

## **The Relationship Between Trade Openness and External Debt in Turkey: A Cointegration Analysis**

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**Abstract:** Although there are many studies in literature on the relation between trade openness and external debt; it is hard to see its examples in Turkey. The major objective of this paper is to analyze the change in the external debt during with trade openness. In this study, to fit this purpose, firstly the relation between these two variables is handled theoretically, later on; the hypothesis that there will be an increase in external debt with the increase of trade openness is tested with the method of cointegration. According to the results of this paper, findings have suggested a significant positive relation between trade openness and external debt in Turkey.

**Keywords:** Trade Openness, External Debt, Cointegration Method, Turkey.

JEL Codes: O24, F34, C1, O53

### **1. Introduction**

Although there are many definitions for trade openness in the literature, there is no generally accepted definition. The simplest definition of trade openness is the integration of a country with the world. Trade openness is measured by the ratio of total exports and imports to GDP (Gross Domestic Products) and indicates the degree of integration of an economy with international economic forces (Bahmani-Oskoe and Niroomand, 1999; Baldemir et al., 2009; Combes and Saadi-Sedik, 2006; Leamer, 1988; Uzun, 2010; Yen, 2008).

External debt in general terms, is the repayment of the debts taken by the residents or non-residents as a capital with or without interest (OECD, 2000). Hence trade openness provides easements in borrowing and lending, countries with high levels of trade openness borrow and lend significantly among each other. The reason for that, is an open economy can borrow from other countries or international organizations and lend to other countries easily.

Developing countries have begun to borrow by taking advantages of international financial institutions developed after World War II. Several countries faced with debt problem until the late 1970s but a debt crisis did not arise all around the world. However in the last quarter of the 1970s, a debt crisis emerged effecting all developing countries especially open-growing Latin American countries. On the other hand, outward-oriented policy of many countries was influential in the rise of debt crisis. This is because trade openness of countries determines the degree of world events

(Kazgan, 1985, p.181). Turkey, like many developing countries was affected by the oil crisis in the world economy in 1970s. Unfavorable economic events led by oil crisis forced Turkey to take radical decisions in order to strengthen the economic structure. Therefore, an application with wide-ranging economic measures and known as the 24th January 1980 Decisions was put into practice. Since 1980, Turkey has participated in the process of expansion to the world and this has opened the way for the improvement of foreign trade structure. In addition to this outward-oriented economic policy, Turkey has also experienced changes in the level of external debt. Hence, the analysis of the relationship between trade openness and external debt or the effect of trade openness on external debt gains importance as a subject of research.

In this study, the effect of trade openness on external debt in Turkey is analyzed econometrically. Within this context, the next part of this study includes literature on trade openness and external debt relation. In the last part, linear relationship between trade openness and external debt has been examined via cointegration analysis.

### **2. Literature**

If the literature on the relationship between trade openness and external debt is examined, it may be said that there are numerous different studies on this specific subject. Some of these studies have argued a strong relationship between these two variables, and many others have said that trade openness and external debt variables are highly important on a country's economic development.

Sakı (2011), investigated the level long-run cointegration relationship between trade openness, foreign aid and economic growth in Ghana for the 1984 to 2007 period, using the ARDL bounds test. The empirical results of that study suggest that, although the total short and long-run positive impact that, trade openness and foreign aid have on economic growth is reduced by their interaction term, both trade openness and foreign aid have been beneficial to economic growth in Ghana, since the adoption of liberalization policies in 1983.

Osuji and Olowolayemo (1998), have investigated the effect of trade openness on external debt for Sub-Saharan African countries. In that study, external debt is used as dependent variable, the ratio of export and import to GDP, terms of trade and exchange rate are specified as independent variables. According to the results, they demonstrated that the level of external debt will increase with a rise in trade openness. Empirical results also show that a rise in domestic imports relative to GDP will increase the external debt.

The other study examining the relationship between trade openness and external debt belongs to Custers (2006). Custers handle the subject of trade openness (liberalization) within EPAs (Economic Partnership Agreements) and African External Debts. Custers also concluded that the first is that the history of the trade liberalization which has been carried out since the 1980s brings out the fact that debt relief measures are bound to remain ineffectual, as long as the insistence on ever larger trade liberalization continues. Trade liberalization has many negative consequences, including the serious danger of de-industrialization, as many countries in Africa have already experienced. But trade liberalization also bears the risk of aggravating the external debt problem of African/ACP (The African, Caribbean and Pacific Group of States) countries. Thus, a halt to trade liberalization is of equal importance from the perspective of solving the outstanding problem of African/ACP countries' external debt. Without a halt to trade liberalization, the solution to the external debt problem is bound to remain elusive.

