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A SURVEY ON THE FACTORS AFFECTING CURRENT ACCOUNT BALANCE OF TURKEY: EVIDENCE FROM ARDL-BOUNDS TESTING APPROACH[*]

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Abstract

It is observed that the ratio of current account deficit-to-gross domestic product is considerably high in Turkish economy, especially in recent years. In this context, investigating the determinants of current account balance becomes important in terms of macroeconomic balance and economic policy decisions. In this study, relationships between the current account balance and selected macroeconomic variables in Turkish economy are researched with the ARDL-Bounds testing approach. Results of the study related to the long-run show that the international terms of trade is a strong explanatory variable of the current account balance of Turkey and this result implies that Harberger-Laursen-Metzler (HLM) hypothesis is valid for Turkey. Findings indicate that also foreign trade balance has strong effect on the current account balance of Turkey while the gross domestic product is found to be statistically significant but the effect level is quite low. Domestic interest rate and the real effective exchange rate variables are found to be statistically insignificant in the long-run. On the other hand, results of the short-run analysis reveal that current account balance of Turkey is mostly affected from the lagged value of itself, from foreign trade balance and also from lagged value of the real effective exchange rate.

Key words: Current Account Balance, Turkey, ARDL-Bounds Testing.
Jel Codes: F32, F40, F41

1. Introduction

While external economic balance is obviously a crucial factor in terms of the macroeconomic stability of a country, current account balance is one of the main factors concerning the external economic balance. On the other hand it is observed that persistence of the current account deficits is a crucial economic problem for most of the developing countries. Turkey is an example for such countries with her persistent and high current account deficits. Turkish economy has had continuous foreign trade deficit annually since 1947. Turkey's current account deficits in 2013 and 2014 were approximately 64.6 and 46.5 billion U.S. Dollars (USD), respectively and estimated to be 32.7 billion USD in 2015 according to the recent data of IMF. On the other hand, parallel course of the foreign trade balance and current account balance for a long time in Turkish economy implies that the main factor determining the current deficits is the foreign trade (merchandise trade) deficits. With the impact of foreign trade deficits it is observed that current account deficits of Turkey are structurally continuous in time. Although decreases in total consumption and imports especially during the economic crises periods temporarily affect current balance positively, current deficits persist in the subsequent periods. The main causes of current account deficits in Turkish economy are seen as overvalued Turkish Lira and economic growth according to some studies (Kasman et al., 2005). Strong effect of the overvalued Turkish Lira on the current deficits is proved to a certain extend by the recent data of current account balance of Turkey. By the rapid depreciation of the Turkish Lira in 2014 and 2015, it is seen that current account deficits of Turkey significantly decreased in these years. Turkish Lira is depreciated %15 and %24 against US Dollar (USD) according to the previous year in 2014 and 2015, respectively. In the same years it is also seen that current account deficit of Turkey is decreased %31 and %26, respectively[1].

There are numerous empirical works on the subject in terms of the current deficits and determinants of the current account balance of Turkey[2]. Results of the study of Yurdakul and Cevher (2015) demonstrate that real effective exchange rate is the variable with greatest impact on the *current account deficit-to-gross domestic product(GDP)* ratio which is followed by the growth rate, energy import, and openness variables. Gacaner Atış and Saygılı (2014) conclude that the most significant determinants of current deficit in Turkey are the terms of trade and the growth rate, and there is unidirectional causality from terms of trade, real exchange rate, real interest rate and GDP to the *current account deficit-to-GDP* ratio. According to the study of Göçer (2013), 37% and 26% of current deficit result from energy imports and non-energy foreign trade

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[1] Ratios are calculated from the data of Central Bank of the Republic of Turkey, Balance of Payment statistics.

[2] Literature reviews presented here are quoted widely from Özdamar (2015).

deficit, respectively. Kayıkçı (2012) concludes that appreciation of the real exchange rate would lead to the deterioration of current account balance in Turkey. Findings of the study of Esen et al. (2012) reveal that the credit channel is more dominant in Turkish economy than the exchange rate channel; therefore an increase in policy interest rate would reduce the current account deficits. Oktar and Dalyancı (2012) found a cointegration relationship in the long-term from terms of trade to current account balance. According to the study of Erden and Çağatay (2011), there is unidirectional causality runs from capital accounts item to current account and it is also found that while "hot money" component of capital accounts triggers current account no relationship exists between other financial investments and current account. Findings of the study of Canıdemir et al. (2011) show that increases in imports and real exchange rate increase current deficits while increases in exports and interest rates reduce current deficits. Yılmaz and Akıncı (2011) found that there is unidirectional causality from gross domestic product to current account balance and similarly study of Telatar and Terzi (2009) also reveals that there is unidirectional causality from growth rate to current balance in Turkish economy. Uz (2010) concludes that exchange rate variable has the strongest effect on the current account balance but the improvement of the current account balance is associated with an appreciation of national currency in the short-run whereas associated with depreciation in the long-run. Peker and Hotunoğlu (2009) found that the real exchange rate, real interest rate and ISE-100 index are the main determinants of current deficits of Turkish economy. The result of the study by Erdoğan and Bozkurt (2009) which investigates the relations among current deficit and a number of economic variables in Turkish economy reveals that the highest correlation value belongs to the ratio of exports to imports. In the study of Erbaykal (2007), exchange rate and economic growth are determined as the causes of the current deficit, while no causality from exchange rate and the current account deficit towards economic growth is found. On the other hand, according to the study of Erkılıç (2006), direction of the relationship between foreign trade and current account deficit in Turkish economy is uncertain and the most important determinants on the current deficits of Turkish economy are previous current deficit, GDP growth rate and real exchange rate.

