ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
ECONOMIC STUDIES

ГОДИНА XX, 2011, 1

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FOREIGN TRADE DEFICIT SUSTAINABILITY OF TURKEY

This paper examines whether the foreign trade deficit of Turkey is sustainable or not by using three-regime threshold autoregressive unit root test of Kapetanious and Shin (2006). Three models are estimated including linear OLS, two-regime self-exciting threshold autoregressive and three-regime self-exciting threshold autoregressive models. The three-regime threshold autoregressive model is chosen as appropriate model for foreign trade deficit of Turkey by employing sup-Wald test. The finding results of the three-regime threshold autoregressive unit root test indicate that Turkey's foreign trade deficit is not sustainable.
JEL: C22; F10

1. Introduction

The external account is an important indicator of a country's performance. This is because major external imbalances might predict future changes in a managed foreign exchange regime(Irandoust and Ericsson, 2004). The empirical literature that examines the sustainability of external imbalances adopts one of the two major empirical approaches. The first approach is to examine whether exports and imports are cointegrated. Cointegration between exports and imports implies that trade deficits are only a short-term phenomena and thus sustainable in the long-run. As the macroeconomic policies have been effective in bringing exports and imports into a long run equilibrium, it can be said that countries are not in violation of their international budget constraint (Perera and Varma, 2008). The second approach is to investigate the sustainability of external imbalances by using unit root tests. As a result, if the current account or trade balance is found to be stationary, this implies that external imbalances are sustainable. If the trade balance is nonstationary, this is either a reflection of bad policies or indicative of the productivity gap hypothesis (Alias et.al, 2009).

There are several ways to make the trade deficit sustainable (Zaman, 2004):

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a) Depreciating the exchange rate: A depreciation of the exchange rate leads to export promotion, while imports decrease. b) Increasing the interest or saving rates: High interest rates attract the necessary capital to finance the deficit in the economy. However, this policy is not advisable because high interest rates lead invariably to economic recession. High saving rates induce an increasing volume of investment and therefore the economic growth is rapid, high and sustainable. c) Accumulating budget surpluses: This is a good alternative for maintaining the trade deficit sustainable. Because, when the budget records a surplus, the government is able to pay its foreign debt in time without additional borrowing. d) Inflationary policies: A possible alternative for reducing the trade deficit is the increase of the average price level in the economy. e) Increasing productivity: A sustainable and fast economic growth represents the only viable solution for reducing the trade deficit.

In the international trade literature, sustainability of foreign trade deficit has been empirically tested by many researchers. Arize(2002) provides new evidence on the long run convergence between imports and exports in 50 countries over the quarterly period 1973:2 to 1998:1 and find evidence in favor of cointegration in 35 of the 50 countries. Bahmani-Oskooee(1994) investigates the long run relationship between Australian exports and imports and concludes that the cointegrating coefficient is close to one, implying that Australia's external account is sustainable. Bahmani-Oskooee and Rhee(1997) use quarterly data to model exports and imports for Korea and find evidence of cointegration. Fountas and Wu(1999) examines the sustainability of the trade deficit by using quarterly US data for the 1967-1994 period and conclude that the US trade deficit is not sustainable. Herzer and Felicitas(2006) investigates the long run relationship between Chilean exports and imports during 1975 to 2004 period by using unit root tests and cointegration techniques and the finding results indicate that there exists a long run equilibrium between exports and imports. Husted(2002) examines whether exports and imports are cointegrated for the US over the period from 1967 through 1989 and finds evidence in support of a long run relationship. Keong et al.(2004) use multivariate cointegration techniques to investigate the long run relationship between Malaysian exports and imports and demonstrate that there exists a long run relationship. Irandoust and Ericsson(2004) examine the long run convergence between exports and imports for a number of industrialized countries and their results indicate that there is a long run relationship for most countries in the sample. Narayan and Narayan(2004) investigate whether there is a long run relationship between exports and imports for Pasific Island Countries - Fiji and Papa New Guinea(PNG). They find that Fiji satisfies the strong form of its intertemporal budget constraint while PNG satisfies only the weak form of intertemporal budget constraint. Narayan and Narayan(2005) examines whether there is a long run relationship between exports and imports for 22 least developed countries and their results show that exports and imports are cointegrated only for six out of the 22 countries.