Another study about trade openness and external debt was made by Zafar and Butt (2008). The major objective of that paper is to discuss the current external debt problem in Pakistan and analyze how its external debt is interrelated with trade liberalization policies and measures. It is investigated in paper that whether there exist a

momentous relationship between external debt and the trade liberalization variables or not. In this case study, ARDL bounds testing approach is employed to investigate the long-run relationships and Error Correction Method (ECM) for short-run dynamics. After finding the order of integration through implementing the Augmented Dickey Fuller (ADF) and Phillips-Perron unit root tests, their finding suggested a significant long-run positive association between external debt and trade liberalization is existed in the case of Pakistan.

Paudel and Perera (2009) examined the role of foreign debt, trade openness and labor force in the economic growth of Sri Lanka, by employing the Johansen maximum likelihood approach of cointegration. The study finds that there is a cointegration relationship between economic growth and foreign debt, trade openness and labor force. Further the results suggest that in the long-run; labor force, trade openness and foreign debt have a positive impact on economic growth of Sri Lanka.

Finally, Combes and Saadi-Sedik (2006) analyzed the effects of trade openness on budget balances by distinguishing the effects of natural openness from those of trade policy. Using GMM-system estimator, the econometric analysis focuses on 66 developing countries over 1974–98. The results of the study shows that trade openness increases a country's exposure to external shocks. This enforces the negative impact on budget balances of terms of trade instability. Additionally, they have found that trade openness influences budget balances through several other channels: corruption, income inequalities, etc. Thus natural openness and trade policy have opposite effects: the former deteriorates budget balances whereas the latter enhances them.

There are many studies in literature on the relation between trade openness and external debt as can be seen above; however, it is hard to see its examples in Turkey. The studies in Turkey focus on the relationship between trade openness and economic growth, inflation, etc. These studies are briefly mentioned below.

Baldemir et al. (2009), examined the relationship between trade openness and macroeconomic stability by considering the period of 1980-2006 in their study and found that inward-oriented case of country had negative effect on macroeconomic stability as a result. According to econometric

analysis evidences, macroeconomic stability as a result of trade openness firstly decreased then increased in low rates and finally decreased again.

Turker (2006) tested the hypothesis that trade openness could affect economic growth by increasing of efficiency with capital accumulation and technological progress via VAR (vector auto regression) model for the period 1988:1-2005:2. In this study the results obtained by estimating the VAR model were interpreted by using impulse-response functions and variance decomposition techniques. According to the results a shock in trade openness first leads to an increase in GDP, but after second period this effect diminishes.

Ari (2001) analyzed the relationship between trade openness and inflation for Turkey and emphasized a negative relationship between those two concepts after 1980. Also according to Ari (2001), one of the most important result of the expansion process is to reach an extremely high level of external debt. As the liberalization of capital movements facilitated finding outsourcing and provided financing opportunity for governments.

Another study examining the relationship between trade openness and economic growth was made by Kurt and Berber (2008). In this study, they analyzed causal relationships and dynamic interactions between trade openness and economic growth by using VAR and variance decompositions for the period of 1989:Q1-2003:Q4. Results of the analysis highlight that there are bi-directional causal relationships between trade openness and economic growth. Besides, they put forth that there are bi-directional causality relationships between economic growth and imports, and unidirectional causality from imports to exports and from exports to economic growth. Results of the study backs the hypothesis that the trade openness put forward by endogenous growth theories increases economic growth.

### 3. Model Method and Data Set

In this study, two variables are used to investigate the relationship between trade openness and external debt in Turkey. Openness index which is calculated as a sum of real exports and imports divided by real GDP is being used as a measure of openness and external debt stock figure is being a measure of external debt. Besides, exchange rate and 2008 crisis dummy variables are also used in the model. The data set is defined in terms of USD and for the period of 1998:Q1-2011:Q4. All data

was taken from Electronic Data Delivery System (EDDS) published by the Central Bank of the Turkish Republic (CBRT) and Econometric Views (Eviews, version 7.1) program was used for all tests and estimates.

The logarithmic transformation (ln) of variables were made before analysis. A seasonal effect on trade openness has been observed and it was seasonally adjusted. Accordingly, **IT IS** identified by using Dickey-Fuller (DF) (1979) test that the model variables were integrated variables (I) and cointegration equation including log-linear cointegration equation is defined as follows;

$$Indebt_t = \beta_0 + \beta_1 Inopen_t + \beta_2 lnexc_t + \beta_3 k2008 + e_t \quad (1)$$

Debt, open, exc and k2008 are external debt stock, trade openness, exchange rate and dummy variable for 2008 crisis respectively. In order to decide whether they are cointegrated variables, DF test is applied to the error terms series of Equation 1. In case of error terms series are stationary, it is determined that these variables are cointegrated. If otherwise, they are considered as non-cointegrated.