In order to determine the economic policies to be applied for removing the balance of payments disequilibrium and ensuring the sustainability of current account deficits, it is crucial to identify the factors affecting the current account balance. Determining the factors that affect the current account balance to what extent is also important for assessing the potential effects of the economic policies which intended to decrease current deficits on economic growth. In this respect, the main objective of this study is to analyze the relationships between current accounts balance of Turkey with some selected major macroeconomic factors such as foreign trade balance, real effective exchange rate, the international terms of trade, gross domestic product and domestic interest rates.

2. Model Specification and Data

In order to investigate the relationships between the current accounts balance and other main macroeconomic variables in Turkish economy, the basic model to be estimated is as follows:

$$CAB_t = \alpha_0 + \alpha_1 FTB_t + \alpha_2 REER_t + \alpha_3 TOT_t + \alpha_4 GDP_t + \alpha_5 INT_t + e_t \quad (1)$$

where CAB is the current account balance, FTB is the foreign trade balance, REER is the real effective exchange rate, TOT is the international terms of trade, GDP is the gross domestic product and INT is the domestic interest rates of Turkey. α_0 is the constant and e_t is the error terms of the model.

Analyze period covers 1995:Q1-2015:Q3. Data of the Current Account Balance and Foreign Trade Balance are gathered from the Electronic Data Delivery System (EDDS) of the Central Bank of the Republic of Turkey (CBRT). Real Effective Exchange Rate data for Turkey (deflated with the consumer price indices of 37 trading partner countries) are taken from the Eurostat (Statistical Office of the European Commission) database. The International Terms of Trade data (as USD) of Turkey is obtained from the Foreign Trade Indices Database of Turkish Statistical Institute. The nominal GDP data for Turkey is taken from Eurostat in millions of Turkish Lira and converted to USD with the TL/USD exchange rate which is also taken from the EDDS of CBRT. The day-to-day domestic interest rate data in a quarterly basis is also obtained from the Eurostat. CAB, FTB and GDP series are taken as millions of USD. CAB, FTB, GDP and TOT series are included to the analyses after they are corrected with the Tramo/Seats method for seasonal effects. Eviews 9 and Gauss 10 programs are used for the analyses.

3. Empirical Findings

According to the time series econometrics literature, the regression results may be spurious if the variables are non-stationary (Granger and Newbold, 1974). On the other hand, various econometric methods are available depending on the integration order of the time series. For this purpose, the unit root tests developed by Phillips and Perron (1988, hereafter PP), Kwiatkowski et al. (1992, hereafter KPSS), and Ng and Perron (2001, hereafter NP) are applied to the series and results are given in Table 1. The PP test does not reject the null hypothesis of a unit root for the levels of all variables with the exception of the interest rate. PP test shows that interest rate variable is stationary in levels. Results of the PP test for the first-differences of the variables imply that all variables are stationary. The KPSS unit root test uses Lagrange Multiplier (LM) statistic for testing the null hypothesis of the time series is stationary around a deterministic trend against the alternative hypothesis of non-stationary. KPSS test results show that the null of stationarity (no unit root) is rejected for the levels of all variables except the current account balance. Current account balance is stationary in level form according to the test model including constant and trend, but non-stationary according to the test model with constant. NP (2001) provides tests called MZ_{α}, MZ_t, *MSB* and MP_T for investigating the existence of unit roots. Here, *MSB* and MP_T test results are given in Table 1. *MSB* and MP_T test results indicate that the null hypothesis of a unit root cannot be rejected for the levels of all variables with an exception of the domestic interest rate variable. As PP, NP test also shows that interest rate variable is stationary in levels.

