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Research Article

The Relationship between Credit Volume and Current Account Deficit: A Dynamic Analysis for Turkey[1]

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Abstract

One of Turkey's most important macroeconomic problems is persistent current account deficit. Credit volume has been shown as one of the basic determinants of current account rate, especially after the global financial crisis in Turkish economy. The Central Bank of Turkey has begun to implement the policy to ensure financial stability by slowing down credit volume in response to current account deficit affected by rapid credit expansion after the global financial crisis of 2008. In this study, we investigated the relationship between credit volume and current account deficit covering the period of 2005:Q1- 2015:Q3 employing Bound test approach, ARDL model and Kalman filter method. Bound test results suggest the existence of co-integration relationship between current account deficit and credit volume. ARDL model results indicate that the credit volume is statistical significant and positively affects current account deficit in the short and long run. The results show that a 1 % increase in credit volume leads to nearly a 0.62 % increase in current account deficit. Kalman Filter method results indicate that the effect of credit volume on current account deficit increased after global financial crisis and started to decrease after 2013.

Keywords: Current Account Deficit, Credit Volume, Kalman Filter.

JEL Codes: E42, E51, F32, C32.

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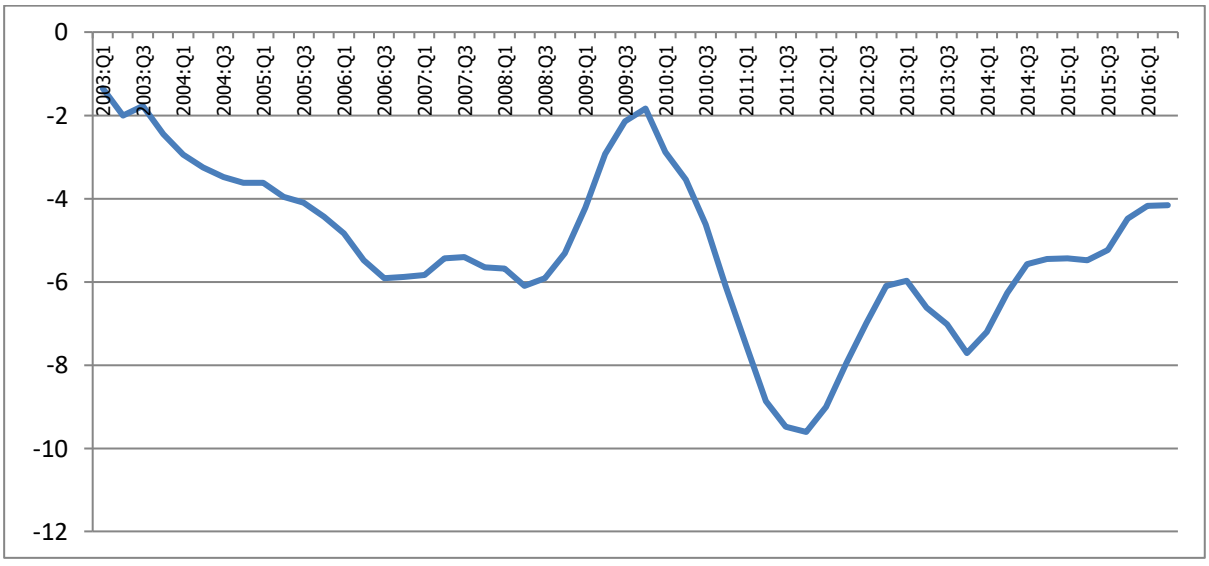
1. Introduction

During the global financial crisis, the excess liquidity caused by the expansionary monetary policy implements of the developed countries gave rise to capital inflows into Turkey, Turkish Lira appreciated and market interest rates dropped. (Central Bank of the Republic of Turkey (CBRT), 2010: 22). Following these, accelerated credit growth and increased import levels caused current account deficit to widen rapidly. (CBRT, 2011-I: 1).

Current accounts deficit, was 20.1 billion dollars in 2005, rose to 37 billion dollars in 2007 and to 44.4 billion dollars in 2010 and consequently CBRT started to apply a policy that considers price stability as well as financial stability since the end of 2010. For this purpose, CBRT increased reverse requirement ratios while decreasing policy interest rates. In order to depress the credit growth rate, Banking Regulation and Supervision Agency (BRSA) increased the minimum payment amount of credit cards according to their limits and limited house loans to be provided by 75% of the value of the house.

