

THE EMPIRICAL ANALYSIS OF THE EFFECTS OF ECONOMIC GROWTH AND EXCHANGE RATE ON CURRENT ACCOUNT DEFICIT: ROMANIA AND TURKEY SAMPLES

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Abstract: *The aim of this study is to analyse the effects of economic growth and real effective exchange rate on current account deficit for Romania and Turkey using Structural Vector Autoregressive Analysis (SVAR). For this purpose, GDP, Real Effective Exchange Rate and Balance of Current Account Data of Turkey and Romania between the dates including 1997q2-2007q3 were used. Consequently, the shock of economical growth has revealed 82 % of variance fault estimation for Turkey and 79 % for Romania. Thus, It can be said that the changeability of economical growth is the most important reason for national current account deficit for both countries.*

Key words: *Current Account Deficit; Economic Growth; Structural Vector Autoregressive Analysis; Turkey; Romania*

1. Introduction

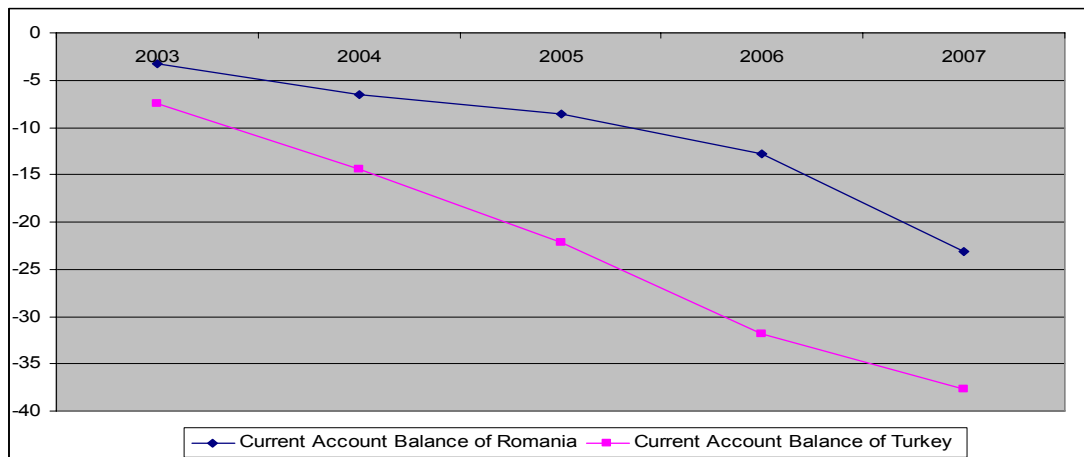
The subjects about on the current account deficit of developing countries have been debated latterly since the current account balance was seen as one of the sensitive and important components in economies. Because the current account balance gives the balance of the commodity trade of real sector and foreign money income-outcome of manufacturer factors.(Yeldan, 2005). At this point, the current account deficit is the mirror of economy in one sense.

It is possible to divide the discussed subjects into two groups¹ concerning the current account deficit. The second debate group deals with which were held the reasons for the deficit. there are two point of views regarding to the reason of deficit seen in the studies.

The economic growth has been seen as one of the most important reasons for current account deficit. The current account deficit is the quantitive difference between national savings and investments. It means, the deficit is ocured as a result of either increase in investments or decrease in savings. The economic growth increases the confidence in economy by establishing higher expectations of profit. In this way the investments increase. On the other side, it decreases savings because of demand rising and then it causes the deficit to increase. The economic slowdown caused by the current account deficit effects the investments and savings in opposite direction so the increase in current deficit falls down automatically. (Roubini ve Watchel, 1998).

As for the other view, the reason for the current account deficit is the overvalued national monetary unit which is independently determined. It is claimed that, there is a mechanism in which the exchange rate is determined by the short-term capital input, the current account deficits are determined by the exchange rate delayingly and the exchange rate is determind by the current account deficits delayingly. Working of this mechanism will lead the real exchange to increase and lead to weaken the competition force of the country. Consequently, the importation of intermediate and consumption goods will increase and it will cause the current account balance distorted. (Türel, 2004).