Table 1: Unit root tests without structural break

	PP (1988)		KPSS (1992)		NP (2001)			
					Constant		Constant & trend	
Levels	Constant	Constant & trend	Constant	Constant & trend	MSB	MP_T	MSB	MP_T
CAB	-1.74	-2.33	1.03***	0.09	0.38	7.79	0.199	8.657
FTB	-1.55	-2.66	1.04***	0.12*	0.39	8.35	0.190	7.246
REER	-1.96	-2.57	1.13***	0.20**	0.69	26.64	0.184*	8.441
TOT	-2.29	-2.25	1.06***	0.20**	0.70	26.75	0.205	11.323
GDP	-0.96	-1.74	1.07***	0.13*	0.85	46.07	0.264	13.959
INT	-2.78*	-5.88***	1.10***	0.22***	0.25*	3.84*	0.120***	2.774***
First differences								
ΔCAB	-7.42***	-7.39***	0.06	0.05	0.11***	0.82***	0.117***	2.671***
ΔFTB	-6.09***	-6.06***	0.06	0.06	0.11***	0.71***	0.119***	2.605***
ΔREER	-8.68***	-9.01***	0.28	0.09	0.19**	2.26**	0.206	8.155
ΔTOT	-8.62***	-8.77***	0.29	0.05	0.21**	2.49**	0.168*	5.229**
ΔGDP	-7.63***	-7.59***	0.09	0.08	0.11***	0.64***	0.114***	2.387***
ΔINT	-25.43***	-25.87***	0.18	0.17**	0.32	5.20	0.330	19.939
Test critical values								
%1	-3.51	-4.07	0.739	0.216	0.174	1.78	0.143	4.03
%5	-2.89	-3.46	0.463	0.146	0.233	3.17	0.168	5.48
%10	-2.58	-3.15	0.347	0.119	0.275	4.45	0.185	6.67

Notes: The bandwidth for PP, KPSS and NP tests was selected with Newey-West using Bartlett kernel. ***, **, and * denote statistical significance at 1%, 5%, and 10% level of significance, respectively. Delta (Δ) is the difference operator.

The PP, KPSS and NP tests do not take into account possible structural break(s) in series. In the case of structural breaks, conventional unit root tests without structural breaks may give misleading results. In this respect, in addition to the conventional unit root tests Zivot and Andrews (1992, hereafter ZA) and Lee and Strazicich (2013, hereafter LS) unit root tests with one structural break are also employed[3].

ZA, transforms Perron's (1989) unit root test which is based upon an exogenously determined break data into an unconditional unit root test. In other words, instead of treating the break data as fixed, ZA purpose a test where the break date is estimated. The test allows for a single break in the intercept and the trend (slope) of the series (Nilsson, 2009: 16). ZA, proceed with three models to test for a unit root based on Perron (1989) models. Model A allows a one-time change in the level of the series, Model B allows for a one-time change in the slope of the trend function, and Model C combines one-time changes in the level and the slope of the trend function of the series. The null hypothesis in all the three models is series contains a unit root with a drift that excludes any structural break, while the alternative hypothesis implies that the series is a trend-stationary process with one-time break in the trend that occurs at an unknown point in time. The sequential ADF test procedure estimates a regression equation for every possible break point within the sample and calculates the *t*-statistics for the estimated coefficients (Chou, 2000, Waheed et al., 2006). The minimum test of ZA selects the breakpoint where the *t*-statistic testing the null of a unit root is the most negative.

The minimum *t*-statistics that correspond to Model A and Model C of ZA test for the level values of the variables are presented in Table 2. Results of the ZA test are very similar to those of the unit root tests without structural breaks in the overall perspective. In terms of Model A, all series -with an exception of interest rate variable- have a unit root in their levels. According to the Model C, all series -with the exceptions of interest rate and real effective exchange rate variables- have a unit root in their levels. According to the LS (2003), ZA and other similar endogenous break tests assume no break(s) under the unit root null and derive their critical values accordingly. Thus, rejection of the null does not necessarily imply rejection of a unit root per se, but would imply rejection of a unit root without breaks. LS (2003) state that in terms of the ZA and similar unit root tests, concluding the rejection of the null as an evidence of trend

[3] In order to save space, details of the unit root tests are not explained here. An interested reader is referred to related original papers.

stationarity will be incorrect because rejection of the null indicates the series are difference-stationary with breaks.

Table 2: Zivot and Andrews (1992) unit root test with structural break

	Model A: Break in intercept			Model C: Break in intercept and trend		
	Test statistic		Break date	Test statistic		Break date
CAB	-4.189	(1)	2005q2	-3.975	(0)	2004q2
FTB	-3.811	(1)	2008q4	-3.813	(1)	2009q2
REER	-4.270	(0)	2004q2	-5.181**	(1)	2006q4
TOT	-1.869	(4)	2008q3	-3.160	(3)	2002q2
GDP	-2.876	(0)	2004q2	-2.553	(0)	2006q3
INT	-7.797***	(0)	2002q2	-7.815***	(0)	2001q2

Notes: Values in parentheses show the optimal lag length chosen by the Schwarz information criterion (max lag=5). The critical values of Model A are -5.34, -4.80, and -4.58; critical values of Model C are -5.57, -5.08, and -4.82 for 1%, 5%, and 10% levels of significance, respectively. ***, and ** denote rejection of the unit root hypothesis at 1%, and 5% level of statistical significance, respectively.

