The Relationship between International Oil Prices and Current Account Deficit: The Case of Turkey

Assoc. Prof. Dr. Mehmet Mucuk (Selçuk University, Turkey)
Mr. Mustafa Gerçeker (Selçuk University, Turkey)
Prof. Dr. Ahmet Ay (Selçuk University, Turkey)

Abstract

In developing countries such as Turkey, the current account deficit, occuring due to the lack of national savings, is considered to be one of the determinants of economic crisis. At the same time owing to Turkey is dependent on foreign countries for energy resources, current account deficit is highly sensitive to fluctuations in the prices of these resources. This paper, investigates the causal relationship between international oil prices and current account deficit for Turkey using Johansen cointegration and causality tests. The empirical findings show that there is a relationship between two variables in the long term.

1 Introduction

Economical growth plays a core part for the developing countries to join the developed countries. Because being able to carry out this process successfully depends on use of the income generated as a result of the growth effectively and efficiently in all fields. At the same time, it is required to canalize the said income to such investments that will reduce external dependency. Integrated to the global economical system by the Decisions of January 24, 1980, Turkey also needs a healthy and sustainable growth to achieve the social and economical targets set as soon as possible. In this respect, it is important to reduce external dependency and mobilize domestic resources in economy. However, the current deficit emerging as a result of the fact that national savings are not much enough to cover the investments and the problematic form of the deficit threatens the development course of the country. While the development structure that is based mainly on domestic consumption and external resource input generates income increase at high rate, marked stimulation of importation by the income increase leads to sacrifice on growth from time to time by increasing the current deficit risk. On the other hand, basic determinants of the current deficit include domestic consumption as well as energy importation. As a matter of fact, current account balance is highly vulnerable to the fluctuations in the prices of energy resources as Turkey, with its external dependency by 70% in energy, procures 93 percent of the oil, 97 of the natural gas needed from outside the country. This study aims to determine the actions to be taken in Turkey particularly in regard to the field of energy in line with the long term targets regarding the changing energy balances and basic macro dimensions by testing impact of the movements in the international oil market on the current account in respect of Turkey's economy deficit using econometric methods. With respect to this aim, first, the present status of international oil prices and the current account deficit in Turkey is addressed, then the association between the said variables is analyzed using VAR technique. In the last section, the measures required to be taken in the field of energy are mentioned of based on the findings attained.

2 International Oil Prices and Its Economical Impacts

Oil prices, which have always been a controversial matter, is addressed as an important variable in the process of planning economical activities of a country (Kiani, 2011). However, as formation of the oil prices cannot be explained solely by the supply-demand conditions, they have a very volatile structure compared to other commodity prices. Australian Institute of Petroleum (AIP) lists the key factors determining the international oil prices as in Table 1.

According to US Energy Information Administration (EIA), 7 key factors influencing crude oil price include production, oil discoveries in global scale, financial markets, demand, demand of non-OECD member countries like China, India and Saudi Arabia, and spot markets (Fessler, 2011). Depending on the said factors, oil prices have from time to time exhibited very critical deviations in the historical process. The trend followed by the oil prices from the 1970s to today is shown in Graph 1.

The 1973 Arab oil embargo had a major price impact as Arabian Light prices surged from USD 1.84/barrel in 1972 to USD 10.98 in 1974. The next spike after 1973 came in 1981, in the wake of the Iranian revolution, when prices rose to a high of nearly USD 40. Prices declined gradually after this crisis. They dropped considerably in 1986 when Saudi Arabia increased its oil production substantially. The first Gulf crisis in 1990 brought a new peak. In 1997, crude oil prices started to decline due to the impact of the Asian financial crisis. Prices started to increase again in 1999 with OPEC target reductions and tightening stocks. A dip occurred in 2001 and 2002, but the expectation of war in Iraq raised prices to over USD 30 in the first quarter of 2003. Prices remained high in the latter part of 2003 and in 2004. Crude oil prices increased dramatically in late August 2005 after Hurricane Katrina hit the US coast of the Gulf of Mexico. Prices continued to increase throughout 2006 as the demand for

