

## Is Turkey's Foreign Deficit Sustainable? Cointegration Relationship between Exports and Imports

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### Abstract

The aim of this study is to examine whether the foreign deficit of Turkey is sustainable or not. To achieve this, first of all it has been examined whether there is a cointegration relationship between imports and exports or not. Secondly, it has been tested whether the slope coefficients obtained from the equations derived from exports and imports series is statistically equal to 1 or not. While the existence of a cointegration relationship between imports and exports is a necessary condition to sustain the foreign deficit, it is not enough to achieve that. The slope coefficients obtained from the equations should also be equal to 1 to put forth clearly that the foreign deficit is sustainable. The result of the study indicates that it is doubtful that the foreign deficit of Turkey is sustainable. Because it has been seen that the slope coefficients obtained from the equations derived from exports and imports series is not equal to 1 although it has been found that there is a cointegration relationship between imports and exports.

**Keywords:** Foreign deficit, sustainability, exports, imports, cointegration

**JEL Classification Codes:** C32, F10, F32

### 1. Introduction

Sustainability of foreign deficits always drew attention of the economists. During the recent years, studies performed on this argument have focused mainly on cointegration relationship between imports and exports (See Arize, 2002; Irandoust and Ericsson, 2004; Choong et al., 2004; Narayan and Narayan, 2004; Narayan and Narayan, 2005). Because the existence of a cointegration relationship between imports and exports points out that the foreign deficit is a short period fact and it is sustainable in long period. This also means that macroeconomic policies embraced by countries affect the foundation of a balance between exports and imports in long period and international budget constraint is not violated this way.

However, the existence of a cointegration relationship between imports and exports is not enough to state clearly that the foreign deficit is sustainable. To come to an absolute conclusion about this matter, while there is a cointegration relationship between imports and exports series, it is also

necessary that the slope coefficients obtained from the equations derived from these series should be statistically equal to 1.

The aim of this study is to put forth that whether the foreign deficit of Turkey is sustainable or not. For this intend, a research has been conducted which consists of two phase. In the first phase of this research, it has been examined whether there is a cointegration relationship between imports and exports or not. In the second phase, it has been examined whether the slope coefficients obtained from the equations derived from these series is equal to 1 or not. The research covers the period after the year 1980 when Turkey liberalized its foreign trade.

The remaining part of the research has been organized as follows. A theoretical framework is given about this matter in the second part. The results of the econometric analyses are presented in the third part. The results of the study are summarized in the fourth part.

## 2. Theoretical Framework

Husted (1992) has developed a simple method which shows the long period relationship between exports and imports. In this study, current period budget constraint for a country has been defined as follows:

$$C_0 = Y_0 + B_0 - I_0 - (1 + r_0)B_{-1} \quad (1)$$

Here  $C_0$  refers to current consumption;  $Y_0$  refers to production;  $I_0$  refers to investment;  $r_0$  refers to interest rate for one period;  $B_0$  refers to foreign borrowing;  $(1 + r_0)B_{-1}$  refers to initial debt stock. Husted has derived a test model by formulating some hypotheses from the equation no (1). This test model is as follows:

$$X_t = a + bM_t + e_t \quad (2)$$

This model can also be written as Arize (2002) puts as follows:

$$M_t = a + bX_t + e_t \quad (3)$$

Here  $X_t$  and  $M_t$  refer to exports and imports respectively. According to this model, two conditions are necessary for an economy to maintain intertemporal budget constraint. The necessary condition which constitutes the weak figure of the model is the stationary of  $e_t$  which is the error term. This means that there is a cointegration relationship between two variables, that is to say they act together in the long period. Failure to accomplish this condition indicates that economy does not function as required and has not succeeded in maintaining the budget constraint. For this reason, it is expected that this economy cannot fulfill its foreign debt liabilities. The necessary and efficient condition which constitutes the weak figure of the model is the fact that  $b$  is statistically equal to 1 which is the slope coefficient in addition to the stationary of  $e_t$ .

