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ANALYSIS OF THE FACTORS AFFECTING CURRENT ACCOUNT DEFICIT IN TURKEY BY VAR MODEL (2002:Q1-2014:Q2)

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Abstract

Balance of current accounts points to the goods, services and official unreturned transfers in an economy. Nowadays, the most important problem of many of both developed and developing countries is current account deficit. Current account deficit should be taken under control in order to protect macroeconomic balances and to provide stable economic growth. Studies made on current account deficit express that the reasons of current account deficit differ according to diverse countries and that it produces different results for the countries having the same current account deficit rate. It is important to analyse the factors affecting current account deficit and their inter-relations within the mentioned economy for the success of the macro policies that will be implied with regard to solving current account deficit problem. The aim of this study is to reveal the factors affecting current account deficit in Turkey and the interrelations among these factors. The macro variables related to current account deficit are determined based on literature survey in the study. The variables used in the study are current account deficit, GDP, exchange rate, inflation rate, interest rate, foreign trade balance and energy imports. The relations among variables for the Turkish economy belonging to the period 2002:Q1-2014:Q2 is studied by use of Granger causality test and Vector autoregression (VAR) method. The impulse-response analysis and variance decomposition results withdrawn from the estimation of the model have given place within the study. As a result of the study, bidirectional causality relation has been found between current account deficit and all the other variants. While current account deficit is primarily affected from its past values, interest rates and energy imports remain at the second and third order respectively.

Keywords: Current account deficit, Granger causality test, VAR, Impulse and response analysis, Variance decomposition

1. INTRODUCTION

Nowadays, the most important problem of many of both developed and developing countries is current account deficit. Current account deficit should be taken under control in order to protect macroeconomic balances and to provide stable economic growth. Studies made on current account deficit express that the reasons of current account deficit differ according to diverse countries and that it produces different results for the countries having the same current account

deficit rate. It is important to analyse the factors affecting current account deficit and their inter-relations within the mentioned economy for the success of the macro policies that will be implied with regard to solving current account deficit problem.

The size of the current account deficit is accepted as the most important parameter of a country's vulnerability and its extent of being open to crisis. Especially in the 1990s, discussions on whetherthe level of current account deficit can be recognized as an indicator of crisis or not have been deepened with the influence of experienced crisis in developing countries (Göçer vd, 2013). Dornbusch ve Fischer (1990) have admitted that the situation in which the ratio of current account deficit to GDP per capita exceeds 4 % should be considered as a crisis signal. Even though there is no consensus on this subject, it has been accepted that the economies of countries with high current account deficit are more open to crisis conditions (Göçer vd., 2013)

Current account deficit in Turkey's economy has increased substantially since the beginning 2000s and started to pose a risk. Table 1 shows the balance of current account deficit in Turkey after the year 2000.

Table 1: Current Account Deficit in Turkey's Economy (million $)

2000	2001	2002	2003	2004	2005	2006
-9.920	3.760	-626	-7.554	-14.198	-21.449	-31.837
2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
-37.779	-40.192	-12.010	-45.313	-75.050	-48.494	-65.034

Kaynak: TCBM, EVDS, www.tcmb.gov.tr, 02.12.2014.

As can be easily understood from the Table 1, Current Account deficit has increased in recent years. While in 2008 the currents account deficit was 40 million $, it declined drastically in 2009. But in 2010 it quadrupled and become 45,3 million $. In 2011, it continued to show increase and become 75 million $. In 2012 the current account deficit was 48 million $ and in 2013 it has increased to 65 million $. By 2000s, the only exception year was 2001. Due to the devaluations made as a result of economic crisises between 2000-2001, the current account were higher in 2001. Policymakers increased the precautions by 2010 regarding the current account deficit which shows heavy increase and affect economic structure negatively.