This study empirically examines the sustainability of foreign trade deficit in Turkey by testing the stationarity of the real trade balance series rather than testing for cointegration between exports and imports. The difference of this paper is that we investigate the sustainability of foreign trade deficit in a nonlinear framework by

using three regime threshold autoregressive unit root test suggested by Kapetanious and Shin(2006).

The structure of the paper is as follows: Section 2 provides a brief note on the Turkish trade balance since 1980s. Section 3 explains the testing procedure. Section 4 describes the data and reports the empirical results. Finally, Section 5 contains some concluding remarks.

2. Turkish Trade Balance since 1980s

Trade played a minor role in the Turkish economy before 1980, but grew rapidly after structural reforms promoted liberalization of foreign trade in 1980. A new way opened in front of Turkey in terms of financial liberalization applications and structural adjustment programs. Import substitution policies have been abandoned and export-led growth strategy has been adopted. Price controls have been lifted, import regime gradually liberalized and export encouraging policies were followed (Hasanov and Omay, 2008). Export licenses were abolished, and export liberalization was put in effect as a major policy issue in the Turkish economy politics (Varol, 2003). The foreign exchange regime was liberalized, banks were allowed to accept foreign currency deposit from citizens and to engage in foreign transactions and new market institutions were established. After the full liberalization of the capital account and the recognition of full convertibility of the Lira in 1989, there was a massive inflow of short term capital into the economy (Balkan and Yeldan, 2001). The share of exports and imports within the gross national product (GNP) increased in time. However, the increase was more rapid in the ratio of import /GNP. Thus, Turkey faced a negative balance of trade.

The integration process of the Turkish economy into the world economy gained further momentum following the Custom Union with the EU in 1996. Nearly 12 years after the Customs Union, EU has a stable share of around 50% in Turkey's foreign trade. The Custom Union is important for Turkey's production structure, since 85% of total imports are intermediary and investment goods. The biggest increase in imports from the EU is in consumer products. The share of consumer goods rose to 15.1% in 2007 from 7.3% in 1994, while the share of investment goods decreased to 21.4% from 29.3%. On the other hand, the share of investment goods in total exports from Turkey to the EU rose to 14% in 2007 from 2.9% in 1994, and the share of intermediate goods rose from 32.5% to 38.7%, while the share of consumer goods declined to 47.1% from 64.6% in the same period (İzmen and Yılmaz, 2009). However, liberalization brought important structural problems and deep crises to the Turkish economy. Integration into the European Customs Union affected the Turkish trade balance predominantly until as recently as 2006.

The 1997 Asian financial crisis and the subsequent Russian crisis in 1998 affected the Turkish trade balance in a negative way because while the exports volume could not be increased, the imports volume maintained a growing trend. And as the anti-inflationary stabilization program based on nominal exchange anchor appreciated the domestic currency, it also deteriorated the trade balance. The stabilization

program was unsuccessful in attaining the ex-ante crawling-peg regime leading to the February 2001 Turkish economic crisis. This crisis resulted in a massive depreciation of domestic currency against hard currencies such as the US Dollar and Euro. These developments brought about a narrowing effect upon imports volume, and supported the exports volume in a positive way. However, having a stabilized economy and having attained a sustainable growth path, trade balance again began depreciating until 2006, although policymakers could provide massive increases in exports volume. Table 2 reports the foreign trade indicators over the period 1980-2008.

Table

Foreign Trade Indicators 1980-2008 ($ Billion)

	1980	1985	1990	1995	2000	2005	2008
Exports	2,910	7,958	12,959	21,636	27,774	73,5	105,4
Imports	7,909	11,343	22,302	35,707	54,502	116,8	163,5
Deficit	-4,999	-3,385	-9,342	-14,071	-26,728	-42,3	-58,2

Source: State Planning Organization of Turkey, Undersecretariat of Trade & Treasury of Turkey.

As can be seen from the table, there is a prevaling reality that the import volume is more than export volume. Therefore, Turkey has been subject to a negative trade balance, balance of payment difficulties and necessary capital accumulation.