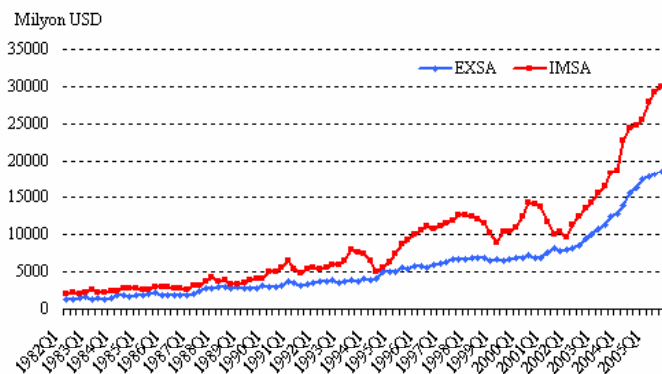
Even if there is a cointegration relationship between exports and imports, it is necessary to look askance on the sustainability of foreign deficit (or surplus) if the slope coefficients obtained from the equations derived from exports and imports series is not equal to 1. The fact that the slope coefficient is lower than 1 in the equation no (2) or the fact that the slope coefficient is higher than 1 in the equation no (3) shows that the economy imports more than 1 dollar to get 1 dollar exports revenue. The fact that the slope coefficient is higher than 1 in the equation no (2) or the fact that the slope coefficient is lower than 1 in the equation no (3) shows that the economy imports less than 1 dollar for 1 dollar exports revenue. Foreign deficit permanently grows in the first example while foreign surplus permanently grows in the second example.

## 3. Data and Empirical Results

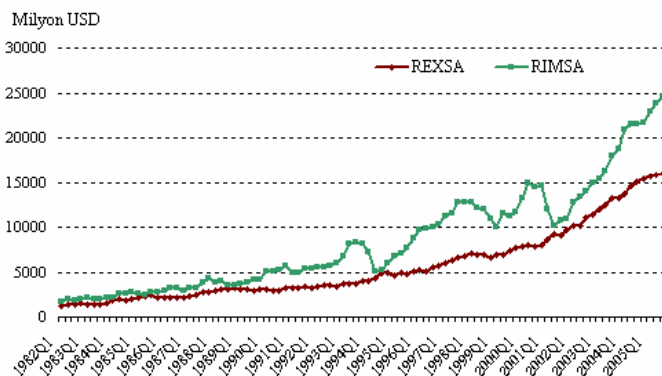
In this section, equations no (2) and (3) have been estimated using quarterly exports and imports data of 1982:01-2005:04 period of Turkey. These equations have been estimated both with nominal exports

and imports series and real exports and imports series. Real exports series has been formed by deflating nominal exports series which are measured as million dollars with exports price index based on 1994=100. Real imports series has been formed by deflating nominal exports series which are measured as million dollars with imports price index based on 1994=100. All series have been corrected seasonally using Tramo-Seats method. In the tables, seasonal corrected nominal exports series have been shown with EXSA symbols, seasonal corrected nominal imports series have been shown with IMSA symbols, seasonal corrected real exports series have been shown with REXSA symbols, seasonal corrected real imports series have been shown with RIMSA symbols. Raw data used in this study have been taken from Electronic Data Distribution System in CBRT's<sup>1</sup> web site (<http://tcmbf40.tcmb.gov.tr/cbt.html>) and SIS<sup>2</sup> (1995). These datas are shown in Figure 1 and Figure 2.

**Figure 1:** Seasonal Corrected Exports and Imports Series (1982:Q1-2005:Q4)



**Figure 2:** Seasonal Corrected Real Exports and Real Imports Series (1982:Q1-2005:Q4)



There are several methods used in analyzing the cointegration relationship between time series. By taking into account of the features of series, Engle-Granger method has been used in this study which was developed by Engle and Granger (1987). This method is based on the analyzing stationary of error term series obtained from the equation derived with level values of time series that are not stationary on the level but become stationary when their difference is taken equally. If the error term series are stationary, this means that there is a cointegration relationship between the mentioned two time series.

In this method, stationary features of the approached time series must be researched first. In our research, ADF (Augmented Dickey-Fuller) test which was developed by Dickey and Fuller (1981) has

<sup>1</sup> CBRT; Central Bank of the Republic of Turkey.

<sup>2</sup> SIS; The State Institute of Statistic.

been used in analyzing the stationary of exports and imports series of Turkey. The results of this test are given in the Table-1.

**Table 1:** Results of the ADF unit roots tests

Variables	ADF Without Trend	ADF With Trend
<i>Level Form</i>		
EXSA	6.54 (0)	3.31 (0)
IMSA	1.33 (1)	-0.73 (1)
REXSA	5.71 (0)	1.99 (0)
RIMSA	1.04 (1)	-1.40 (1)
<i>First Differences</i>		
EXSA	-2.31 (2)	-3.24*** (2)
IMSA	-6.29* (0)	-6.67* (0)
REXSA	-2.77*** (2)	-9.81* (2)
RIMSA	-6.65* (0)	-6.92* (0)

**Notes:** The numbers in brackets are the lag lengths which have been selected using Schwarz criterion. \*, \*\*, and \*\*\* marks show meaningfulness on 1%, 5%, 10% levels. In ADF test, MacKinnon (1990) critical values are -3.50, -2.89 and -2.58 on model without trend, and -4.06, -3.46 and -3.16 on model with trend for 1%, 5%, 10% meaningfulness levels.

