data and Empirical Results

In this paper, we use monthly data belonged to real effective exchange rate, common equity and return on equity for Turkish Banking Sector in the period from 2014:01 to 2018:09. The data sources for real effective exchange rate, common equity and return on equity are Central Bank of the Republic of Turkey, Ministry of Treasury and Finance and Banking Regulation and Supervision Agency, respectively. The seasonality is removed from the data with X12 seasonal adjustment procedure. We convert the data into the natural logarithms before the analysis. The labels of the logarithmic real effective exchange rate, common equity and return on equity are **LRER**, **LCE** and **LROE**, respectively. As a first step, we use conventional ADF (Dickey and Fuller, 1979) and PP (Philips and Perron, 1988) unit root tests with intercept and trend by neglecting existence of possible structural breaks and report the results in Table 1.

	ADF		**PP**	
Series	**Level**	**First difference**	**Level**	**First difference**
LRER	-0.026	-5.810a	-0.164	-5.776a
LCE	-2.564	-6.807a	-2.563	-6.814a
LROE	-2.455	-8.752a	-2.604	-8.931a

Note: [a] indicates rejection of the unit root null hypothesis at the 1% significance level.
Table 1. The results of ADF and PP unit root tests

The results of ADF and PP unit root tests show that LRER, LCE and LROE series have a unit root in level but stationary after first differencing. According to these results, it can be said that the integration orders of the all series are one ($I(1)$). Since Perron (1989) claims that ignoring a structural break can lead to spurious acceptance of the unit root null hypothesis, we extend our unit root analysis with structural breaks by using Carrion-i Silvestre at al. (2009) unit root test. The advantage of the test is that it takes into account for up to five structural breaks. Based on the lenght of our data period, it is possible to consider structural breaks up to three in our analysis. We apply Carrion-i Silvestre at al. (2009) unit root test by considering one, two and three structural breaks in level and trend. The results are tabulated in Table 2.

	Panel A: The results for one break					
Series	P_T	MP_T	MZ_α	MSB_T	MZ_T	**Break years**
LRER	17.749 [5.854]	14.043 [5.854]	-8.035 [-19.692]	0.248 [0.158]	-1.996 [-3.133]	2018:02
LCE	7.533 [6.850]	7.087 [6.850]	-22.424 [-23.627]	0.149 [0.143]	-3.347 [-3.418]	2015: 01
LROE	17.531 [6.309]	15.564 [6.309]	-9.079 [-22.799]	0.233 [0.147]	-2.123 [-3.358]	2017:01
	Panel B: The results for two breaks					
LRER	17.448 [6.514]	15.436 [6.514]	-10.622 [-25.221]	0.216 [0.140]	-2.303 [-3.552]	2016:10; 2018:06
LCE	12.653 [7.299]	12.715 [7.299]	-16.640 [-29.455]	0.173 [0.129]	-2.884 [-3.812]	2014:11; 2015:09
LROE	19.933 [7.760]	16.382 [7.760]	-14.306 [-30.147]	0.185 [0.128]	-2.658 [-3.860]	2015:01; 2017:01
	Panel C: The results for three breaks					
LRER	14.014 [6.587]	14.168 [6.587]	-13.013 [-28.076]	0.195 [0.134]	-2.550 [-3.739]	2014:04; 2017:10; 2018:06
LCE	8.677 [4.596]	8.649 [4.596]	-15.360 [-27.551]	0.180 [0.142]	-2.771 [-3.642]	2014:08; 2014:11; 2015:09
LROE	9.690 [5.381]	9.355 [5.381]	-17.986 [-29.410]	0.165 [0.135]	-2.973 [-3.811]	2014:03; 2015:01; 2017:01

Note: Numbers in square brackets are critical values obtained from bootstrap approach.
Table 2. The results of Carrion-i Silvestre et al.(2009) unit root test under multiple structural breaks

The results in Table 2 indicate that all calculated test statistics are bigger than the corresponding critical values for all cases with one, two and three structural breaks implying that the unit root null hypothesis cannot be rejected for LRER, LCE and LROE series. In order words, LRER, LCE and LROE series are nonstationary in levels for all structural break cases. These results are consistent with conventional ADF and PP unit root tests. When we give our attention to obtained structural breaks, we see that structural breaks of LRER occur in 2018: 02 for one break, in 2016:10 and 2018:06 for two breaks and in 2014:04, 2017:10 and 2018:06 for three breaks. For LCE, structural breaks are obtained in 2015:01 for one break, in 2014:11 and 2015:09 for two breaks and in 2014:08, 2014:11 and 2015:09 for three breaks cases. The structural breaks for LROE occur in 2017:01 for one break, in 2015:01 and 2017:01 for two breaks and in 2014:03, 2015:01 and 2017:01 for three breaks.