The current account balance has become an important indicator for economies since the capital mobility was liberalized and the national economies became global. The current account deficit of Turkey and Romaina within the years 2003-2007 was shown in Graph 1.



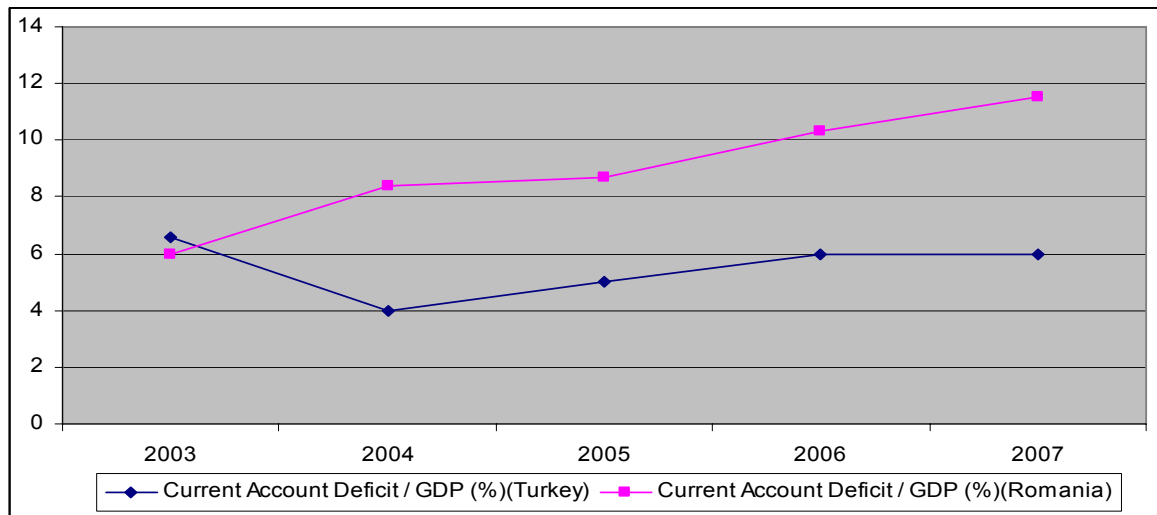
Graph 1. Current Account Balance of Turkey and Romania (2003-2007) (Billion USD)

Resource: IMF Country Stats

While examining the first quarter of 2008, It is seen that, the current account deficit in Turkey which has been continuously increased within these years will increase in the same way. The current account balance reached 3.4 billion \$ current extra in 2003, 1.5 billion \$ in the following year, and during the following four years it reached 8.1 billion \$, 15.6 billion \$, 22.1 billion \$ and 31.8 billion \$ respectively. In 2007 the deficit reached 38.2 billion \$.

Romania which became the member of EU in 2007 is one of the countries faced with Current Account Deficit Problem. Its current account deficit, which showed changes between 1.3-2.5 billion \$ in the last ten years period until 2003, reached 3.3 billion \$ in 2003. During the following three years, it reached 6.4 billion \$, 8.6 billion \$, and 12.8 billion \$ respectively. In 2007 the deficit reached 23.1 billion \$.

On the other hand, the current account deficit/GDP ratio was given in Graph 2. Contrary to current values, if taking these values into consideration as a proportion, the situation is not too bad for Turkish Economy. Furthermore, it can be said that it is relatively much balanced when proportioning current deficit with GDP. Because, the ratio which was 4 % in 2004 rose to 6 % level increasing only 2 % in 2006 and 2007.



Graph 2. Current Account Deficit/GDP Ratio for Turkey and Romania (2003-2007)

Resource: IMF Country Stats

When looking at the Romania's GDP ratio of current account deficit of last five years, We see that the 6 % level in 2003 rose up nearly double to 11.5 %. In that respect, it is seen that the deficit is quite above the threshold value.