oil in emerging economies, especially China, put pressure on the supply/demand balance, averaging 24 per cent higher than the previous year. In 2007, the increase continued with Dubai hitting USD 88.82/barrel at the beginning of November and WTI climbing to USD 96.50/barrel. In early 2008, prices crossed the symbolic USD 100/barrel threshold and reached a new peak just under USD 150/barrel in July 2008; this brought the real price of oil in 2008 to an all time high. At the beginning of 2009, prices fell to USD 40/barrel as the impact of high prices and the onset of the global financial crisis sharply curbed oil demand. Later in the year, prices ranged between USD 70 and 80/barrel. Crude oil prices increased steadily throughout 2010and 2011 with the post-recession demand rebound, tightening stocks and low spare capacity. In 2012, prices continued to increase at the beginning of the year, averaging USD 122.40/barrel in March, before declining to under USD 100/barrel in June. (OECD, 2011).

Changes in regional and global supply balances in both the short & longer term	Changes in economic conditions/sentiment in both the short and longer term
Major supply disruptions from natural disasters, war, civil unrest and strikes	New oil discoveries
Seasonal demand and demand spikes	Investment in new oil production/refining capacity
Inventory management	Future global demand and supply balances
Shipping availability and freight rates	Global economic growth and conditions
Market trading activities and strategies	Costs of oil production and refining
Short term decisions of oil producing countries, National Oil Companies (NOCs) and nations holding strategic reserves	Technological progress
Alternative fuel developments	Long term policies of NOCs and oil producing nations
Population growth	Regulation and government policy

Table 1. *Key Factors Influencing International Crude Oil Prices. Source: Australian Institute of Petroleum (AIP), "Facts About the International Fuels Market & Prices", www.aip.com.au 01.02.2013.*

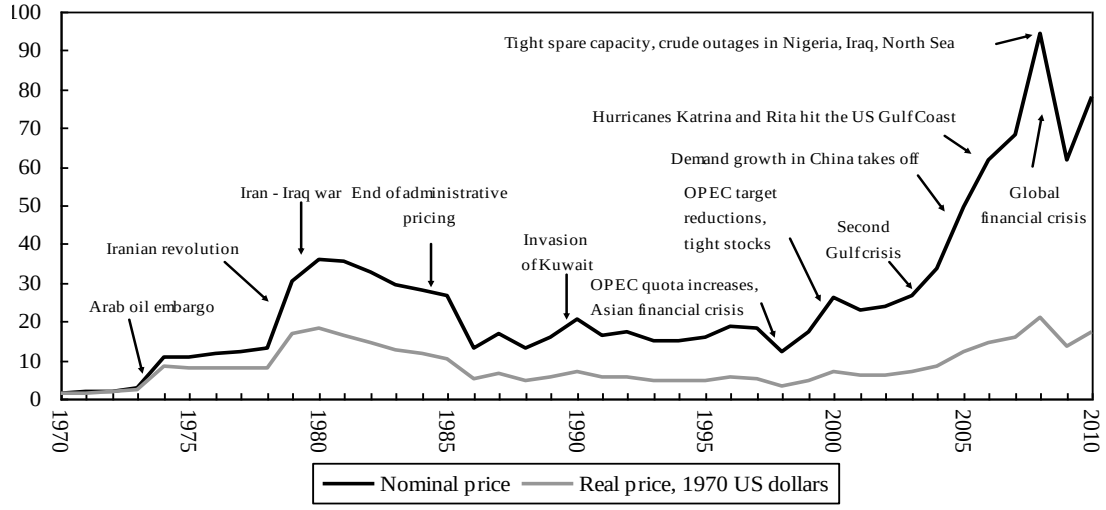

Figure 1. *Crude Oil Spot Prices (US dollars per barrel). Source: OECD (2011), OECD Factbook 2011-2012: Economic, Environmental and Social Statistics*

Various estimations are made within the framework of Hubbert Curve about the trend to be followed by the oil prices in the upcoming terms. According to the Hubber Curve reflecting the course of production over time for the resources with limited reservoir, once a natural resource is discovered, its production increases rapidly in the beginning and peaks at a certain point of the time. Expressing that price of the old energy resource will stand high for the new energy resource to become more attractive in the regions where production decreases, Ediger (2007) draws the attention to the fact that oil importation cost will increase henceforward. This is expected to be reflected on the energy bills of the countries such as Turkey, which are highly external dependent in respect of basic energy resources, particularly oil.