Recently, the increase in current account deficit in Turkey economy stand out as a critical issue. The studies regarding the current account deficit are divided into two, sustainability of the issue and reasons of deficit. Sustanibility studies based on the crisises between the years 1994-2001 in Turkey. The current account deficit as compared to national income value was %3.5-%4, these ratio is taken as a threshold value in order to undertsand the sustanibility of the current account deficit (Erdoğan and Bozkurt, 2009; Çiftçi, 2014). The second study made on current account deficits results that there are various factors effecting this issue. Factors which cause the current account deficit in Turkey is shown as the following :

- *Exchange Rates (*(Eşiyok, 2012; Erkılıç, 2006; Peker and Hotunluoglu, 2009; Yapraklı, 2010)
- *Development* (Erkılıç, 2006; Eken, 1990; Telatar and Terzi, 2009; Sekmen and Çalışır, 2011; Yılmaz and Akıncı, 2011)
- *Foreign Trade* (Yamak and Korkmaz, 2007; Erdoğan and Bozkurt, 2009)
- *Interest Rates* (Peker and Hotunluoglu, 2009; Esen vd., 2012)

- *Credit volume* (Telatar, 2011; Göçer vd., 2013)
- *Energy Import* (Eşiyok, 2012)
- *Crude Oil Prices* (Erdoğan ve Bozkurt, 2009)

As Esiyok (2012) stated in his study regarding the sustanability of current account deficit, by 1990's Turkey policymakers prioritized the finance of short-term capital inflows. Hence, Short-term capital outflows cause some crisises.

One of the reason of Turkey's increase of current account deficit is the energy import dependence. Turkey imports %99 of its oil and natural gas. (Eşiyok, 2012:88).

In this study, the factors and their relationship which effect the current account deficit are suggested. Granger Causality test and Vector Autoregression (VAR) method are used to study the relationship between variants by using the first quarter datas of the years 2002-2014 in Turkey economy. Study includes the impulse&response analysis gained from the model estimation and also the result of decomposition of variants.

2. EMPIRICAL LITERATURE

Empirical literature about the factors affecting current account deficit in Turkey, is summarized in Table 2

Table 2: Literature review: Determinants of Current Account Deficits in Turkey

Study	Methodology	Period	Relationship
Eken (1990)	EKK	1980-1988	There is a weak relation between economic growth and current account deficit.
Erkılıç (2006)	VAR	1980-2004	The current account deficit of the previous period, domestic growth rate, and real Exchange rate are the determinants of current account deficit.
Yamak and Korkmaz (2007)	Modern Times Series	2001:04 2005:09	There is a co-integration relation between export-import series.
Erdoğan and Bozkurt (2009)	MGARCH	1990-2008	Export/Import rate and oil prices are the most important determinants of current account deficit.
Peker (2009)	Co-integration method	1992:01-2007:12	As a result of the survey, he found out that current account deficit can be sustained at alow level, though a longterm relation between export and import series exists, co-integration co-efficient is 0,8926 consequently, he concluded that foreign currency revenues are lower than foreign currency expenditures.
Peker and Hotunluoğlu (2009)	VAR	1992:01 2007:12	Real exchange rate, real interest rate and İstanbul Stock Exchange index are the most important indicators of current account deficit.

Telatar and Terzi (2009)	VAR	1991Q1-2005Q4	Econometric studies show that there is a one way relation from the growth rate to the current account deficit.
Yapraklı (2010)	ARDL	2001-2009	The increase in exchanges increase current account deficit.
Oktar and Dalyancı (2011)	Time series econometric techniques	2003Q1-2010Q3	Main result of the study is that there is not Granger causality between monetary policy anc current account balance in the short run, but there is a cointegration relationship in the opposite ditection in the long run.
Sekmen and Çalışır (2011)	ARDL	1998-2009	Economic growth increases current account deficit.
Telatar (2011)	Causality tests	2003:Q1-2010-Q4	It has been found that consumer credits are the most important reason for current account deficit and there exists a weak relation of causality between housing credits and current account deficit.
Yılmaz and Akıncı (2011)	Johansen cointegration and Granger causality test	1980–2010	There is a one way relation of causality from GDP per capita toward current account deficit.
Esen, Yıldırım and Kostakoğlu (2012)	SVAR	1988:01 2010:04	The credit channel is more dominant than the exchange rate channel for mentioned period. This finding puts forward that an increase in the policy interest rate decreases the current account deficit through the credit channel.
Göçer vd. (2013)	Cointegration methods	1992Q1-2012Q3	there is a cointegration relationship between domestic credit volume and current account deficit, namely determined that an increase in the domestic credit volume is a factor in increasing the current account deficit.
Adıgüzel (2014)	Markov Switching vector autoregression models	2002:01-2012:08	According to the results, there is a positive and significant effect on expensionary regime due to structural problems.
Çiftçi (2014)	Johansen cointegration test	2001:Q1-2012:Q3	Current deficit is the Granger reason for GDP per capita and Exchange rate.