If it is understood that the series are cointegrated, is concerned the study investigation of short-run dynamics with error correction model. In this model, focusing relationship between trade openness and external debt, error correction term (ECT) defines that short-run behavior is related with long-run behavior and calculates the time when deviations from the long-run equilibrium level will disappear. According to this the model is as follows;

$$\Delta Indebt_t = \beta_0 + \beta_1 \Delta Inopen_t + \beta_2 \Delta lnexc_t + \beta_3 k2008 + \beta_4 e_{t-1} + \epsilon_t \quad (2)$$

Here,  $\Delta$  shows that first-degree difference of variables is taken.  $e_{t-1}$  indicates error correction term,  $\beta_4$  is then adaptation speed to the long-run balance and  $\epsilon_t$  is error term.

### 4. Application and Empirical Findings

#### 4.1. ADF Unit Root Test

In this study, levels of stability of variables are analyzed by using DF test. DF test is applied on the basis of the three regression equations:

Simple case:

$$\Delta Y_t = \gamma Y_{t-1} + u_t \quad (3)$$

Intercept:

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + u_t \quad (4)$$

Intercept and Trend:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + u_t \quad (5)$$

As a result of these tests, DF statistics are compared with critical values of MacKinnon and null hypothesis ( $H_0: g=0$ ) is tested against the alternative hypothesis ( $H_1: g \neq 0$ ). The null hypothesis indicates nonstationary status of the series and alternative hypothesis suggests that the series is stationary. If the error term has autocorrelation, Equation 5 is rearranged as follows;

$$\Delta Y_t = a_0 + a_1 t + \gamma Y_{t-1} + \beta_t \sum_{i=1}^m \Delta Y_{t-i} + u_t \quad (6)$$

Here, m indicates length of the delay and  $\Delta$  is the difference operator. This model is known as

Augmented Dickey Fuller (ADF) test. ADF test results are presented in Table 1. It is found that all the variables are stable at the level value.

#### 4.2. Cointegration Test (Long-Run Analysis)

According to Table 2, the ADF test statistic should be bigger than Engle-Granger (1987) value to mention about cointegration relationship. As seen in table, absolute value of ADF test statistic is bigger than Engle-Granger value (3.17) in the level of 5% significance. This result shows that variables are cointegrated. This finding is also supported by CRDW (Cointegration Regression Durbin Watson) test. CRDW statistic value is 0.47 in the estimated model and this value is bigger than Engle-Granger value (0.32) in the level of 5% significance. Based on these ADF and CRDW results, it is concluded that cointegration relation emerged.

Table 1: ADF Unit Root Test

Variables	ADF Test	Critical Values		
		%1	%5	%10
1998:Q1-2011:Q4				
Indebt	-2.05558 [1]	-4.1372	-3.4952	-3.1766
Inopen	-2.91223 [2]	-4.1408	-3.4969	-3.1775
Inexc	-2.46311 [1]	-4.1372	-3.4952	-3.1766
$\Delta$ Indebt	-5.67421 [0]	-3.5574	-2.9165	-2.5961
$\Delta$ Inopen	-3.32769 [4]	-3.5683	-2.9211	-2.5585
$\Delta$ Inexc	-4.87538 [0]	-3.5574	-2.9165	-2.5961

Note: Values in parentheses shows that the appropriate lag length of variables determined by Akaike information criterion. As the test type, intercept and trend is used in the level value and only intercept regression equation is used in the differenced series.

Table 2: Cointegration Test Results (1998:Q1-2011:Q4)

Indebt = f(Inopen, Inexc, k2008)			
Variables	Coefficients	t-statistics	
invariable	13.77424	52.60945	
Inopen	1.913795	7.26329	
Inexc	-0.122501	-1.54261	
k2008	0.457956	8.12181	
Diagnostic Test Results			
R <sup>2</sup> : 0.85			
$\hat{R}^2$ : 0.84		$\chi^2_{ARCH} = 29.25(0.056)$	
CRDW: 0.47		$\chi^2_{JBN} = 0.458(0.795)$	
ADF: [0] -3,2913			
F-Statistic: 100.1124			

Note:  $\chi^2_{ARCH}$  and  $\chi^2_{JBN}$  indicates ARCH LM test and Jarque-Bera normality test statistics respectively. Values in parentheses show that probability values.