Along with the economies' beginning to recover following the 2008 global crisis, the balances involving production and consumption also strengthen the expectations that the oil prices may increase. However, when

considered along with other factors, there is an uncertainty about the exact trend to be followed by the oil prices in the future.

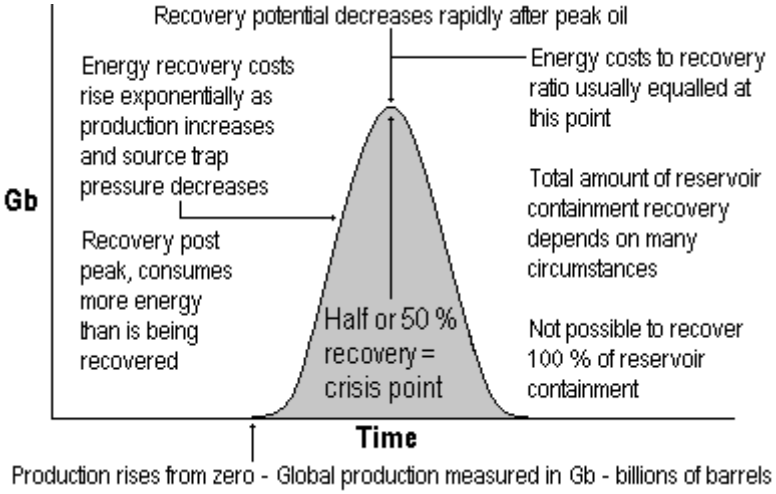

Figure 2. *Hubbert Curve. Source: www.hiram-caton.com 05/05/2013; Hubbert, M. King (1956), "Nuclear Energy and The Fossil Fuels", Shell Development Company Exploration and Research Division, Publication 95.*

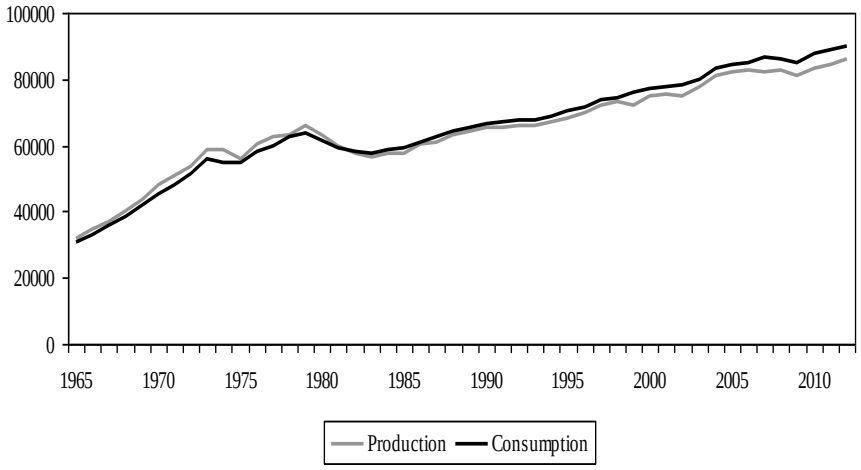

Figure 3. *World Oil Production and Consumption(thousands barrels daily) Source: BP Statistical Review of World Energy 2012*

Like with other developing countries, as the energy demand of Turkey at production phase is high, the increase in oil prices could lead to cost inflation. On the other hand, persistency and scale of the shock in the oil markets as well as the money and finance policies to be implemented by the central bank and government in this course are of great importance as well. Moreover, the increase in oil prices contribute to growth of the current account deficit by increasing the energy bill (Yetkiner and Berk, 2008). As a matter of fact, the current account deficit of 77 billion dollars, corresponding to 10 percent of the national income in 2011, consisted of energy importation by around 70 percent with 54 billion dollars. In 2012 when oil prices stood high in average, a resource of around 60 billion dollars was allocated for importation of energy resources. This figure amounts to 25 percent of the total importation. Share of the energy importation that stood around 10 percent until 2005 within the total importation raised to over 20 percent recently as a result of increase of the international energy prices and high growth performance (Yıldırım, 2013). In parallel to this, for struggling with current deficit, increasing the share of the domestic and renewable resources in energy, reducing the dependency on importation by supporting the efforts providing energy efficiency are also presented as a measure in the Medium Term Development Programme for 2013-2015, prepared by the Ministry of Development.