When evaluated within studies on the subject, it is observed that diverse results have been reached. Further, the differences among studies in terms of periods and methods used make comparison of the retrieved results even more complex.

3.ANALYSIS

3.1.Data Set

2002:Q1-2014:Q2 covering the period of this study, seven variables were used. What variables stand for; (CA), current account balance (percentage of GDP); (GDP), gross domestic product growth rate; (ER), exchange rate, (INF), inflation rate; (IR), interest rate; (EI), energy imports; (TB), foreign trade balance.

Table 3 is examined variables and data sources. As a result of the analysis, which variable or variables were effective on the variables that determine the current account deficit was analyzed. Estimates for all the test and computer package Eviews 8 program was used.

Table 3: Variables and Data Sources

Variables	Definition	Source
CA	Current account, balance, Percentage of GDP	OECD
GDP	Gross domestic product growth rate compared to previous quarter, seasonally adjusted	OECD
ER	US Dollar (Effective Buying) Change% (USD)	TCMB
INF	Consumer prices - all items Percentage change on the same period of the previous year	OECD
IR	Deposits Interest Rates (TL, Weighted Average %)	TCMB
EI	Imports by SITC, Rev.3 :Mineral fuels, lubricants and related materials (thousand $)/GDP have been compiled by the author.	TUIK-OECD
TB	Foreign Trade Balance, By Broad Economic Categories (BEC).	TUIK

3.2.Method

Generally there is a dynamic feedback between the variants of microeconomic models. It is still unknown if the time path of any time sequence in the system is independant from a different time sequence of time path in the system. Vector Autoregression (VAR) method is used for this type of multi-equational system which includes the time sequences with symmetic interactions. (Enders, 1995:310-312).

Every variant by itself and other variants existing in the model is function of past their values. Seven-variants-based Autoregression model is introduced including; Current account deficit (CA), Gross domestic product (GDP), Exchange rate (ER), inflation rate (INF), interest rate (IR), foreign trade balance (TB) and energy import (EI).

The effects of shocks that these are likely to ocur in error terms of the variables in the models are measured with Impulse-Response functions as shown in Enders (1995: 305-311), the Variance Decomposition which is determined with the model prediction and measures the prediction error variance another technique is used in the analysis of residuals. It is mention that with technical assistance mentioned, the effects of statistical shocks on the variables will be observed.

Another important aspect of VAR method is that, instead of showing the predicts of causality theory it reveals the true causality relationship between variants. According to Cooley and Leroy (1985), the aim of VAR analysis is to find out the relationship between the variants rather than

predicting the parameters (Zengin, 1999:102). Above mentioned model is predicted for 2002:Q1-2014:Q2 period and resulted with the following findings.

3.3. Findings

3.2.1. Unit Root Test

Tablo 4 shows expanded results of Dickey-Fuller Test (ADF) ve Phillips-Perron Test (PP).

Table 4: ADF and PP Unit Root Test

	ADF		PP	
	Level	1st Difference	Level	1st Difference
CA	-2.476	-6.385*	-2.709	-6.378*
	(-3.577)	(-3.574)	(-3.571)	(-3.574)
GDP	-5.593*	-7.683 *	-5.601*	-22.430*
	(-3.571)	(-3.577)	(-3.571)	(-3.574)
ER	-6.885*	-11.625*	-6.884*	-47.309*
	(-3.571)	(-3.574)	(-3.571)	(-3.574)
INF	-4.420*	-3.712 *	-19.742*	-8.764*
	(3.577)	(-3.588)	(-3.571)	(-3.574)
IR	-2.843	-7.385*	-3.001	-8.221*
	(-3.571)	(-3.574)	(-3.571)	(-3.574)
EI	-2.379	-7.193*	-2.190	-10.420*
	(-3.577)	(-3.574)	(-3.571)	(-3.574)

Not: Appropriate delay lengths, for the ADF stability Test Schwarz Information criteria is used and for PP stability test Newey West Bandwitch statistics were preffered according to the automatic option measurement criterias. All variants values are calculated as stable. Values which are shown in brackets emphasize the %1 semantic value. %1 level is significant.

Considering the first differences of the unstable sequences ADF and PP test statics were taken along with the comparison of Mackinnon (1991) criteria levels and result shows that all variants absolute values are higher than the Mackinnon (1991) values hence the sequences are static-variance (1).