LS (2013) unit root test with one structural break is kind of an evaluation of the Lee and Strazicich (2003) unit root test with two structural breaks. LS (2003), propose a two-break minimum Lagrange multiplier (LM) unit root test in which the null hypothesis is a unit root with two structural breaks and the alternative hypothesis clearly implies trend stationarity. The two-break minimum LM unit root test determines the break-points endogenously by utilizing a grid search and the breakpoints are determined to be where the test statistic is minimized. With respect to LS (2003), LS (2013) consider two models of structural change. Model A allows for a one-time change in intercept under the alternative hypothesis and Model C allows for a shift in intercept and change in trend slope under the alternative hypothesis. The location of the break is determined by searching all possible break points to find the minimum (i.e. the most negative) unit root test statistic. Minimum LM *t*-statistics for the levels of the variables are presented in Table 3 show that the results are similar to those of the ZA test. According to the results real effective exchange rate and interest rate variables found to be stationary in levels while the others are non-stationary in terms of both models.

Table 3: Lee and Strazicich (2013) unit root test with structural break

	Model A: Break in intercept			Model C: Break in intercept and trend			
	Test statistic		Break date	Test statistic		Location of Break (λ)	Break date
CAB	-2.268	(0)	2005q3	-3.496	(0)	0.506	2005q2
FTB	-2.840	(1)	2009q2	-3.918	(1)	0.458	2004q2
REER	-3.346*	(0)	2008q2	-5.240***	(1)	0.578	2006q4
TOT	-1.544	(4)	2002q1	-2.565	(4)	0.482	2004q4
GDP	-1.735	(0)	2007q4	-2.723	(0)	0.470	2004q3
INT	-6.509***	(0)	2002q3	-7.667***	(0)	0.325	2001q3

Notes: Values in parentheses show the optimal lag length chosen by the Schwarz information criterion (max lag=5). The critical values of Model A are -4.239, -3.566 and -3.211 for 1%, 5%, and 10% levels of significance, respectively. Critical values of Model C are sensitive to the location of break (λ) and are symmetrical around (λ) and (1-λ). Critical values of Model C are -5.15, -4.45 and -4.18 for (λ=0.3), -5.05, -4.50 and -4.18 for (λ=0.4); -5.11, -4.51 and -4.17 for (λ=0.5) for 1%, 5%, and 10% levels of significance, respectively. ***, and * denote rejection of the unit root hypothesis at 1%, and 10% level of statistical significance, respectively.

The unit root analyses imply that CAB, FTB, TOT and GDP variables are non-stationary in their levels but stationary in first differences. INT is stationary in its level form according to the PP, NP, ZA and LS tests. REER is also stationary in its level form according to the LS, Model C of ZA and also in terms of the MSB test of NP in which the test model includes constant and trend. Since the order of integration of INT and also REER variables differ from that of other variables, Engle and Granger (1987) and Johansen and Juselius (1990) cointegration methods which require all the variables under study to be integrated in first order, $I(1)$, cannot be performed.

3.1. The ARDL-Bounds Testing Approach to Cointegration

In order to determine the presence of cointegrating relations, Bounds testing approach to cointegration under the Auto-Regressive Distributed Lag (ARDL) model which was developed by Pesaran et al. (2001) is employed. ARDL-Bounds testing approach can be applied irrespective of whether the explanatory variables are purely $I(0)$, purely $I(1)$ or mutually cointegrated. ARDL approach depends on the ordinary least squares regression method in which lagged values of both dependent and explanatory variables are used as explanatory variable. ARDL model explores the different optimal lags of each variable in the model. To apply the bounds testing approach, firstly an unrestricted error correction model is formed. Narayan and Smyth (2006) notes that the ARDL approach is expected to have better statistical properties than the Engle and Granger (1987) and Johansen and Juselius (1990) methods because it draws on the unrestricted error correction model. The bounds test procedure for checking the cointegration relationship between the variables in Equation (1) is conducted with the following ARDL model:

$$\Delta CAB_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\Delta CAB_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\Delta FTB_{t-i} + \sum_{i=0}^{o} \alpha_{3i}\Delta REER_{t-i} + \sum_{i=0}^{p} \alpha_{4i}\Delta TOT_{t-i} + \sum_{i=0}^{r} \alpha_{5i}\Delta GDP_{t-i} + \sum_{i=0}^{s} \alpha_{6i}\Delta INT_{t-i} + \beta_1 CAB_{t-1} + \beta_2 FTB_{t-1} + \beta_3 REER_{t-1} + \beta_4 TOT_{t-1} + \beta_5 GDP_{t-1} + \beta_6 INT_{t-1} + e_t \quad (2)$$