The aim of this study is to analyse the factors economic growth and real effective exchange rate which effects current account deficit for Romania and Turkey and to analyse which factor is much effective one.

This study consists of five parts. the first part includes the theory, the following part gives the literature concerning the subject, the third part explains the method and the data used in this study. The obtained estimated results are given in the fourth part. The last part gives conclusion and implications.

2. Literature

There are so many studies available investigating the reasons for current account deficit. In these studies, analyses were carried out by using different econometrical methods and data concerning different countries and years. The obtained results have mostly showed that there are causality relations between current account deficit and real effective exchange rate or/and economic growth.

Findings obtained in some studies examining the relation between current account deficit and real effective exchange rate show that there is a strong relationship between two variables [Sarcinell (1982), Khan ve Knight (1983) ve Howard (1989)]. In his study Freund (2000) examined 25 developed countries using ordinarily least squares method and states expressly that loss in value of real effective exchange rate (consequently loss on current account balance) has lagged responses on trade balance. In his study including the period between 1980-1988. Eken (1990) came to the conclusion that there was a strong relationship between real effective exchange rate and foreign trade balance in Turkey. Furthermore it was concluded that high economic growth lead to balance of payment matter. Calderon et al. (2002) performed estimation and inference on panel data including the years between 1966-1994 of 44 developing countries. According to the study, a rise in the reel effective exchange rate caused higher current account deficit. Boyd et al. (2001) analyzed the data of 8 OECD countries using vector error correction model and found that there was a statistically significant relationship between reel affective exchange rate and its effects on trade balance.

Herwartz and Siedenburg (2007) carried out a panel data study in which the data of 16 OECD countries including the years between 1980-2004 were used. In this study, there were 4 factors stated as reasons for current account deficit. These were, past current account deficit, budget deficits, differences in production output and changes in trade situations. Erbaykal (2007) carried out a Toda and Yamamoto casuality analysis for Turkey including the years between 1987-2006. Results showed that both real effective exchange rate and economic growth had effects on current account deficit.

The main findings of the studies which examined the casuality relation between current account deficit and economic growth differ among one another. Kandil and Greene (2002) performed cointegration test using both quarterly and monthly data including the years between 1960-2000, in order to find the raeason for current account deficit of United States. Consequently, they found that the changes in real GDP was effective on current account balance. Hooper ve Tyron (1984), Karunaratne (1988), Bagnai ve Manzocchi (1999) and Freund (2000) showed in their studies that there were strong relations between economic growth and current account deficit.

However, some researcher defend that there is no strong relationship between above mentioned subjects. Chinn ve Prasad (2000) carried out a panel data and a cross-sectional study using the data of 18 industrialized and 71 developing countries including the years between 1971-1995. As a result of the study, they determined a weak relationship between current account deficit and economic growth. They also found that the reasons for current account deficit showed differences between industrialized and developing countries. The findings obtained by Calderon et al. (2002), Yücel (2003) and Eken (1990) support the findings of Chinn ve Prasad (2000) in terms of the relation between current deficit and economic growth.

3. Methodology

Since the economic relations are complicated, many economic situations need to be examined by simultaneous equation models rather than one-equation models. It has been observed that macro economic variables are mutually effected. Consequently, It will be difficult to divide the variables into two groups as pure endogenous and exogenous variables. The VAR method is used to solve the mentioned problems (Adrian,1990:114-116).

In this study the effects of economic growth and real effective exchange rate on current account deficit were tested with SVAR analysis. While the variables in VAR analysis were chosen, The empirical studies² were taken into consideration and three variables were used in our study including the period between 1997q2-2007q3.

The variable vector used in this study is as follows

$$x_t = [REDK_t, BO_t, CA_t]$$

Here, $REDK_t$ denotes real effective exchange rate at t period and BO_t denoting growth rate at t period were estimated by GDP which were projected by expenses. CA_t , denoting the current accounts balance at t period. This variables are made seasonal adjustment using Tramo-Seats method in the paper.