Tablo 5: VAR Lag Section Criteria Endogenous Variables

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-862.9473	NA	1.46e+08	38.66432	38.94536	38.76909
1	-724.2053	228.1534	2778389.	34.67579	36.92408	35.51393
2	-679.0627	60.19013	3864939.	34.84723	39.06278	36.41875
3	-604.5746	76.14339	1961525.	33.71443	39.89723	36.01931
4	-505.4807	70.46679	609872.1	31.48803	39.63809	34.52629
5	-304.7031	80.31105*	8585.172*	24.74236*	34.85967*	28.51399*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 5 is examined, LR, FPE and AIC values are in the same direction, and 5 is the minimum value for the delay. Both aim to determine the level of consistent delay, and, due to lack of a very long time period covered five-term delay, the delay level is determined as appropriate for the model.

3.3.2. VAR Granger Causality Test

Table 6: VAR Granger Causality/Block Exogeneity Wald Tests

Variables	Probability Value	Causality
CA-EI	0.0002/ 0.0479	← →
CA-ER	0.0443/ 0.0155	← →
CA-GDP	0.0022/ 0.0398	← →
CA-INF	0.0419/0.0664	← →
CA-IR	0.0001/ 0.0864	← →
CA-TB	0.0266/0.0000	← →
EI-ER	0.1066/ 0.0477	←
EI-GDP	0.0807/0.0000	← →
EI-INF	0.1955/0.3319	NONE
EI-IR	0.1810/0.4814	NONE
EI-TB	0.0234/0.0000	← →
ER-GDP	0.0539/0.2357	← →
ER-INF	0.8235/0.0695	←
ER-IR	0.7811/ 0.3254	NONE
ER-TB	0.5340/ 0.0181	←
GDP-INF	0.2256/ 0.0166	←
GDP-IR	0.1290/ 0.1314	NONE
GDP-TB	0.0123/0.0002	← →
INF-IR	0.0000/0.1303	→
INF-TB	0.0761/ 0.0042	← →
IR-TB	0.1460/0.0000	←

Note: The first of possibility values shows whether there exists causality from the first variant to the second one or not, while the second value shows whether there exists causality from the second variant to the first one or not.

VAR Granger Causality test results can be seen on the Table 6. Probability values are used for determining the direction of the causality relationship of variations shown.

When the causality flows which are shown on the Table 6 are studied, all the variants which have been included to the system has directly or indirectly contribution to the Turkey's current account deficit. As can be seen from the table, there is a bidirectional causality between the current account deficit and all other variants. In other words, GDP, interest rate, inflation, foreign trade balance, energy import and exchange rate are the Granger reason for current accounts deficit.

3.3.3. Variance Decomposition

Variance decompositions which are obtained from the VAR's kinetic average defines the variants and other variants's impact sources in percentage terms. It shows the reason of variance happened in any variant in the system and the sources of what percentage is casued by itself and what percentage is made by other variants. If the majority variance occur due to itself, it means that variants is in the external action. Moreover, variance decompositions give information regarding the degree of causality relation between the variants. (Enders, 1995:311).

Table 7: Variance Decomposition Results of CA

Period	S.E.	CA	EI	ER	GDP	INF	IR	TB
1	0.847910	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.633719	75.99950	0.392074	4.508534	0.005161	1.809209	15.48637	1.799157
3	2.779053	65.36881	0.135820	6.441141	1.522145	1.750741	23.70739	1.073956
4	3.421988	53.89601	4.113020	9.262277	1.425996	2.143992	28.27361	0.885089
5	3.690490	52.82561	5.499226	9.217647	1.248676	1.924338	28.46365	0.820849
6	3.897924	48.60661	9.681325	8.873995	1.616299	2.164581	28.31703	0.740157
7	3.990332	46.38791	12.21004	8.532896	3.024335	2.076637	27.05118	0.716998
8	4.102115	43.94191	16.24153	8.091014	3.301660	1.988511	25.75398	0.681403
9	4.207012	42.92280	17.70663	7.788557	3.149595	1.926257	25.84816	0.657992
10	4.304971	41.60633	19.39530	8.059215	3.187325	2.031998	24.95302	0.766804
11	4.318592	41.36771	19.37443	8.052321	3.552218	2.054064	24.79590	0.803359
12	4.439787	40.20477	20.46270	7.885067	4.358578	2.367633	23.94210	0.779161

Variance decompsition of current account deficit is shown in Table7 in 12 period. The first column periods emhasizes the second column's predicted standard faults during 1-12 period process. Third, fourth, fifth, sixth, seventh, eighth, ninth columns respectively shows the predicted variance of current account deficit reasons as; what percentage by itself, what percentage by energy import, what percentage by exchange rates, what percentage by GDP, what percentage by inflation, what percentage by interest rates, what percentage by foreign trade balance.