where Δ is the first difference operator and m, n, o, p, r, s are the optimal lag lengths. The α coefficients are the parameters that represent the short run, whereas the β coefficients show the long run dynamics of the model. To ensure the stability conditions (no serial correlation) for the estimated model firstly optimal lags of the variables in equation (2) are determined by the information criterions and then bounds test is performed for the model estimated with selected lags of the variables. Optimal lags of the variables for the ARDL model are determined as (1,1,1,0,0,0) with the Akaike information criterion (AIC) which satisfies the stability conditions by taking maximum order of lags as 5 due to the quarterly series are used in the study[4]. In bounds testing, null hypothesis of no lung-run relationship between variables is tested. For cointegration inference, *F*-test is applied on lags of dependent and independent variables. The null hypothesis for this test is established as [H_0: $\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=0$]. *F*-test statistic obtained from the Bounds test is compared with lower and upper asymptotic critical values calculated by Pesaran et al. (2001) for various statistical confidence levels according to the structure of the model which takes into account constraints, constant and trend specifications of the model and also number of explanatory variables. If the calculated *F*-statistic is greater than the critical upper bound value the null hypothesis is rejected which means there is a cointegration relationship between the series. If the calculated *F*-statistic is lower than the critical lower bound value the null cannot be rejected which means there is no cointegration relationship between the series. Finally if the calculated *F*-statistic is between the upper and lower critical bounds, no exact opinion can be made and other cointegration tests should be applied.

Following Pesaran et al. (2001), the Bounds test results for the model in this study is given in Table 4. In this regard, equation (2) is estimated with the selected lags by the AIC for each variable and then *F*-statistic is calculated to test null hypothesis for cointegration inference. Trend specification of the model is taken as unrestricted constant (level) and in this case the null hypothesis is as mentioned before, [H_0: lagged levels are equal to zero]. Therefore *F*-test statistic is compared with the critical values of Pesaran et al. (2001) which are calculated for this case.

Table 4: Bounds Test Results

		1% Critical values		5% Critical values	
		I(0)	*I*(1)	*I*(0)	*I*(1)
*k**	*F-statistic*	Lower bound	Upper bound	Lower bound	Upper bound
5	6.2963	3.41	4.68	2.62	3.79

	Diagnostic Tests
R^2 = 0.890	Breusch-Godfrey LM [5] test = 3.843 (0.572)
$\bar{R}^2$ = 0.878	White heteroskedasticity test = 46.194 (0.381)
F-stat. = 74.043 (0.000)	Jarque-Bera normality test = 0.657 (0.719)
DW = 1.906	Ramsey Reset [1] test = 0.274 (0.601)

* *k:* number of explanatory variables. Critical values are from Pesaran et al. (2001), Table CI(iii). The numbers in parentheses are *Prob.* values.

Bounds test result shows that *F*-statistic is greater than the critical upper bound value of Pesaran et al. (2001) in 1% statistical significance level, which means there is a cointegration relationship between the series. Diagnostic test results show that the model satisfies the stability conditions. Due to the fact that a cointegration relationship has been detected between the series, the ARDL model can be established in order to determine long-run and short-run relationships.

3.2. Long-Run Estimations with the ARDL Model

The ARDL model to be estimated for surveying the long-run relationships between the current account balance and other variables in this study is as follows:

$$CAB_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} CAB_{t-i} + \sum_{i=0}^{n} \alpha_{2i} FTB_{t-i} + \sum_{i=0}^{o} \alpha_{3i} REER_{t-i} + \sum_{i=0}^{p} \alpha_{4i} TOT_{t-i} + \sum_{i=0}^{r} \alpha_{5i} GDP_{t-i} + \sum_{i=0}^{s} \alpha_{6i} INT_{t-i} + e_t \quad (3)$$

In order to determine long-run relationships between the series, equation (3) will be estimated with ARDL model by using the optimal lags of the variables which were previously selected according to the Akaike information criterion (AIC). Results of the estimated ARDL (1,1,1,0,0,0) long-run model and results of the diagnostic tests are presented in Table 5.

[4] ARDL model selection criteria table is given in Appendix 1.

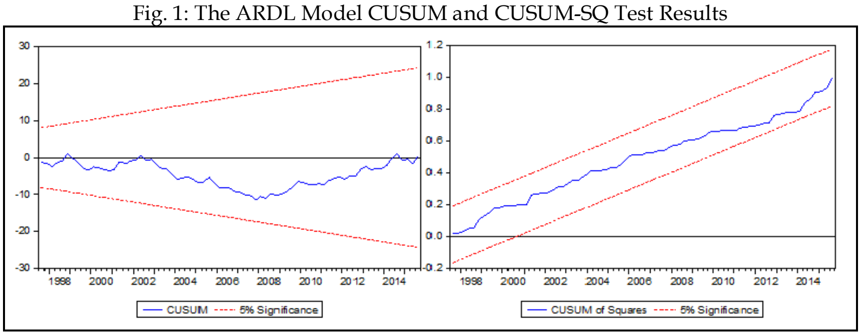
Table 5: ARDL (1,1,1,0,0,0) Model

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
CAB(-1)	0.4072	0.0944	4.3114	0.0000
FTB	1.1181	0.0513	21.774	0.0000
FTB(-1)	-0.5517	0.0977	-5.6470	0.0000
REER	26.538	18.6130	1.4258	0.1582
REER(-1)	-40.963	17.0405	-2.4038	0.0188
TOT	41.962	17.8635	2.3490	0.0215
GDP	0.0142	0.0061	2.2920	0.0248
INT	2.9903	4.1222	0.7254	0.4705
Constant	-3450.98	2482.70	-1.3899	0.1688
$R^2 = 0.987$	$\bar{R}^2 = 0.986$	*F*-stat. = 722.52 (0.000)	D-W stat. = 1.985	

Diagnostic Tests	Test statistic	Prob.
Breusch-Godfrey serial correlation LM [5] test	3.466	0.628
White heteroskedasticity test	46.759	0.359
Jarque-Bera normality test	0.963	0.617
Ramsey Reset [1] test	1.226	0.271

Notes: Model selection method: AIC, Maximum dependent lags=5 (Automatic selection).