Figure 1 displays the Current Account Deficit/GDP rate between 2003:Q1-2016:Q2 by years. Before the economic crisis, capital inflows and credit expansion increase, therefore current accounts deficit increases as well. However, during the years of crisis, balance of current accounts gets better as a result of capital outflows and credits narrow. After the years of crisis, same circumstances as the years before the crisis can be observed. (Saçık and Karaçayır, 2014: 1) In Figure 1, it can be seen that current account deficit/GDP significantly increased before the 2008 global financial crisis, decreased during the years of crisis and increased again after 2009:Q4. Ratio of current accounts deficit to GDP increased considerably from 2009:Q4 until 2011:Q4, and tended to decrease after CBRT started to apply the monetary policy strategy that respected the financial stability as well.

Figure 1: Ratio of Current Account Deficit to GDP (%)



Source: CBRT (2016)

In this study, dynamic effects of credits on current account deficit will be analyzed and the importance of credits as the determinants of current account deficit will be shown. In the second section of the study, the former studies carried out concerning the relation between current deficit and credits will be analyzed. The third section presents the data set and the methodology and the last section has the findings of the analysis.

2. Literature Review

Table 1 demonstrates the summary of some studies which investigated relationship between current account deficit and credit. According to Table 1, the studies for Turkish economy have been investigated the causality relationship between current account deficit and credit. Considering the literature, there is no general consensus about which loan type, such as, cash, commercial, house and automobile, has the biggest effect on current account deficit.

Table 1: Literature Summary on Current Account Deficit and Credit

Researcher / Date of Publication	Analyzed Country	The Period	The Method	Obtained Findings
Alioğulları et al. (2015)	Turkey	2003:Q2-2015:Q2	Regression	It was determined that even though effect of growing consumer loan on current account balance is statistically significant and negative, growing commercial loan has no meaningful effect on current account balance.
Atış and Saygılı (2014)	Turkey	1998:01-2013:01	VECM and Granger Causality	The results of the analysis determined that there is a long-term relationship between current account deficit and credits and there is a one-way relation of causality from credits to current account deficit.
Göçer et al. (2013)	Turkey	1992:Q1-2012:Q3	Cointegration Test With Multiple Structural Breaks of Maki (2012)	It was determined that 100% increase in domestic credit volume increases current account deficit by 20% and that credits are the leading determinant for the process of current account deficit.
Sandalcılar and Altıner (2014)	Turkey	2003:Q1-2013:Q2	Granger Causality	In this study, although a relationship of causality has been determined between total credits, consumer loans and house loans, there is no relationship of causality determined between cash loan, automobile loans and current account deficit.
Kılıç (2015)	Turkey	2004:Q4-2014:Q3	Engle Granger Cointegration And Granger Causality	In this study where cointegration relationship was determined between current account deficit and total consumer loans, automobile loans, cash loans and individual credit cards; there has been relationship of causality determined towards current account deficit from mentioned series, except for individual credit cards.
Telatar (2011)	Turkey	2003:I-2010:IV	Granger Causality	It was determined that there is a positive relationship of causality from consumer loans towards current account deficit but there is no relationship of meaningful causality from total loans towards current account deficit.

Source: Authors' own elaboration

Table 1 (continuing): Literature Summary on Current Account Deficit and Credit

ToganveBerument (2011)	Turkey	1993:Q1-2010:Q4	VAR Model	It was determined that capital inflows increases the ratio of current accounts balance/GDP and the effect of increasing reel credits on above-mentioned ratio is quite limited.
Bitzis et al. (2008)	Greece	1995:Q1-2006:Q4	Johansen Cointegration and VECM	It was determined that the real factors which increases current deficit in the long run are financial liberalization and growing credits which reflect the low interest rates; and in the short term, the same factors are the prices of oil and freightage.
Aizenman and Jinjarak (2014)	36 Country	2005:Q1 2012:Q4	Dynamic Panel Estimate	It was concluded that, before and after 2008-2009 financial crises, there is a firm relationship between increase in real estate value, credits growth and current account deficit
Ganioğlu (2013)	24 Developed Country, 26 Less Developed Country	1970-2008	Panel Logit Estimation Technique	It was determined that, in both developed and developing countries, current account deficit and credit expansion increases the possibilities for a financial crisis to occur.
Akbaş et al. (2013)	G7 Countries	1990-2011	Panel Cointegration	In this study where it was determined that there is a two-way relation of causality between current account deficit and total loans, it was also determined that there is a one-way relation of causality from foreign direct investments towards current account deficit and total loans.