As the Table 7 is studied it can be deduced that explaining the long lasting reason of current account deficit is first by itself and respectively, interest rates and energy import. In Turkey, current account deficit is tried to be financed by foreign capitals and as being a energy-import-dependent country the results shows consistency.

The results taken from the Table 7 verify the bidirectional causality relationship betweeen the current account deficit and all other variants.

Table 8: Variance Decomposition of Variables in the VAR system

	CA	EI	ER	GDP	INF	IR	TB
CA	**54.4**	**10.4**	**7.2**	**2.2**	**1.9**	**23.0**	**0.8**
EI	**23.3**	53.7	5.4	2.8	3.7	9.5	1.5
ER	**19.1**	14.8	41.2	11.4	2.3	10.6	0.5
GDP	**20.5**	32.2	14.0	19.2	2.8	9.6	1.6
INF	**15.9**	22.0	7.9	8.0	19.2	25.1	1.9
IR	**42.8**	12.1	4.9	5.9	3.0	30.0	1.2
TB	**38.1**	11.6	7.4	12.0	11.6	12.5	6.7

In order to see the affects of variants one another, Table 8 shows the average tendency calculation for findings of variance decomposition process. For a average tendency identification, average value is pointed out by arithmetical average taken from the 12 period decompositions results.

The first column identify the " variance", first line identify the "source" variations. If the numbers are assumed as X form, X defines the, source of values mentioned on the i. Column explains the variance that can occur in the J. Column. It clarifies the source of variance that happens on the the variant exist in the column. In the related table, we can see what percentage is caused by itself and what percentage is caused by other variants.

**Graph 1:** Variance decomposition of current deficit
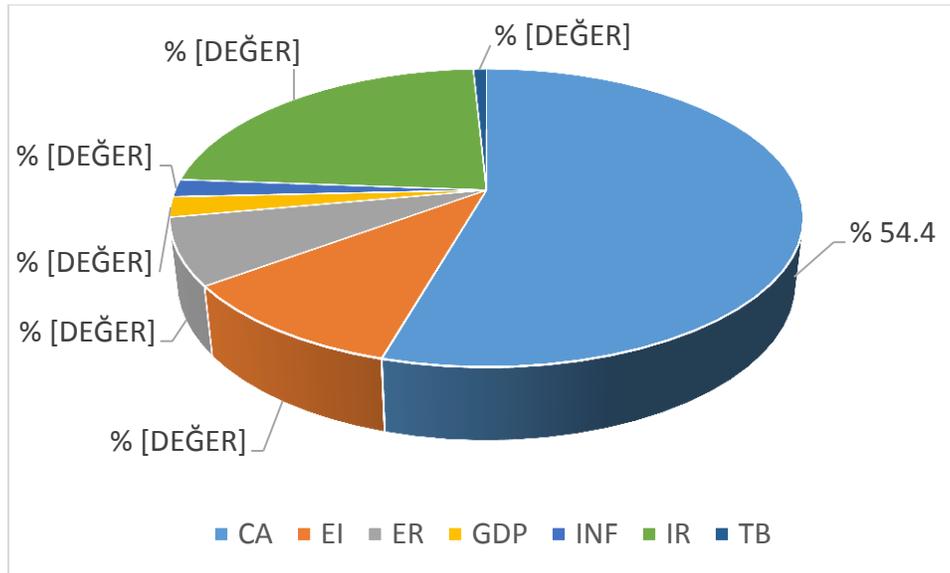
As the Chart 1 shows, almost all variants have important impact on the Turkey's current account deficit problem. While the first reason of current account deficit is by itself having the %54 percentage, interest rates follow with the %23 percentage and respectively, %10 energy import, %7 exchange rates, % GDP, %1 inflation and lastly with the %0.8 trade balance. As also

mentioned in the findings of causality, all variants of system have significant impact for the variance in current account deficit which hinders the control of current account deficit.