Fig. 1: The ARDL Model CUSUM and CUSUM-SQ Test Results



Diagnostic test results of the estimated ARDL model show that there is no autocorrelation and heteroskedasticity problem in the model, error terms normally distributed and also there is no model specification error. The cumulative sum of recursive residuals (CUSUM) and the CUSUM square (CUSUM-SQ) test results show that long-run parameters estimated with the ARDL model and also the residual variance of the model are stable which means there is no structural change and therefore the model can be estimated without using any dummy variable. In other words, the CUSUM and CUSUM-SQ plots against the critical bound of the 5% significance level imply that the estimated model is stable over time. In order to test the constancy of the parameters also Recursive Coefficient test is applied and results are presented in Appendix 2. Results of this test show that there is no significant change in the coefficients of the estimated model when more data is added for estimating the equation. In this regard, estimated long-run coefficients through ARDL (1,1,1,0,0,0) model are given in Table 6.

Table 6: ARDL (1,1,1,0,0,0) Model Long Run Coefficients

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
FTB	0.9555	0.0582	16.3980	0.0000
REER	-24.3356	26.1361	-0.9311	0.3549
TOT	70.7934	28.3784	2.4946	0.0149
GDP	0.0239	0.0101	2.3569	0.0211
INT	5.0450	6.8876	0.7324	0.4662

*Dependent variable: Current Account Balance (CAB).

Estimation results of the long-run ARDL model show that the explanatory variables have the expected signs. According to the results, increases in FTB, TOT and GDP affects CAB positively and coefficients are statistically significant. One unit increase in FTB, TOT and GDP improves CAB 0.95, 70.8 and 0.02 units, respectively. Findings reveal that one unit increase in FTB affects CAB positively almost as the increment in itself, which means CAB and FTB will move together very closely. This result is compatible with the view that CAB of Turkey is highly dependent to the FTB.

Relationship between CAB and GDP could be either positive or negative. If the domestic investments which substitute imports increase when GDP increases, the effect of GDP on CAB could be positive. In this context findings show that increase of the GDP affects CAB positively but effect level is quite low. Results indicate that domestic interest rate (INT) also has a positive effect on CAB, which is one unit increase in INT affects CAB positively about 5 million USD but the coefficient is statistically insignificant. On the other hand REER is found to be negative as expected, which is one unit increase in REER affects CAB negatively about 24 million USD but the coefficient is also statistically insignificant.

An important result of the analysis is about the international terms of trade variable. Results indicate that one unit increase in TOT affects CAB positively almost 70 million USD, i.e. TOT has a strong effect on CAB of Turkey. In this respect the Harberger-Laursen-Metzler (HLM) hypothesis seems valid for Turkey which means increase of TOT affects foreign trade balance and therefore current account balance positively and strongly. This result reveals that if Turkey produces and exports high-tech intensive products more, her current account balance could improve in time. On the other hand this result is consistent with the positive effect of GDP on CAB. An improvement in the international terms of trade of a country would increase its current income, therefore (under the assumption that marginal propensity to consume is less than unity) current consumption increases less than current income and in this situation personal savings increase and hence GDP affects CAB positively. According to the results FTB and TOT are found as most effective factors on the current account balance of Turkey in the long-run. Results are also quite consistent with the findings of Özdamar (2015).

3.3. Short-Run Estimations with the Error Correction Model

Short-run relationships between the current account balance and other variables in this study are examined with the Error Correction Model (ECM) based on the ARDL model. The model is as follows:

$$\Delta CAB_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\Delta CAB_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\Delta FTB_{t-i} + \sum_{i=0}^{o} \alpha_{3i}\Delta REER_{t-i} + \sum_{i=0}^{p} \alpha_{4i}\Delta TOT_{t-i} + \sum_{i=0}^{r} \alpha_{5i}\Delta GDP_{t-i} + \sum_{i=0}^{s} \alpha_{6i}\Delta INT_{t-i} + \delta ECT_{t-1} + e_t \quad (4)$$

In equation (4) ECT_{t-1} is the lagged error correction term which is the one period lagged value of the error terms derived from the long-run equilibrium model. The coefficient of the lagged error correction term (δ) shows the eliminating of speed of disequilibrium, i.e. speed of adjustment toward the long-run equilibrium level. Coefficient of lagged ECT is expected to be negative and statistically significant in order to operation of the error correction mechanism. Results of the error correction model based on the ARDL model (i.e. the estimated short-run coefficients) are presented in Table 7, below.