In this research quarterly data including the time between 1997q2- 2007q3 were used.³ The data and resources were shown at Table 1.

Table 1. The Data Set

Variables	Explanations	Resources
CA	Current Account Deficit, \$	IMF
BO	GDP Growth Rate, %	IMF
REDK	Real Effective Exchange Rate, PPI based (1995=100)	IMF

Econometric Views (Eviews, version 5.1) program was used to test the data and estimate the results.

In our study, SVAR analysis was used to test the effects of economic growth rate on current account deficit. Performing the analysis depends on obtaining deconstructive terms (ε_t). Variance-covariance matrix of Cholesky decomposition and reduced VAR resids are used for this. Relation between structural destructive term and reduced VAR resid is given below:

$$\begin{bmatrix} u_t^{REDK} \\ u_t^{BO} \\ u_t^{CA} \end{bmatrix} = \begin{bmatrix} S_{11} & 0 & 0 \\ S_{21} & S_{22} & 0 \\ S_{31} & S_{32} & S_{33} \end{bmatrix} = \begin{bmatrix} \varepsilon_t^{REDK} \\ \varepsilon_t^{BO} \\ \varepsilon_t^{CA} \end{bmatrix}$$

S matrix⁴ is triangular matrix (a lower-triangular matrix) which denotes that some structural shocks has no simultaneous effect on some other variables when the ranking of internal variables is constant in model. According to this, structural model is determined by putting $k(k-1)/2$ constraint on S matrix. In here, k denotes number of internal variables. Thus, comparing with structural VAR model, coefficients for each variables are not forecasted like unrestricted VAR model in the same number with each variable. Consequently in each equation some variables are left out of account⁵

In VAR analyse, rank of variables is an important level in determining structural shock. Ranking can be both implemented by Granger Causality test and by Economic theory. variables must be ranked from external to internal. In this paper, variables are ranked as follows: Real effective exchange rate, economic growth and current account deficit by using Granger Causality test and economic theory.

4. Estimation results

Variables which will be used in VAR analyse, must be stationary. In this paper, whether variables are stationary were examined by Augmented Dickey Fuller (ADF) unit root test and the results are shown in Table 2.

Table 2. ADF Unit Root Test of Results

Turkey							Romania														
REDK		BO		CA		Critical Values	REDK		BO		CA		Critical Values								
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)									
1	-	-	-	-	-	0.01 = -	0.01	-	-	-	-	3.69	5.8	-	0.01 = -						
	0.39	9.02	3.69	-6.23	0.11	5.57										3.61	2.94	2.94	2	2.61	
	-	-	-	-	-	-										0.05 = -	0.05 = -	0.05 = -	0.05 = -	0.05 = -	0.05 = -
	-	-	-	-	-	-										0.10 = -	0.10 = -	0.10 = -	0.10 = -	0.10 = -	0.10 = -
2	-	-	-	-	-	0.01 = -	0.97	3.71	4.75	8.39	1.49	-	7.65	-	0.01 = -						
	2.92	9.03	4.44	-6.10	1.78	5.74										4.23	3.54	3.54	3.20		
	-	-	-	-	-	-										0.05 = -	0.05 = -	0.05 = -	0.05 = -	0.05 = -	0.05 = -
	-	-	-	-	-	-										0.10 = -	0.10 = -	0.10 = -	0.10 = -	0.10 = -	0.10 = -

¹ Intercept (c) term; ² Trend (t) and intercept (c) term.

Note: MacKinnon (1996) critical values was used. All variables was made ADF test according to Schwarz information criterion.

As it is seen in the table, except economic growth variable, other variables are stationary after first differentiation [I(1)]. Therefore, cointegration test was not performed as variables did not move cointegrated. Instead of this, VAR model which has no stationary condition in the same level was performed. According to this result, except economic growth variable, other variables will be given place with their first differentiation in structural model which will be forecasted.