The following studies shows that only by focusing on one variant will not help to control the current account deficit; not only one variant has important affect on explaining the sources of variance, the variance occured on the variant is to be comparatively shared by the other all variants.

**Graph 2:** The effects of current deficit: Variance decomposition
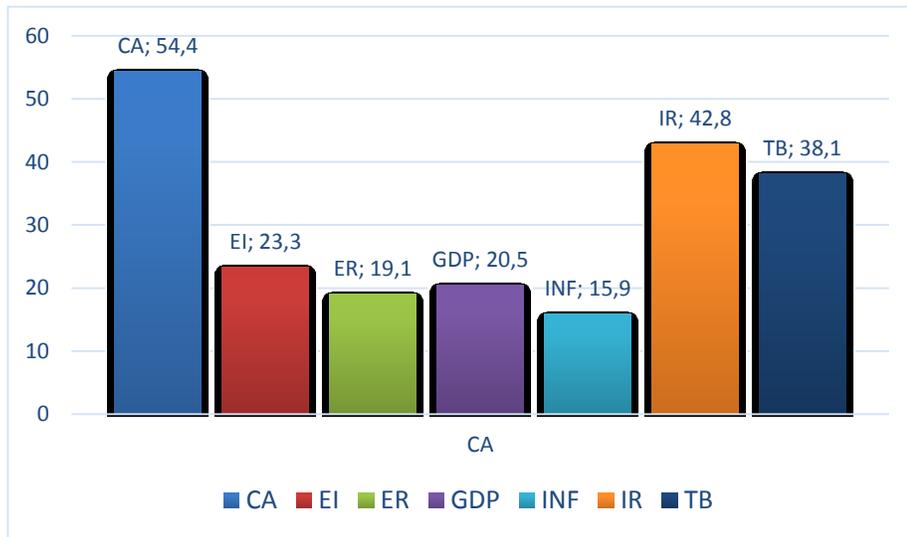
In chart 2, the percentage of predicted variants in the system occured as a result of current account deficit. You can also see from this chart that the cause of current account deficit is mainly by itself with the %54.4 and it follows respectively as 23.3, 19.1, 20.5, 15.9, 42.8 ve 38.1; energy imports, Exchange rate, GDP, inflation, interest rate ve foreign trade balance.