Source: Authors' own elaboration

3. Data and Methodology

The paper aims to investigate the relationship between credit volume and current account deficit in Turkey. The dependent variable is the real current account deficit and the independent variable consists of the real total credit given by commercial bank to private sector from the period 2005:Q1 to 2015:Q3. Current account deficit and credit volume series in the analyses were obtained from CBRT (2016). Current account deficit series were converted Turkish Lira by using US dollar and were included in the analysis as its absolute value. The series were seasonally adjusted by using the Tramo-Seats methodology. Credit volume and current account deficit measured in natural logarithms and were denoted as LKRD and LCA respectively.

We firstly analyzed stationary properties of the series by employing ADF (Augmented Dickey-Fuller), PP (Phillips-Perron) and Ng-Perron tests in the empirical analysis. After determining stationary properties for the series, we investigated the existence of co-integration relationship between credit volume and current account deficit employing Bound Test developed by Pesaran et al. (2001). The short and long term static relationship between credit volume and current account deficit were analyzed by employing ARDL model

(Autoregressive Distribution Lag). Lastly, the dynamic relations between the series were examined by employing the Kalman Filter model.

3.1. Unit Root Test

We firstly analyzed stationary properties of the series by employing ADF (Augmented Dickey-Fuller), PP (Phillips-Perron) and Ng-Perron test in the empirical analysis. The results of unit root tests are presented in Table 1.

For ADF and PP tests, the null hypothesis suggests that the series include unit root. For Ng-Peron test, according to MZ_a, MZ_t tests the null hypothesis indicates that the series have unit root and according to MSB and MPT tests the null hypothesis indicates that the series are stationary (Ertuğrul and Kenar, 2013).

Table 1 shows that both LCA and LKRD series are integrated of order I(1) according to ADF, PP and Ng-Perron tests results. The calculated t statistics for the series are less than the critical values in their level forms, the null hypothesis cannot be rejected for both ADF and PP tests. For Ng-Peron test, the calculated t statistics for LKRD and LCA are less according to MZa and MZt tests and greater than the critical values according to MSB and MPT tests. The calculated t statistics for LKRD and LCA are greater according to MZa and MZt tests and less according to MSB and MPT tests for the first difference of series. In brief, unit root tests results suggest that LKRD and LCA series are stationary after differencing.

Table 1: Unit Root Test Results

ADF Test Results				
Series	Level	First Differenced		
LCA	-2.63	-6.94		
LKRD	-2.58	-3.63		
Phillips-Perron Test Results				
Series	Level	First Differenced		
LCA	-2.67	-6.96		
LKRD	-2.88	-3.70		
Critical Values (Level) %1= -4.19 %5= -3.52		Critical Values (First Differenced) %1= -3.60 %5= -2.93		
Ng-Perron Test Results (Level)				
Series	MZa	MZt	MSB	MPT
LCA	-11.23	-2.32	0.21	8.35
LKRD	-6.94	-1.82	0.26	13.18
Ng-Peron critical values the series for MZa, MZt, MSB, MPT respectively; %1 significance level 23.80, -3.42, 0.14, 4.03; %5 significance level -17.30, -2.91, 0.17, 5.48'dir.				
First Differenced				
Series	MZa	MZt	MSB	MPT
LCA	-20.34	-3.17	0.15	1.28
LKRD	-25.38	-3.55	0.14	0.99
Ng-Peron critical values the series for MZa, MZt, MSB, MPT respectively; %1 significance level -13.80, -2.58, 0.17 and 1.78; %5 significance level -8.10, -1.98, 0.23 and 3.17.				

Source: Authors' own estimations

3.2. Co-Integration Analysis

After determining stationary properties for the series, we investigated the existence of co-integration relationship between credit volume and current account deficit employing Bound Test developed by Pesaran et al. (2001). For the Bound test analysis, we utilize the

Unrestricted Error Correction model (UECM) where "p" represents number of lags and "i" represents trend variables, may be written as follows.

$$\Delta LCA_t = a_0 + a_{1t+} \sum_{i=1}^{p} a_{2i} \Delta LCA_{t-i} + \sum_{i=0}^{p} a_{3i} \, \Delta \mathrm{LKRD}_{t-i} + a_4 LCA_{t-1} + a_5 \Delta \mathrm{LKRD}_{t-1} + u_t \qquad (1)$$

The null hypothesis for F test, which examines co-integration relationship, is proposed as H_0:α_4=α_5=0 and calculated F statistics is compared with table bottom and upper critical levels in Pesaran et al. (2001). If the estimated F statistic is lower than the bottom critical level, the null hypothesis cannot be rejected. Inversely, if the estimated F statistic is above the upper critical level, there is a co-integration relationship between the series (Karagöl et al., 2007: 76).Table 2 demonstrates the bound test results.