3. Econometric Methodology

This section describes the test procedure of Kapetanios and Shin(2006) which is employed to analyze the sustainability of the foreign trade deficit. The two regime self-exciting threshold autoregresive model which is used in this paper can be considered as follows:

$$\Delta y_t = \theta_1' x_{t-1} 1_{\{Z_{t-1}<\lambda\}} + \theta_2' x_{t-1} 1_{\{Z_{t-1}\geq\lambda\}} + e_t \qquad t = 1,.....T \tag{1}$$

where $x_{t-1} = \left(y_{t-1} r_t', \Delta y_{t-1}.....,\Delta y_{t-k} \right)'$, y_t is the foreign trade deficit series, $1_{\{\cdot\}}$ is the indicator function, r_t is a vector of deterministic components including an intercept and possibly a linear time trend, $k \geq 1$ is the autoregressive order, $Z_{t-1} = y_{t-1} - y_{t-m}$ for some $m \geq 1$, the delay parameter , λ is the threshold variable and takes on values at the interval $\lambda \in [\lambda_1, \lambda_2]$, where λ_1 and λ_2 are selected, so that $P(Z_t \leq \lambda_1) = \pi_1 > 0$ and $P(Z_t \leq \lambda_2) = \pi_2 < 1$, e_t is an independently and identically distributed (*iid*) error term. Suppose that y_t series

follow the three regime self-exciting threshold autoregressive process. The model can be written as:

$$\Delta y_t = \beta_1 y_{t-1} 1_{\{Z_{t-1} \le r1\}} + \beta_0 y_{t-1} 1_{\{r1 < Z_{t-1} < r2\}} + \beta_2 y_{t-1} 1_{\{Z_{t-1} > r2\}} + e_t \tag{2}$$

where $1_{\{\cdot\}}$ is the indicator function, $\beta_1 = \phi_1 - 1$, $\beta_0 = \phi_0 - 1$, $\beta_2 = \phi_2 - 1$ and $y_{t-1} 1_{\{Z_{t-1} \le r1\}}$, $y_{t-1} 1_{\{r1 < Z_{t-1} < r2\}}$, $y_{t-1} 1_{\{Z_{t-1} > r2\}}$ are orthogonal to each other by construction. For the joint hypothesis $\beta_1 = \beta_0 = \beta_2 = 0$ in equation (2), Bec et.al.(2004) proposed the supremum Wald (sup-Wald) test procedure. Kapetanios and Shin(2006) consider the model where y_t follows the self-exciting threshold autoregressive model by imposing $\beta_0 = 0$ in (2) and they focus on the following model:

$$\Delta y_t = \beta_1 y_{t-1} 1_{\{Z_{t-1} \le r1\}} + \beta_2 y_{t-1} 1_{\{Z_{t-1} > r2\}} + e_t \tag{3}$$

The null hypothesis of unit root is considered as $H_0 : \beta_1 = \beta_2 = 0$ against the alternative hypothesis of threshold stationarity $H_1 : \beta_1 < 0; \beta_2 < 0$. Kapetanios and Shin(2006) suggest to use average and exponential average statistics defined by

$$W_{\sup} = \sup_{i \in \Gamma} W^{(i)}_{(r_1, r_2)}, \quad W_{avg} = \frac{1}{\#\Gamma} \sum_{i=1}^{\#\Gamma} W^{(i)}_{(r_1, r_2)}, \quad W_{\exp} = \frac{1}{\#\Gamma} \sum_{i=1}^{\#\Gamma} \exp\left(\frac{W^{(i)}_{(r_1, r_2)}}{2} \right).$$

Here, $W^{(i)}_{(r_1, r_2)}$ is the Wald test statistic obtained from the *i* th point of the threshold parameters grid set, Γ and $\#\Gamma$ is the number of elements of Γ.

4. Data and Empirical Results

This paper uses quarterly real exports and real imports data obtained by deflating nominal exports and imports series with exports and imports price indexes, respectively. The data covering the 1981:01-2009:02 period are taken from the International Monetary Fund's (IMF) International Financial Statistics (IFS) database. The trade deficit values are calculated as a difference between real exports and real imports. In the first step of the analysis, we explore true data generating process of the series. If the true data generating process is nonlinearly mean-reverting, these features should be incorporated to test structures so as to increase the power of the unit root test (Kim, 2005). In the threshold autoregressive model methodology, it is important to select the appropriate lag order (k) and delay

parameter (m) for the threshold variable. To do this, we use Akaike information criteria and report the values for different lag lenghts and delay orders for two and three regimes threshold autoregressive models in Table 2.