Taking all these test results into account, it is possible to observe a strong relationship between trade openness and external debt in Turkey in cointegration regression equation. A 1% increase in trade openness bring about approximately two-fold increase in the ratio of external debt and a linear relationship between both variables has emerged as consistent with our theoretical expectations. Coefficient of trade openness is statistically interpretable and also provides an important framework for external debt in Turkey. Considering the fact that imports have a much larger significance than exports in the measure of Turkey's trade openness, observed that external debt has an important role in relations with external world. Based on this result, we can talk about a parallelism between the increase in imports and external debt.

In the Table 2, there is an inverse relation between the exchange rate and the external debt has emerged. It is estimated that this situation occurs due to the reducing effect of the increase in the exchange rate on external debt. If elaborated, an increase in exchange rate reduce the value of Turkish lira, which results in an increase in exports and hence in export revenues. External debt payment will ease and in such case it provides reduction of external debt stock. Besides dummy variable is used to represent the global crisis of 2008 in the model and its calculated level is significant as expected.

### 4.3. Error Correction Model (Short-Run Analysis)

Table 3 shows that the error correction term has a positive coefficient contrary to expectations thus

error correction term of model is meaningless. A linear relationship has been identified between trade openness and external debt variable in the short-run analysis as well as in the long-run analysis. This result shows that external debt is reactive to trade openness. However, the significance of the trade openness variable is controversial.

## 5. Conclusion

In this study, effect of trade openness on external debt in Turkey has been analyzed and following theoretical and empirical conclusions were obtained; Theoretically although definitely can not be said that external debt increases as openness does, it can be inferred that effect may differ depending on the economic structure of countries and external shocks.

Empirically; there is a strong relationship between trade openness and external debt in Turkey according to estimated cointegration regression equation results 1998:Q1-2011:Q4 period for Turkey. A 1% increase in trade openness brings about approximately two-fold increase in the ratio of external debt and a linear relationship between both variables has emerged meeting our theoretical expectations. Coefficient of trade openness is statistically interpretable and provides an important framework for external debt in Turkey. Considering the fact that imports have a much larger significance than exports in the measure of Turkey's trade openness, observed that external debt has an important role in relations with external world.

Table 3: Short-Run Estimation Results (1998:Q1-2011:Q4)

$\Delta \text{Indebt} = f(\Delta \text{Inopensa}, \Delta \text{Inexc}, \text{EC}_{t-1})$			
Variables	Coefficients	t-statistics	
invariable	0.027439	6.101051	
$\Delta \text{Inopensa}$	0.124696	1.410156	
$\Delta \text{Inexc}$	-0.139452	-2.735385	
$\text{EC}_{t-1}$	0.000876	0.031460	
Diagnostic Test Results			
$R^2$ : 0.13	$\chi^2_{\text{BGAB}}(2) = 1.026(0.598)$		
$\hat{R}^2$ : 0.07	$\chi^2_{\text{WDV}} = 10.069(0.098)$		
DW: 1.66	$\chi^2_{\text{JBN}} = 0.063(0.918)$		
F-Statistic: 2.541	$\chi^2_{\text{RRMKH}}(2) = 0.584(0.746)$		

Note: Where,  $\chi^2_{\text{BGAB}}$ ,  $\chi^2_{\text{WDV}}$ ,  $\chi^2_{\text{JBN}}$  and  $\chi^2_{\text{RRMKH}}$  are respectively Breusch-Godfrey Autocorrelation, White Heteroscedasticity, Jarque-Bera Normality and Ramsey Regression Model Specification Error test statistics respectively. Values in parentheses show that probability values.

Based on this result, we can talk about a parallelism between the increase in imports and external debt. On the other hand, the error correction term has a positive coefficient contrary to expectations but it cannot be interpreted as t-statistic is pointless. Thus, error correction term of model is insignificant. A linear relationship has been identified between trade openness and external debt variable in the short-run analysis as well as in the long-run analysis. This result shows that external debt is reactive to trade openness. However, the significance of the trade openness variable is controversial.

In this context, the obtained results are with compatible with Sakyi (2011), Osuji and Olowolayemo (1998) Zafar and Butts' (2008) studies concluding a linear relationship between trade openness and external debt. However, if we set different periods, it is believed that more different findings may be reached a linear relationship between trade openness and external debt for Turkey. Based on this result, considered that Turkey should turn to its own internal dynamics about raw materials and intermediate goods. As imports are diminished in this way, a lower external debt rate will be assured. According to findings, trade openness of Turkey with this economic structure appears to be quite costly. Within this context, first of all the economic model of Turkey need to be redefined depending on the changing structure of imports and a new development model for Turkey must be designed. If these measures are taken, macroeconomic balances will become more robust against to crisis which in the end result in a sustainable social welfare.

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