In order to analyse the effects of economical growth and real effective exchange rate on current account deficit using data belonging to Turkey including the period 1997q2–2007q3, the delay number was researched by autocorrelation test within the structural model which has three variables and it was determined as five for Turkey and three for Romania. This test is shown in appendix 1 and 2.

Impulse-Response Functions

Impulse–response functions of variables in the structural model are shown in Table 3 as twenty periods.⁶ Answer of variables to a structural shock of one standart deviation in all variables in system are shown in Table 3. For both countries, the real effective exchange rate (refdk) reacts negatively in the first quarter, then reacts positively and negatively in the other quarters against to a structural shock of one standart deviation in economic growth rate (bo). Then, the reaction of real effective exchange rate to the current account deficit (ca)

shock is considerably low level. This finding is an evidence for low effect of real effective exchange rate on current account deficit.

Table 3. Impulse Response Functions

Variables	Period	REDK		BO		CA	
		TR	RO	TR	RO	TR	RO
REDK	1	0.101	0.101	-0.010	-0.010	0.001	0.001
	2	-0.057	-0.008	0.054	0.032	-0.006	-0.004
	3	0.047	-0.032	-0.081	0.011	0.008	-0.001
	4	-0.029	-0.018	0.036	0.030	-0.003	-0.003
	5	-0.027	0.003	0.027	-0.046	-0.003	0.005
	10	-0.001	-0.006	-0.015	0.005	0.002	0.000
	15	0.007	-0.001	0.004	0.000	-0.000	0.000
	20	0.002	0.000	0.008	0.000	-0.001	0.000
BO	1	-0.010	-0.010	0.101	0.101	-0.010	-0.010
	2	0.013	-0.007	0.011	-0.077	-0.001	0.008
	3	-0.012	0.001	-0.011	0.006	0.001	-0.001
	4	0.012	-0.017	-0.011	0.036	0.001	-0.003
	5	-0.001	0.021	-0.057	0.043	0.006	0.004
	10	0.005	-0.005	0.023	0.002	-0.002	0.001
	15	0.003	0.001	0.001	-0.007	-0.001	0.001
	20	-0.001	0.001	0.002	0.001	0.000	0.000
CA	1	0.000	0.000	0.000	0.000	0.100	0.100
	2	-7.936	-0.766	18.903	-2.824	-1.869	0.269
	3	-1.766	-0.816	0.885	-1.992	-0.119	0.226
	4	-0.351	-1.218	-2.598	-0.018	0.269	0.046
	5	-0.132	-1.096	6.422	-2.430	-0.632	0.240
	10	-0.335	-0.410	-1.595	-0.004	0.175	0.016
	15	0.585	0.077	-0.134	-0.584	-0.014	0.061
	20	-0.109	-0.047	1.744	0.023	-0.174	0.004

Economic growth reacts in the same way and in the same value for both countries in the first quarter to one standart deviation shocks in current account deficit and real effective Exchange rate; when it closes to twentieth quarter, the reaction falls down.

Current account deficit does not react in the first quarter to structural shocks of one standart deviation in economic growth and real effective exchange rate. In both economies, current account deficit reacts negatively to real effective exchange rate from second quarter to twentieth quarter (except for fifteenth quarter). On the other hand, we can say that, current account deficit generally reacts negatively to economic growth shock in Romania and positively in Turkey. Accordingly, reaction of current account deficit to economic growth shock, occurs in a higher rate than the other shocks and this situation can be interpreted as an important finding about the effect of economic growth on current account deficit.

On the other hand, the continuation of effects of real effective exchange rate and economic growth shocks in both countries continue for twenty quarters, means that real effective exchange rate and economic growth (especially) effect the current account deficit for a long time. It can be regarded as an important result for this paper.

Variance Decomposition

Results of variance decomposition process of variables used in structural model, is shown in Table 4.⁷ Variance decomposition process shows that forecasting error variance in each variable arises depending on their shocks and shocks of other variables in economy.