The bidirectional causality between the current account deficit and other variants (energy imports, Exchange rate, interest rate, GDP, foreign trade balance and inflation) can be seen if Chart 1 and 2 are compared. The interest rate and energy import variants respectively %23 and %10 shows the variance in current account deficit, whereas current account deficit's explanation of these variants power is %42.8 and %23.3. In conclusion, we can deduct that current account deficit's interest rates and energy import explanation in these variants are more than their clarification. Findings from these variance decompositions shows parallelism with the causality findings.
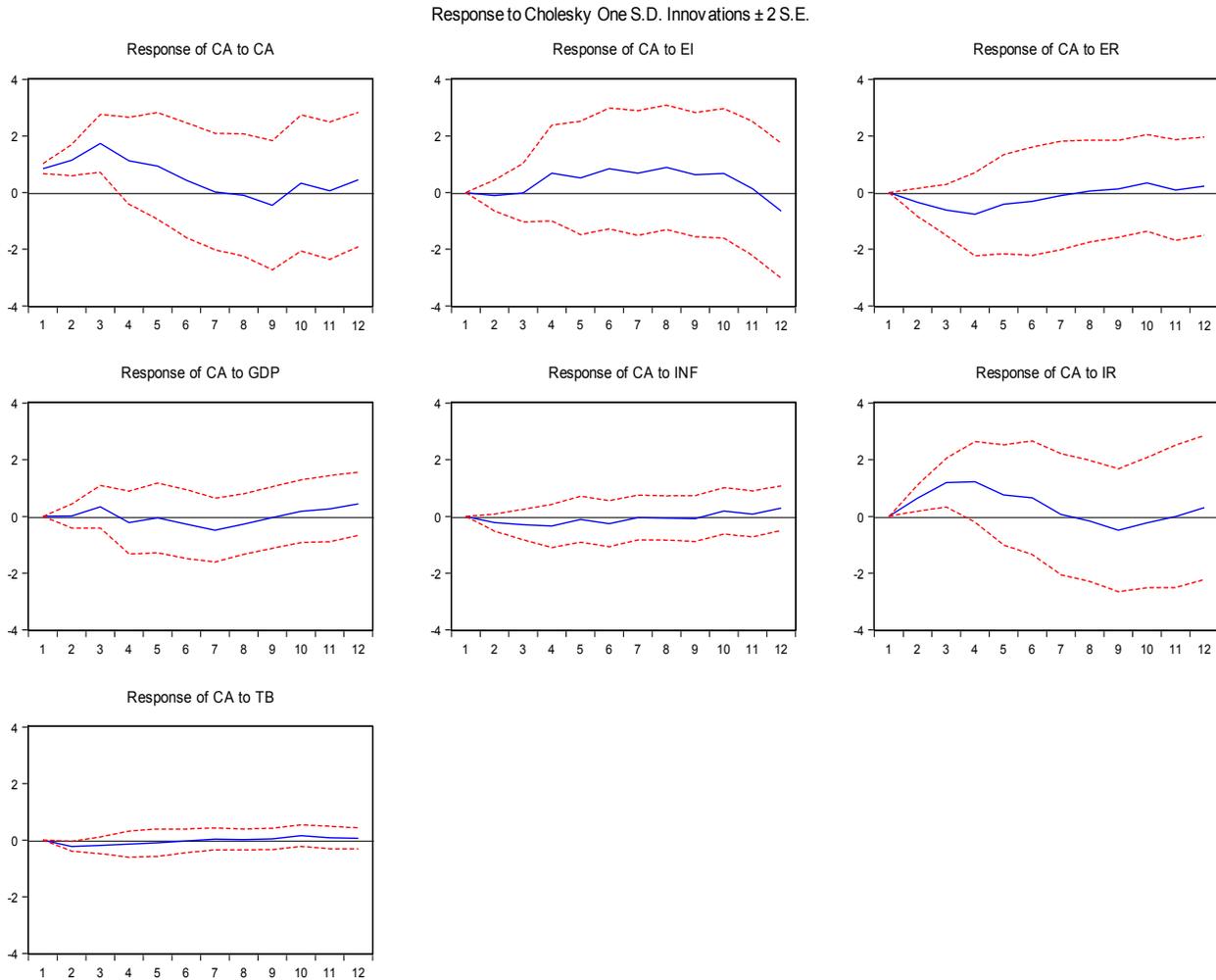
3.3.4. Impulse-Response Analysis

VAR's kinetic average section is the most important element regarding the identification of dynamic interaction between the variants.The functions obtained from the Impulse-Response in this section shows the reactions of variation in case of a any sudden action. In other words, it analyze the result of any sudden action occurred in any variant and its impact on other variants thus, it is a important element in shaping the economical policies.

In this part of study, graphics are included to show the impulse-response functions on current account deficits and their reaction against of any "standard"sudden action in any variants.