These break dates are consistent with the performance of both Turkish economy and Turkish banking sector. In this period, the decisions taken by the regulatory authorities, Credit Guarantee Fund, the reduction of the reserve requirement ratios by the Central Bank of the Republic of Turkey and the changes in the reserve option coefficients positively affected the profitability. The increase in profitability had a positive effect on common equity and there seemed a significant volatility in foreign exchange rates.

After finding that all series are integrated of the same order, it is suitable to investigate the long run relationship between these series by using cointegration analysis. It is known that conventional cointegration methods are biased towards admitting the null of no cointegration and if there are structural breaks in the relationship, these standard tests may produce false cointegration results. The importance of the structural breaks in the cointegration analysis leads us to use Maki (2012) cointegration test with multiple structural breaks. The null hypothesis of the Maki (2012) test is no cointegration against the alternative hypothesis of cointegration under structural breaks. We consider the long run relationship between

real effective exchange rate and common equity and the long run relationship between real effective exchange rate and return on equity seperately and give results in Table 3. The first part of the table reports the results for the relationship between real effective exchange rate and common equity and the second part of the table gives the results for the relationship between real effective exchange rate and return on equity. Here, we again take into account structural breaks up to three and report the results for one, two and three structural breaks.

Part 1. Cointegration model: $LRER = f(LCE)$		
Models	**Statistics**	**Break years**
	Panel A: The results for one break	
Model 1	-2.215	2017:09
Model 2	-3.488	2018:09
Model 3	-2.769	2017:09
Model 4	-3.292	2017:05
	Panel B: The results for two breaks	
Model 1	-4.232	2016:03; 2017:09
Model 2	-3.509	2016:05; 2017:10
Model 3	-4.116	2016:12; 2017:09
Model 4	-5.041	2014:12; 2017:05
	Panel C: The results for three breaks	
Model 1	-4.596	2016:03, 2017:09; 2018:04
Model 2	-3.612	2014:04; 2016:05; 2017:10
Model 3	-4.391	2015:05; 2016:12; 2017:09
Model 4	-5.042	2014:12; 2016:01; 2017:05
Part 2. Cointegration model: $LRER = f(LROE)$		
Models	**Statistics**	**Break years**
	Panel A: The results for one break	
Model 1	-4.456[c]	2017:07
Model 2	-3.575	2015:06
Model 3	-4.333	2018:02
Model 4	-4.799	2016:10
	Panel B: The results for two breaks	
Model 1	-4.455	2017:07; 2017:12
Model 2	-5.378[b]	2014:08; 2015:06
Model 3	-4.377	2017:04; 2018:02
Model 4	-4.799	2015:02; 2016:10
	Panel C: The results for three breaks	
Model 1	-5.160[b]	2015:12; 2017:07; 2017:12
Model 2	-5.377[b]	2014:08; 2015:06; 2017:12
Model 3	-4.377	2015:02; 2017:04; 2018:02
Model 4	-5.276	2015:02; 2016:10; 2018:02

Note: [b] and [c] denote the rejection of the null hypothesis of "no cointegration" at the 5% and 10% significance levels, respectively. Critical values can be found in Table 1 of Maki (2012).

Table 3. The results of Maki (2012) cointegration test under multiple structural breaks

According to the results in Part 1 of the Table 3, there is no evidence on the long run relationship between real effective exchange rate and common equity for one, two and three structural breaks cases. On the other hand, the results in Part 2 of Table 3 indicate that there is evidence of long run relationship between real effective exchange rate and return on equity for one, two and three structural breaks cases. When we check the obtained structural break dates for cointegration cases between real effective exchange rate and return on equity, it is seen that the breaks occur in 2014:08, 2015:06, 2015:12, 2017:07 and 2017:12. These breaks correspond to important time periods of Turkish Economy. The appreciation of foreign exchange rates against Turkish Lira increase the cost of deposits in Turkish banking sector.

Because foreign exchange deposits have a significant portion in total deposits and the increase in the foreign exchange rates increase the Turkish Lira value of these liabilities, the depreciation of the Turkish Lira causes a downward movement on the profitability. Therefore, negative movements in foreign exchange rates lead to depreciation on both return on asset and return on equity. On the other hand, with the operation of Credit Guarantee Fund the loans become secured and lending limits increase, it has positive effect positive impact on profitability due to the growth in credit volume.

5. Conclusions

This paper examines the relationship between real effective exchange rate, common equity and return on equity in the period from 2014:01 to 2018:09 by considering the effects of structural breaks in the analysis. For this purpose, we use Carrion-i Silvestre et al. (2009) unit root test and Maki(2012) cointegration test. The advantage of using these methods is that both tests allow for up to five structural breaks. After finding that real effective exchange rate, common equity and return on equity series are integrated of the same order, we tried to explore long run relationship between real effective exchange rate and common equity and also between real effective exchange rate and return on equity by using Maki (2012) cointegration test. The results indicate that there is no long run relationship between real effective exchange rate and common equity but there is evidence of long run relationship between real effective exchange rate and return on equity with structural breaks.

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