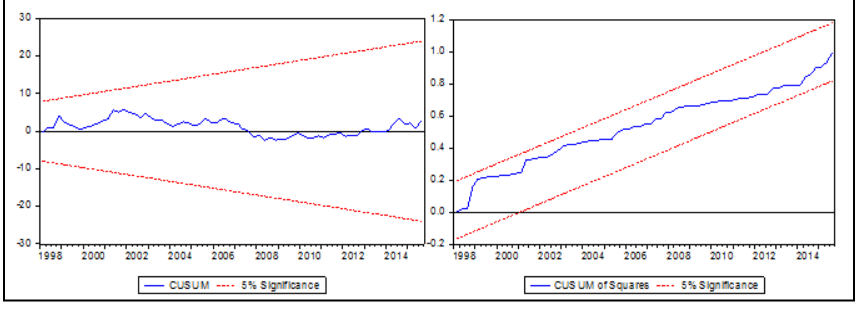
Diagnostic test results of the estimated error correction (short-run) model also show that the model satisfies all of the stability conditions. According to the results given in Table 7, the lagged error correction term (ECT) in the model is statistically significant at the 1% level with a negative coefficient. If the value of the lagged error correction terms coefficient is between -1 and -2, this shows the lagged error correction term produces dampened fluctuations in current account balance about the equilibrium path. As seen from the results of the short-run model, coefficient of the lagged error correction term is found to be -1.02, which implies that instead of monotonically converging to the equilibrium path directly, the error correction process fluctuates around the long-run value in a dampening manner and when this process is completed, convergence to the equilibrium path is expected to be rapid (Narayan and Smyth, 2006).

Table 7: Error Correction Model Results Based on ARDL (1,1,1,0,0,0) Model

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
ΔCAB(-1)	0.4262	0.1624	2.6236	0.0106
ΔFTB	1.1225	0.0625	17.941	0.0000
ΔFTB(-1)	-0.5630	0.1837	-3.0645	0.0031
ΔREER	26.684	17.134	1.5573	0.1238
ΔREER(-1)	-36.943	17.627	-2.0958	0.0397
ΔTOT	32.886	32.358	1.0163	0.3129
ΔGDP	0.0155	0.0124	1.2510	0.2150
ΔINT	0.7524	3.6692	0.2050	0.8381
ECT(-1)	-1.0298	0.1999	-5.1509	0.0000
Constant	-6.6979	79.966	-0.0837	0.9335
$R^2 = 0.894$	$\bar{R}^2 = 0.881$	*F*-stat. = 67.214 (0.000)	D-W stat. = 1.913	

Diagnostic Tests	Test statistic	Prob.
Breusch-Godfrey serial correlation LM [5] test	6.709	0.243
White heteroskedasticity test	50.183	0.622
Jarque-Bera normality test	0.811	0.666
Ramsey Reset [1] test	0.007	0.929

Fig. 2: Error Correction Model CUSUM and CUSUM-SQ Test Results



According to the results, the lagged dependent variable is statistically significant with a positive coefficient. The coefficient of the lagged current account balance (CAB) indicates that increase in the lagged one period of CAB generates an increase in the CAB in the current period. Current value of the foreign trade balance (FTB) is statistically significant with a positive coefficient. Despite that, one period lagged value of the FTB is also statistically significant but the coefficient is found to be negative. If the improvement of the foreign trade balance causes an appreciation of the local currency and/or decrease of the domestic interest rates, this process may affect the current account balance in the next period. On the other hand, an increase in the real effective exchange rate (REER) of Turkey corresponds to an appreciation of the Turkish Lira and/or a higher inflation rate compared to the trading partner countries. In this regard, an increase (decrease) in REER is expected to affect the CAB negatively (positively). Results of the short-run model reveal that one period lagged value of the REER is found to be statistically significant with a negative coefficient as expected while the current value is statistically insignificant. This result is consistent with the J-curve hypothesis which implies the effects of the exchange rate changes will occur with a time delay. Of the other variables in Table 7, the terms of trade (TOT), gross domestic product (GDP) and interest rate (INT) variables are also found to be statistically insignificant in the short-run. These results imply that the current account balance of Turkey is affected mostly from the lagged value of itself, from foreign trade balance and also from the lagged value of real effective exchange rate in the short-run.

Conclusion

After the local economic crisis in 2001, Turkish economy has achieved an average annual real growth of %4.9 in the 2002-2014 periods. On the other hand it is seen that Turkish economy has a high current deficit problem since 1990 with the exception of 1991, 1994, 1998 and 2001 years which coincide with a global or local economic crisis and consequently with the depreciation or devaluation of Turkish Lira. Despite real economic growth, one of the main problems in Turkish economy as in many emerging economies is increasing current account deficits. According to the IMF data, the simple average value of the *current account deficit-to-GDP* ratio is -5.06% in Turkish economy for the 2002-2014 periods and this ratio is accepted as a risk level in terms of economic crises by some economists such as Dornbusch. On the other side, one of the indicators in the fragility index of the American Federal Reserve's (FED) Monetary Policy Report is the *current account deficit-to-GDP* ratio. The results of the index show that among 15 developing countries examined in the index, Turkey would be affected from decisions of the FED at most (***see*** FED, 2014). In this context, it is important to examine the factors that affect the current account balance in Turkish economy.