Response to Cholesky One S.D. Innovations ± 2 S.E.
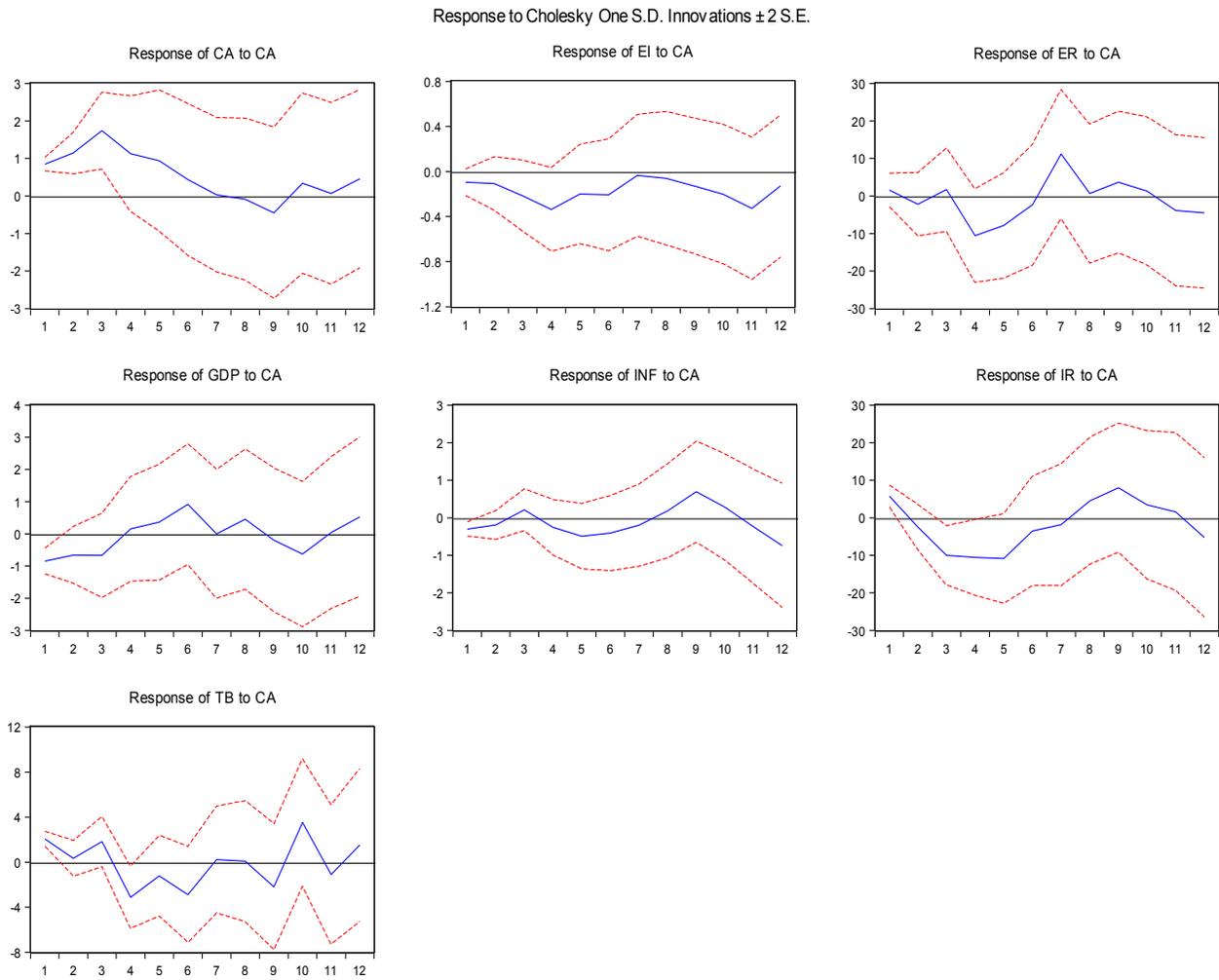
As following, graphics are included to show the impulse-response functions on current account deficits and their reaction against of any ''standard''sudden action happened in any variants.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of CA to CA

Response of CA to EI

Response of CA to ER

Response of CA to GDP

Response of CA to INF

Response of CA to IR

Response of CA to TB

4. CONCLUSION

It can be understood that almost all variants has significant affect on Turkey's Current Account Deficit. According to the obtained results, as explaining the cause of Current Account Deficit;

- ✓ By having itself the percentage of %54.4,
- ✓ Secondly,interest rate with the %23.
- ✓ Thirdly, energy import with the %10.4.
- ✓ Respectively, Exhange rate, GDP, inflation and foreign trade,%7.2, %2.2, %1.9 and %0.8.
- ✓ In Turkey, current account deficit is tried to be financed by foreign capitals and as being a energy-import-dependent country the results shows consistency.

As the Current Account's impulse on variants is studied;

- ✓ Current account deficit defines its variance %54.4, whereas energy imports, Exchange rate, GDP, inflation, interest rate ve foreign trade balance variants' respectively percentages are 23.3, 19.1, 20.5, 15.9, 42.8 ve 38.1.
- ✓ Variants of interest rate and energy import variance is respectively %23 and %10, and current account deficit explains them accordingly to clarification power as %42.8 and %23.3. In conclusion, we can deduct that current account deficit's interest rates and energy import explanation in these variants are more than their clarification.
- ✓ Findings from these variance decompositions shows parallelism with the causality findings.
- ✓ There is a bidirectional causality between the current account deficit and all other variants.

As also mentioned in the findings of causality, all variants of system have significant impact for the variance in current account deficit which hinders the control of current account deficit.

The following studies shows that only by focusing on one variant will not help to control the current account deficit; Not only one variant has important affect on explaining the sources of variance, the variance occured on the variant is to be comparatively shared by the other all variants.

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