For both economies, the main sources of variance in each variable are their own shocks. We can not say the same thing for current account deficits. In the first period, the change of current account deficit can be explained by its own shock at 100 % (Table 4). In short term and middle term, economic growth is an important source of change in the current account deficit. For example, It is seen that the economic growth explains the change in current account deficit at 84.31% in Turkey and at 92.26% in Romania in the second quarter, also it explains the change in current account deficit at 85.26% in Turkey and change in current account deficit at 81.21% in Romania in the fifth quarter. Finally, economic growth explains the change in current account deficit at 86,93% in twentieth quarter in Turkey and at 82.18% in Romania. In the same periods, explanation levels, for the change in the current account deficit of other variables are probably weaker than economic growth.

Table 4. Variance Decomposition

Variables	Period	SHOCK					
		REDK		BO		CA	
		TR	RO	TR	RO	TR	RO
REDK	1	99.00	99.00	0.99	0.99	0.01	0.01
	2	81.50	90.22	18.30	9.68	0.20	0.11
	3	61.89	90.15	37.73	9.75	0.38	0.10
	4	60.05	84.44	39.56	15.39	0.39	0.18
	5	59.50	73.25	40.11	26.47	0.40	0.28
	10	59.43	70.29	40.17	29.40	0.40	0.31
	15	58.59	69.95	41.00	29.74	0.41	0.31
	20	57.89	69.91	41.70	29.77	0.41	0.32
BO	1	0.98	0.98	98.04	98.04	0.98	0.98
	2	2.46	0.93	96.58	98.09	0.96	0.98
	3	3.68	0.94	95.36	98.08	0.95	0.98
	4	4.91	2.44	94.15	96.60	0.94	0.96
	5	3.82	4.36	95.23	94.70	0.96	0.94
	10	3.88	5.43	95.16	93.63	0.96	0.93
	15	4.01	5.51	95.03	93.56	0.96	0.93
	20	4.03	5.52	95.02	93.55	0.96	0.93
CA	1	0.00	0.00	0.00	0.00	100.00	100.00
	2	14.86	6.79	84.31	92.26	0.83	0.95
	3	15.45	9.40	83.72	89.60	0.82	1.00
	4	15.24	18.47	83.94	80.62	0.83	0.91
	5	13.91	17.91	85.26	81.21	0.84	0.88
	10	12.52	17.49	86.62	81.62	0.85	0.90
	15	12.42	16.90	86.73	82.19	0.85	0.90
	20	12.21	16.92	86.93	82.18	0.85	0.90

As it is emphasized when analysing with impulse–response functions, current account deficit occurs owing to the change (especially) in economic growth and in real effective exchange rate. In other words, the effect of change in economic growth on current account deficit occur in a high rate. Consequently, it is seen that the change in the economic growth explains the four fifth of current account deficit.

5. Conclusion and Implications

In this study, the effects of economic growth and exchange rate changeability of Turkey and Romania on the current deficit were analyzed by using Structural VAR method by evaluating the data concerning the period between 1997:II and 2007:III. within the frame of related literature. The obtained theoretical and empirical results can be summarized as follows.

Economic growth has been seen as one of the most important reasons for current account deficit. The current account deficit is the quantitative difference between national savings and investments. It means, the deficit is ocured as a result of either increase in investments or decrease in savings. Economic growth increases the confidence in economy by establishing higher expectations of profit. In this way the investments increase. On the other side, it decreases savings because of demand rising and then it causes the deficit to increase. The economic slowdown caused by the current deficit effects the investments and savings in opposite direction and so the increase in current deficit falls down automatically.

According to empirical findings of our study, it has been obtained that, the changes appeared in current account deficit is highly sensitive to the changes in economic growth in the economies of Turkey and Romania. It has been seen that, the response of current account deficit to the shock of economic growth was happened largely compared to the shocks of other variables in the impulse-response functions of the model. Besides, according to results of variance decomposition, it has been seen that, the changeability on growth has effect on current account deficit in the proportion of 4/5.