In this study, the relationships of the current account balance with foreign trade balance, real effective exchange rates, the international terms of trade, gross domestic product and domestic interest rates in Turkish economy are analyzed by using 1995:Q1-2015:Q3 quarterly data. In order to analyze the relationships firstly conventional unit root tests without structural break and also unit root tests with one structural break developed by Zivot and Andrews (1992) and by Lee and Strazicich (2013) are applied to the series. Because of some variables found to be integrated in level and some in first order, the ARDL-Bounds testing approach is employed to determine the long-run relationships and error correction model based on the ARDL approach is employed to determine the short-run relationships.

Estimation results of the long-run ARDL model show that the explanatory variables have the expected signs. According to the results, increases in foreign trade balance, the international terms of trade and gross domestic product affects current account balance positively and coefficients are statistically significant. Findings imply that one unit increase in foreign trade balance affects current balance positively almost as the increment in itself in the long-run, which means current balance and foreign trade balance will move together very closely. This result is compatible with the view that current account balance of Turkey is highly dependent to the foreign trade balance. Results show that increase of the gross domestic product affects current balance positively but effect level is quite low. On the other hand domestic interest rate also has a positive effect on the current balance but the coefficient is statistically insignificant. The real effective exchange rate is found to be negative as expected but the coefficient is also statistically insignificant. Results show that the international terms of trade affects current balance positively and significantly and has a strong effect on the current account balance of Turkey. In this respect the Harberger-Laursen-Metzler (HLM) hypothesis seems valid for Turkey which means increase of the terms of trade affects foreign trade balance and therefore current account balance positively and strongly. According to the findings foreign trade balance and the international terms of trade are found as most effective factors on the current account balance of Turkey in the long-run.

Results of the short-run error correction model analysis show that the lagged error correction term in the model is statistically significant at the 1% level with a negative coefficient. Coefficient of the lagged error correction term is found to be between -1 and -2, which implies that instead of monotonically converging to the equilibrium path directly, the error correction process fluctuates around the long-run value in a dampening manner and when this process is completed, convergence to the equilibrium path is expected to be rapid. Short-run findings also reveal that the current account balance of Turkey is affected mostly from the lagged value of itself, from the foreign trade balance and also from the lagged value of real effective exchange rate in the short-run.

When all the results concluded, it is seen that foreign trade balance is the dominant factor in terms of the current account deficits in Turkish economy. In this respect real effective exchange rate -which comprise nominal exchange rates and relative inflation ratios- is also seems to be important both for the foreign trade deficits and current account deficits. Letting nominal exchange rate to be in its free market equilibrium level and disinflation process may help to reduce the current deficits. The international terms of trade is found to be other major impact factor for the current account balance of Turkey in the long-run. This result reveals that if Turkey produces and exports high-tech intensive products more, her current account balance could improve in time. On the other hand this result is consistent with the positive effect of gross domestic product on the current account balance. An improvement in the international terms of trade of a country would increase its current income, therefore (under the assumption that marginal propensity to consume is less than unity) current consumption increases less than current income and in this situation personal savings increase and hence gross domestic product affects current account balance positively. This view also puts forward the importance of the domestic savings and policies to increase the marginal propensity to save.

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Appendix:

Appendix 1: The ARDL Model Selection Criteria Table (First 10 Model)

LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
-616.328940	16.034075	16.306003	16.142933	0.986090	ARDL(1, 1, 1, 0, 0, 0)
-616.084409	16.053446	16.355589	16.174399	0.985973	ARDL(1, 1, 1, 1, 0, 0)
-613.123078	16.054438	16.447223	16.211677	0.986399	ARDL(1, 1, 1, 4, 0, 0)
-616.140971	16.054897	16.357039	16.175850	0.985953	ARDL(1, 1, 1, 0, 0, 1)
-615.186647	16.056068	16.388424	16.189116	0.986088	ARDL(1, 1, 1, 0, 0, 2)
-612.216583	16.056835	16.479834	16.226170	0.986504	ARDL(1, 1, 1, 5, 0, 0)
-616.295688	16.058864	16.361006	16.179817	0.985897	ARDL(1, 2, 1, 0, 0, 0)
-615.301072	16.059002	16.391358	16.192050	0.986047	ARDL(3, 1, 1, 0, 0, 0)
-616.305250	16.059109	16.361251	16.180062	0.985894	ARDL(1, 1, 2, 0, 0, 0)
-616.312448	16.059294	16.361436	16.180247	0.985891	ARDL(2, 1, 1, 0, 0, 0)

Appendix 2: The ARDL Model Recursive Coefficient Test Results