Table 2: Bound Test Results

K	F statistics	Critical Values at %5 Significance Level	
		Bottom Bound	Upper Bound
1	11.83	6.56	7.30

Source: Authors' own estimations
Note: K is the number of independent variable in equation (1). Critical values are get from Table CI(V) at Pesaran et al. (2001).

Considering Table 2, F statistics is higher than the upper bound of critical values, which implies that the null hypothesis (H_0:α_4=α_5=0) is to be rejected. Bound test results show the existence of co-integration relationship between credit volume and current account deficit.

3.3. ARDL Model

After detecting co-integration relationship, the short and long run relationships between credit volume and current account deficit are analyzed by employing ARDL model (Autoregressive Distribution Lag). For this purpose, we use the following ARDL model specifications.

$$\mathrm{LCA}_t = a_0 + \sum_{i=1}^{m} a_{1i} \mathrm{LCA}_{t-i} + \sum_{i=0}^{n} a_{2i} \, \mathrm{LKRD}_{t-i} + u_t \qquad (2)$$

$$\Delta \mathrm{LCA}_t = a_0 + a_1 \, \mathrm{ECM}_{t-1} + \sum_{i=1}^{m} a_{2i} \Delta \mathrm{LCA}_{t-i} + \sum_{i=0}^{n} a_{3i} \, \Delta \mathrm{LKRD}_{t-i} + u_t \qquad (3)$$

ECM (-1), which is the error correction term, is the one period lagged value of the error terms derived from the equilibrium relationship and shows the extent of the eliminated rate of the short-run disequilibrium in the long run (Karagölet al., 2007: 78). Table 3 show that the estimated short and long-run coefficients by employing ARDL (1,2) model.

There are no serial correlation, heteroscedasticity, and misspecification problems in the ARDL model according to the diagnostic checks. The long-run coefficient, which is 0.397 obtained from the ARDL (1,2) model is statistically significant. The long-run coefficient estimates suggest that a 1 % increase in credit volume will lead to nearly a 0.62 % increase in current account deficit. The error correction term, which is ECT(-1), is estimated as -0.602,

which means in the case of the discrepancies from the long-run equilibrium in short-run, the system would reach equilibrium about approximately at 6 months.

In sum, according to the results of the ARDL model, credit volume is significant and positively affects current account deficit in both short and long run.

Table 3. ARDL (1,2) Model Long and Short-Run Parameter Estimations

Variables	Coefficient	T statistics
LCA (-1)	0.397475	3.206282
LKRD	4.060400	2.210425
LKRD (-1)	1.800181	0.543107
LKRD (-2)	-5.484610	-2.685485
C	2.044592	0.957288
Diagnostic Checks		
X^2BG	0.093432 [0.9110]	
X^2WHITE	0.000410 [0.9840]	
X^2RAMSEY	0.093111 [0.7621]	
Estimated Long-run Coefficients Using ARDL(1,2) Model		
LKRD	0.623993	3.491398
C	3.393371	0.973050
Error Correction Term Using ARDL(1,2) Model		
ECM (-1)	-0.602525	-4.860346

Source: Authors' own estimations

3.4. Kalman Filter Method

We employ Kalman Filter approach in order to investigate dynamic relationship between reel credit volume and reel current account deficit. The Kalman Filter model is presented in equation (4) and (5) below.