According to the results of this study, the changeability of economic growth has been proofed to be one of the basic determining factors on economies of Turkey and Romania. However, As the economic growth is indispensable for the economies of both countries, It is necessary to determine the structural factors effecting the current account deficit increases and to implement the reformist strategies, policies and precautions. For instance, applying regulations such as decreasing the dependency of exportation on importation, promoting domestic intermediate input, implementing reforms at micro and macro level supporting competition power, adopting growth, employment and competition power based policies.

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¹ The first subject is about to continuity of the current account deficit. According to the Lawrence Summers the former minister of finance of USA, so as to the current account deficit being continuous, the current account deficit of a country should not exceed the 5% of the GDP ratio of the country. To this view if the deficit exceeds the 5% threshold value, it will be the indication of crisis (Kasman, 2005). On the other hand, some studies show that these excessions are not thought strong enough to cause crisis. According to Sebastian Edwards. It will be deceiving to estimate a continuous threshold value for current account balance in which the macro economic variables are in interaction. (Edwards, 2001). According to Milesi et. Al. (1996) The current account deficit should be tried to explain by structural factors such as Exchange rate policies, rate of openness, the quality of financial system, saving and investment levels.

² (Freund, 2000), (Kandil and Greene, 2002), (Kasman et.al., 2005) and (Erbaykal, 2007)

³ Scope of study is restricted 1997q2-2007q3 period as absence data for Romania

⁴ Here a lower triangular matrix S can be derived when positive determined symmetric matrix Ω is constant. In other words, Cholesky decomposition of Ω specifies that $\Omega=PP^l$ when Choleski factor P is a lower triangular matrix. Because, under assumption that structural disturbing terms are orthonormal, $\Omega=E(u_t u_t^l)=SE(e_t e_t^l)=SS^l$. In other words, $E(e_t e_t^l)=I$ and a lower-triangular matrix S equals to Choleski factor P .

⁵ For detailed information: See Sims (1986) and Bernanke (1986)

⁶ The Impulse Response functions are given in Appendix 3

⁷ The results of variance decomposition process are shown in Appendix 3

Appendices

Appendix 1: Autocorrelation Test* (Turkey)

Legs 1		Legs 2		Legs 3		Legs 4		Legs 5	
LM-Stat	Prob	LM-Stat	Prob	LM-Stat	Prob	LM-Stat	Prob	LM-Stat	Prob
14.621	0.102	9.352	0.406	17.594	0.040	18.091	0.0341	9.534	0.390
11.393	0.250	9.554	0.388	12.954	0.165	13.859	0.1275	14.036	0.121
3.509	0.941	9.745	0.372	11.224	0.261	4.450	0.8794	7.854	0.549
20.792	0.014	20.278	0.016	18.921	0.026	8.907	0.4459	15.896	0.071
15.314	0.083	9.142	0.424	7.381	0.598	5.777	0.7620	6.072	0.733
2.467	0.982	2.404	0.983	6.971	0.640	5.979	0.7420	5.684	0.771
5.566	0.783	8.281	0.506	8.532	0.482	5.785	0.7613	4.385	0.884
11.097	0.269	11.634	0.235	17.088	0.047	11.974	0.2148	9.577	0.386
17.364	0.043	18.172	0.033	22.083	0.009	13.794	0.1298	6.655	0.673
13.06	0.160	10.041	0.347	8.807	0.455	15.108	0.0880	9.251	0.414
10.008	0.350	14.566	0.104	10.123	0.341	6.877	0.6500	6.680	0.670
10.673	0.299	7.799	0.555	8.981	0.439	11.679	0.2320	9.117	0.427

*Autocorrelation test was made according to Lagrange Multiplier (LM).