These results show that nominal and real exports and imports series is not stationary on level but they become stationary when their first difference is taken. This means that Engle-Granger method can be used in cointegration analysis.

The results of Engle-Granger cointegration test are shown in Table-2.

**Table 2:** Results of the Engle-Granger cointegration tests

Cointegration Equation	R <sup>2</sup>	ADF Without Trend	ADF With Trend
EXSA = 99.16 + 0.62 IMSA [0.78] [55.52]*	0.970	-4.25*(1)	-4.26** (1)
IMSA = 110.63 + 1.55 EXSA [0.55] [55.52]*	0.970	-4.40*(1)	-4.38** (1)
REXSA = 2.22 + 0.66 RIMSA [0.01] [40.24]*	0.945	-3.63** (1)	-3.63*** (1)
RIMSA = 472.26 + 1.43 REXSA [1.88]*** [40.24]*	0.945	-3.78** (1)	-3.80*** (1)

**Notes:** The numbers in brackets are the lag lengths which have been selected using Schwarz criterion. The numbers in square brackets are t statistics. \*, \*\*, and \*\*\* marks show meaningfulness on 1%, 5%, 10% levels. In ADF test, MacKinnon (1990) critical values are -4.02, -3.40 and -3.09 on model without trend, and -4.50, -3.88 and -3.57 on model with trend for 1%, 5%, 10% meaningfulness levels.

These results indicate that there is a long period relationship both between nominal exports and imports series and real exports and imports series. In view of the ADF unit root tests applied on error term series obtained from equations number (2) and (3), it has been found that these series are stationary on level. This means that there exists a cointegration relationship between the two series.

On the other hand, as specified above, the existence of a cointegration relationship between imports and exports is not enough to state clearly that the foreign deficit is sustainable. The slope coefficients obtained from the equations should also be equal to 1 to put forth clearly that the foreign deficit is sustainable. The results of the Wald tests are given which has been done to examine the slope coefficients obtained from the equations no (2) and (3) is equal to 1 or not.

**Table 3:** Results of the Wald tests

Equation	Coefficient b	Null Hypothesis	F Statistics
EXSA = f(IMSA)	0.62	$H_0 : b = 1$	1113.34*
IMSA = f(EXSA)	1.55	$H_0 : b = 1$	391.42*
REXSA = f(RIMSA)	0.66	$H_0 : b = 1$	419.72*
RIMSA = f(REXSA)	1.43	$H_0 : b = 1$	144.67*

\*Denotes for 1% significance level.

These results reveal that none of the calculated slope coefficients is equal to 1. The reason for this is that the F statistics calculated with Wald test come out statistically meaningful and zero hypotheses is rejected.

#### 4. Conclusion

In this study, it has been aimed to examine whether the foreign deficit of Turkey is sustainable or not. For this intend, the method developed by Husted (1992) has been used. In the first phase of this research, it has been researched whether there is a cointegration relationship between imports and exports or not. In the second phase, it has been tested whether the slope coefficients obtained from the equations derived from exports and imports series is equal to 1 or not.

The result of the study indicates that it is doubtful that the foreign deficit of Turkey is sustainable. Because it has been seen that the slope coefficients obtained from the equations derived from exports and imports series is not equal to 1 although it has been found that there is a cointegration relationship between imports and exports. While the existence of a cointegration relationship between imports and exports is a necessary condition to sustain the foreign deficit, it is not enough to state it clearly. Along with the existence of a cointegration relationship between imports and exports the slope coefficients obtained from the equations derived from these series should also be equal to 1 to put forth clearly that the foreign deficit is sustainable. Failure to fulfill the second condition in Turkey example requires that the sustainability of foreign deficit must be considered with doubt. The fact that the slope coefficient is lower than 1 in the equation no (2) or the fact that the slope coefficient is higher than 1 in the equation no (3) shows that the economy imports more than 1 dollar to get 1 dollar exports revenue. This way the sustainability of the foreign deficit will always be uncertain due to the fact that it will permanently grow.

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