3 Literature Survey

Relationship of the energy factor that is among the most important inputs of almost all sectors of the economy with the basic macro dimensions in the external dependent countries particularly in terms of this resource is increasingly gaining importance. As the most consumed energy resource among the fossil fuels is oil, changes in

the oil prices are closely followed and their impacts are tested econometrically. In this study, it was sought to analyze the relationship between the movements in the oil prices and the current account deficit that poses a great problem for Turkey's economy. Information on the studies conducted previously to test the impact of the oil prices on the current account deficit are given in Table 2.

Authors	Country	Period	Empirical Method	Results
Baclajanschi et al. (2006)	Moldova	1997-2004	Arithmetic Index and Geometric Index	Energy price changes could dampen economic growth while putting additional strains on the current account deficit.
Demirbaş et al. (2009)	Turkey	1984-2008	Error Correction Model	An increase in oil prices would led tor is in cureent account deficit.
Demirci and Er (2007)	Turkey	1991-2006	ARMA-VAR	Turkish economy is getting more dependent on the prices of crude oil and natural gas which makes the current account deficit grow faster.
Bildirici et al. (2010)	USA	1968-2008	TVAR and Granger Causality Analysis	There is a bidirectional relationship between oil prices and current acoount deficit.
Özlale and Pekkurnaz (2010)	Turkey	1999-2008	Structural VAR	A significant effect of oil price shocks on the current account ratio in the short-run.
Anam and Zaman (2012)	Pakistan	1975-2010	ARDL Approach	There is a unidirectional causality running from oil prices to trade imbalance.

Table 2. *Overview of Previous Studies*

A substantial portion of the studies conducted both on Turkey's economy and other countries' economies points out presence of a strong correlation between the international oil prices and current account deficit. However, while oil prices reflect positively on the current account balance in the oil exporter countries, exactly opposite results attained in the importer countries.

4 Data and Methodology

The monthly current account deficit (CD) data for the period 1992:01-2013.02 as used in the study were obtained from Electronic Data Distribution System of Central Bank of Turkey, and international oil prices (OP) were obtained from official website of BP.

In this study addressing impact of the international oil prices on the current account deficit in the context of Turkey’s economy, the correlation between the said variables were analyzed through the following econometric methods:

- Unit Root Test
- Johansen’s Cointegration Test
- Vector Error Correction Model

5 Results

In this study examining impact of the international oil prices on the current account deficit, first, stability tests of the series were conducted in order to establish significant relationships between the variables. Results of the Expanded Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski Phillips Schmidt Shin (KPSS) unit root tests used to test the stability are presented in Table 3.

While assuming that null hypothesis (H_0) series contain unit root in ADF and PP tests, it is suggested that alternative hypothesis (H_1) series contain unit root in KPSS test. In this context, ADF, PP and KPSS unit root tests show that current account deficit and international oil prices series are not stable at level, but both become stable at their first difference. As a matter of fact, the t statistics calculated for ADF and PP tests are, as absolute value, smaller than the MacKinnon's critical value at original level. In KPSS test, as LM statistics is bigger than the critical value, not the H_0 hypothesis but its alternative is valid. At their first difference, the unit root problem disappears, the series become stable.

The fact that the series are stable at the same level points out that it is probable for the current account deficit and international oil prices to move in parallel in the long term. In order to clearly determine whether there is a long term relationship between the variables, the optimal lag length was selected and VAR model was predicted

in the first stage. According to the Table 4 containing the LR (Consecutive Modified Likelihood Ratio Test Statistics), FPE (Final Prediction Error), AIC (Akaike Information Criterion) and HQ (Hannan-Quinn Information Criterion), SC and HQ criteria show that the optimal lag length is 2.