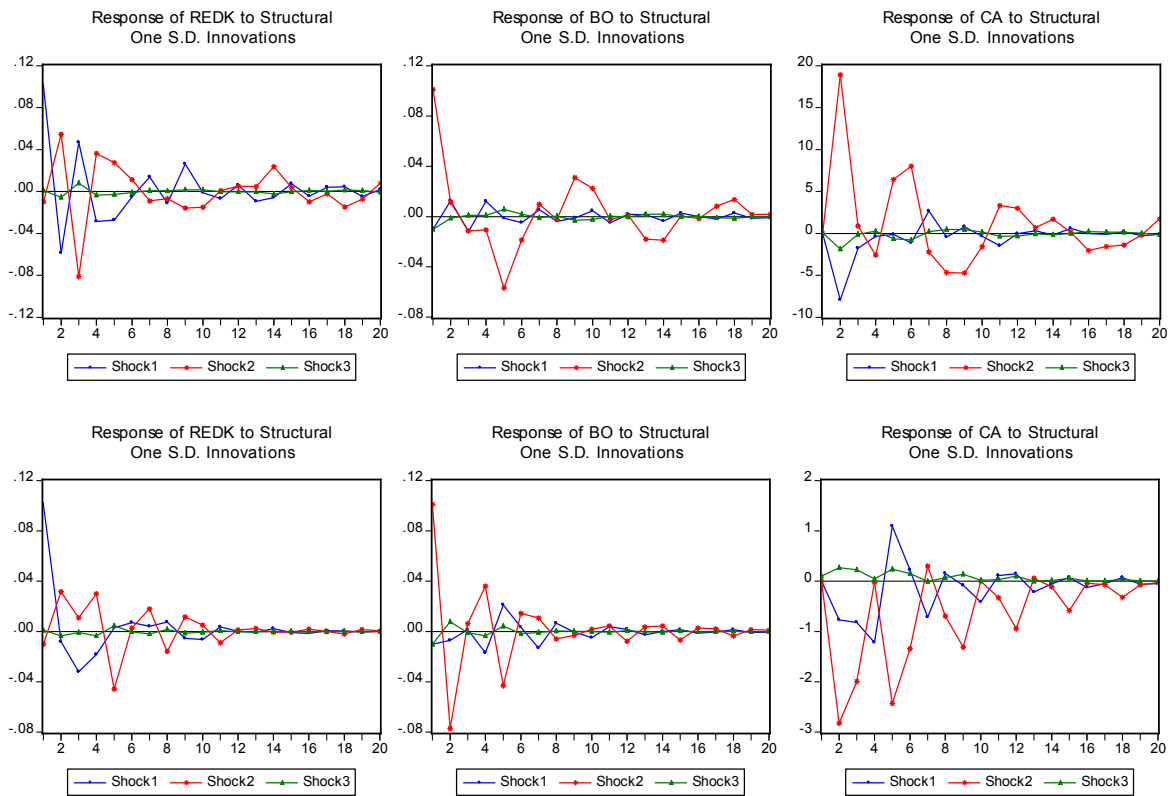
Appendix 2: Autocorrelation Test* (Romania)

Legs 1		Legs 1		Legs 1	
LM-Stat	Prob	LM-Stat	Prob	LM-Stat	Prob
16.437	0.058	19.755	0.020	10.099	0.343
26.186	0.002	8.201	0.514	10.155	0.338
26.719	0.002	18.196	0.033	1.261	0.997
11.626	0.235	11.108	0.268	4.538	0.873
19.319	0.023	14.548	0.104	7.047	0.632
16.769	0.053	13.759	0.131	7.701	0.565

7.697	0.565	6.387	0.701	6.716	0.667
18.518	0.030	6.405	0.699	6.454	0.694
11.519	0.242	13.68	0.137	11.670	0.233
7.296	0.606	6.396	0.700	4.164	0.900
22.018	0.009	11.857	0.222	11.532	0.241
4.203	0.898	5.425	0.796	13.322	0.149

*Autocorrelation test was made according to Lagrange Multiplier (LM).

Appendix 3: Impulse-Response Function of Turkey ve Romania Respectively*



*Shock1, shock2 ve shock3 represent redk, bo and ca respectively.

Appendix 4: Variance Decomposition of Turkey ve Romania Respectively