$$LCA_t = \alpha_0 + \alpha_{1,t} LKRD + \varepsilon_t \quad (4)$$

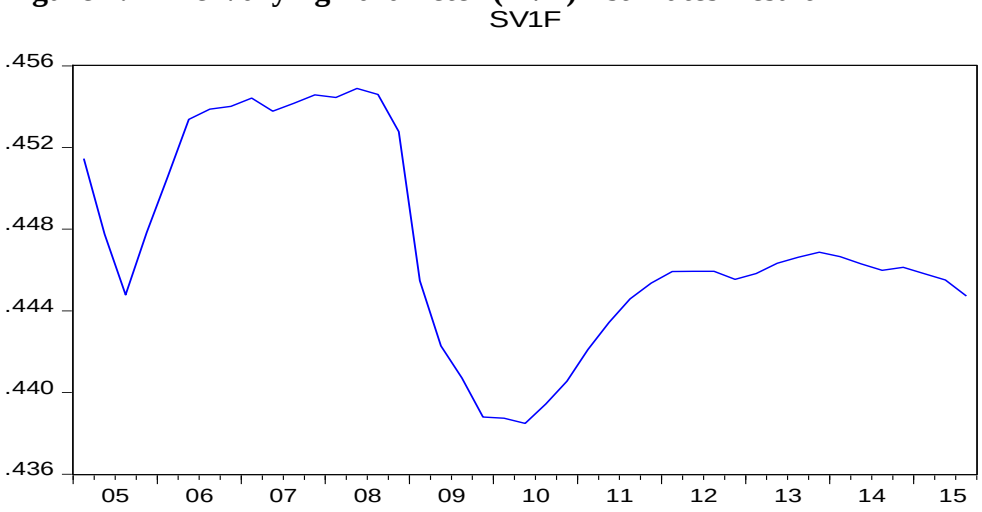
$$\alpha_{1,t} = \alpha_{1,t-1} + \nu_{i,t} \quad (5)$$

where ε_t and $\nu i,t$ are vectors of mean zero, Gaussian disturbances. The Kalman filter recursively estimates the parameters by updating the estimation with every additional observation (Ertuğrul ve Kenar, 2013: 89). The $\alpha_{1,t}$ coefficient in equation (4) indicates credit elasticity of current account deficit, which shows percentage chance in current account deficit in response to a one percentage chance in credit. The time-varying parameter (TVP) estimates for credit elasticity of current account deficit are shown in Figure 1.

Figure 2 shows that the effect of credit volume on current account deficit;

- increased in the period of 2005:Q3 - 2007:Q1,
- followed a fluctuating course in the period of 2007:Q1 - 20008:Q2,
- decreased in the period of 2008:Q2 - 2010:Q2,
- increased from the period of 2010:Q2 until 2012:Q1,
- followed a stable course between the first quarter of 2012 and the third quarter of 2012,
-despite minor fluctuations, the above-mentioned effect increased between the third quarter of 2012 and the fourth quarter of 2013,
- despite minor increases, the effect decreased on the whole between the third quarter of 2013 and the third quarter of 2015.

Figure 2: Time-Varying Parameter (TVP) Estimates Result



Source: Authors' own estimations

The TVP results conclude that the effect of domestic credit volume on current account deficit decreased during the period of global financial crisis. Even after the period, in which policy precautions were initiated in order to decrease credit growth in the last quarter of 2010, the credits continued to be the determinant factor on current deficit.

4. Conclusion

The paper aims to investigate that the relationship between credit volume and current account deficit. We, in this study, firstly analyzed stationary properties of the series by employing ADF (Augmented Dickey-Fuller), PP (Phillips-Perron) and Ng-Perron test in the empirical analysis. After determining stationary properties for the series, we investigated the existence of co-integration relationship between credit volume and current account deficit employing Bound test developed by Pesaran et al. (2001). According to Bound test results, calculated F statistics was higher than the upper bound of critical values. Bound test results suggest the existence of co-integration relationship between current account deficit and credit volume. After detecting co-integration relationship, the short and long term static relationship between the credit volume and current account deficit were analyzed by employing ARDL model (Autoregressive Distribution Lag). According to the results of the ARDL models, there was a positive and statistically significant relationship between the credit volume and current account deficit in both the short and long term. ARDL model result revealed that an increase of 1% in credit volume have caused an increase of 0.62 % in current deficit in long run. In other words, credit volume is one of the main determinants of current account deficit in Turkish economy. Lastly, the dynamic relationship between the credit volume and current account deficit was examined by employing the Kalman Filter. The results show that the effect of credit volume on current account deficit has decreased during the global financial crisis. The effect of credit volume on current account deficit has not decreased after the monetary policy implements in 2010 until the third quarter of 2013. After current account deficit tended to decrease in 2013, the effect of credits on current account deficit started to decrease in this period.

The results suggest that credits are an important macroeconomic variable as the determinant of current account deficit in Turkey. Especially cash loans, that are predominant in credits, may lead a strong effect of credits on current account deficit. Therefore, we

conclude that bank dependent borrowers' debt levels should reduce and it should be implemented the policy, which aims to increase national savings, so that current account deficit decrease.

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