Table 2

AIC for Different Lag Lenghts and Delay Orders

m/k	Threshold model with two regimes				Threshold model with three regimes			
	1	2	3	4	1	2	3	4
1	**8.1373**	8.153	8.2469	8.144	8.1144	8.1545	8.1748	**8.0084**
2		8.2434	8.175	8.1419		8.1299	8.0797	8.0699
3			8.2698	8.2221			8.1442	8.1262
4				8.1929				8.0453

As can be seen from the table, appropriate lag lenght and delay order are 1 for two regime threshold autoregressive model while delay order is 1 and lag lenght is 4 for three regime threshold autoregressive model. By using these appropriate lag lenght and delay orders, we estimate OLS, two regime and three regime threshold models and give the estimation results in Table 3.

Table 3

OLS, Two and Three Regimes Threshold Model Estimations

Explanatory variables	OLS	Threshold model with two regimes		Threshold model with three regimes		
		Lower	Upper	Lower	Middle	Upper
C	-5.018427[c]	-4.333514[c]	-166[a]	-2.012285	606.4132[a]	-608.9372[a]
A(-1)	-0.078769[c]	-0.075054[b]	-2.420441[a]	-0.030827	12.66798[a]	-12.73588[a]
D(A(-1))	0.048439	0.027844	1.051415	-0.300385	-0.748334	0.836448[c]
D(A(-2))	-0.247462[b]			-0.166876	-5.319859[a]	5.34643[a]
D(A(-3))	-0.203104[c]			-0.38677[b]	-23.59067[a]	23.60488[a]
D(A(-4))	0.314466[a]			0.933334[a]	-2.842882[a]	2.566464[a]

For comparison purposes, the first column in Table 3 displays estimations from a linear specification that ignores threshold effects. The appropriate lag lenght for OLS model is found as 4 by using AIC (8.363) criteria. Second and third columns provide estimates for the two regime threshold autoregressive model. Column 2 and 3 correspond to observations below and above the threshold, respectively. Threshold value obtained from the model with two regime is 22.406. The remaning columns of the Table 3 indicate estimates for the three regime threshold autoregressive model. Column 4, 5 and 6 give the results for lower, middle and upper thresholds, respectively. Obtained threshold values from these models are -3.435 and 20.453. In the next stage of the analysis, we use sup-Wald test to select the appropriate model for trade deficit. The test results are presented in Table 4.

Table 4

Sup-Wald Test Results

linear vs 2 regimes	23.20774	p-value	0.000000
2 regimes vs 3 regimes	31.12202	p-value	0.000000

* the p values are obtained from 10.000 bootstrap replications.

According to the results in the table, the three regime threshold autoregresive model is chosen as appropriate model for foreign trade deficit of Turkey. In the light of this finding, we use three regime unit root test suggested by Kapetanios and Shin(2006) for stationarity properties of the series. The results can be seen in Table 5.

Table 5

Three Regime Unit Root Test Results

$W_{\sup}$	13.98162	p-value	0.369000
W_{avg}	1.340838	p-value	0.190700
$W_{\exp}$	4.651558	p-value	0.212900

As can be seen from the Table 5, Turkey's foreign trade deficit is nonstationary for all the $W_{\sup}, W_{avg}$ $W_{\exp}$ test statistics. These findings can be interpreted as Turkey's foreign trade deficit is not sustainable.

5. Conclusion

This paper investigates whether the foreign trade deficit of Turkey is sustainable or not by using three-regime threshold autoregressive unit root test of Kapetanious and Shin(2006) over the period from 1981:01 through 2009:02. In the first step of the analyis, we try to explore true data generating process. For this purpose, linear OLS, two regime self-exciting threshold autoregressive and three regime self-exciting threshold autoregressive models are estimated with appropriate lag order(k) and delay parameter(m) for the threshold variable. Then, the sup-Wald test is employed to the corresponding models in order to choose the most appropriate model for foreign trade deficit of Turkey. It is found that the three regime threshold autoregressive model is the most appropriate one. In the final step, the three regime threshold autoregressive unit root test of Kapetanious and Shin(2006) is used for the stationarity properties. According to the test results, it is concluded that Turkey's foreign trade deficit is not sustainable. The government must decide immediately about a preventive set of policies to stabilize the deficit and bring it to reasonable levels.

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