	ADF Test		PP Test		KPSS Test	
	t statistics	Critical Values	t statistics	Critical Values	LM statistics	Critical Values
CA	-1.982859	-3.457515	-3.162461	-3.456093	1.558615	0.739000
		-2.873390		-2.872765		0.463000
		-2.573160		-2.572826		0.347000
PF	-1.792379	-3.456197	-1.380814	-3.456093	1.691471	0.739000
		-2.872811		-2.872765		0.463000
		-2.572851		-2.572826		0.347000
ΔCA	-3.467575	-3.457515	-24.36584	-3.456197	0.039647	0.739000
		-2.873390		-2.872811		0.463000
		-2.573160		-2.572851		0.347000
ΔPF	-9.114739	-3.456197	-9.037412	-3.456197	0.044839	0.739000
		-2.872811		-2.872811		0.463000
		-2.572851		-2.572851		0.347000

Table 3. *Unit Root Test Results*

	LogL	LR	FPE	AIC	SC	HQ
0	-3203.080	NA	1.09e+09	26.48826	26.51710	26.49988
1	-2679.723	1033.737	14951281	22.19606	22.28256	22.23091
2	-2641.465	74.93584	11264758	21.91293	22.05710*	21.97101*
3	-2640.195	2.465674	11522080	21.93550	22.13734	22.01681
4	-2638.398	3.460190	11734214	21.95370	22.21321	22.05824
5	-2633.501	9.348872	11648205	21.94629	22.26347	22.07406
6	-2627.886	10.62736	11494676	21.93294	22.30779	22.08394
7	-2620.275	14.27838	11157954	21.90310	22.33561	22.07733
8	-2619.179	2.037386	11430677	21.92710	22.41728	22.12456
9	-2613.534	10.40345	11278412	21.91351	22.46136	22.13420
10	-2608.588	9.034141	11193099	21.90569	22.51120	22.14961
11	-2599.276	16.85330	10715327	21.86179	22.52498	22.12894
12	-2593.591	10.19554*	10570610*	21.84786*	22.56872	22.13825

* Shows the lag length selected by the criterion.

Table 4. *VAR Model Lag Length Determination Criterion Results*

Number of cointegrated vectors in the system is required to be found in order to determine the long term relationship between the series seen to be stable at the same level. For this purpose, trace and maximum eigenvalue statistics were used in the study within the scope of Johansen's cointegration test. In maximum eigenvalue test, existence of maximum r cointegrated vectors is tested against the alternative hypothesis expressing that r+1 cointegrated vectors exist. In trace eigenvalue test, existence of maximum r conintegrated vectors is tested against the alternative hypothesis expressing that minimum r+1 cointegrated vectors exist (Üçdoğruk, 1996).

Number of Assumed Cointegration Equalities	Trace Test			Maximum Eigenvalue Test		
	Eigenvalue	Trace Statistics	5% Critical Values	Eigenvalue	Maximum Eigenvalue Statistics	5% Critical Values
0	0.162177	46.82078	15.49471	0.162177	44.41400	14.26460
Maximum 1	0.009543	2.406783	3.841466	0.009543	2.406783	3.841466

Table 5. *Johansen's Cointegration Test Results*

According to Table 5, both trace test and maximum eigenvalue test show that 1 cointegrated vector exists among the international oil prices and current account deficit at the significance level of 5%. Because for the zero hypothesis assuming that cointegrated vector does not exist, maximum eigenvalue was calculated as 44.4 and trace statistics was calculated as 46.2. As the calculated test values were higher than the critical values at 5% significance level (14.2 for maximum eigenvalue test, 15.4 for trace test), the zero hypothesis suggesting the cointegrated does not exist was rejected by both tests. This result reflecting existence of long term balance

relationship shows a substantial parallelism with the results of the studies conducted previously for Turkey and other countries.

Existence of a long term relationship between the current account deficit and the international oil prices shows that the behaviors of the variables in the short term may be addressed within the framework of error correction model. Results of the error correction model and Wald test conducted to determine the causal relationship between the variables in the short and long term are presented in Table 6.

Dependent Variable	t test				t test	Wald test	
	ΔCA_{t-1}	ΔCA_{t-2}	ΔPF_{t-1}	ΔPF_{t-2}	ECT_{-1}		
ΔCA	-0.110766 [-1.49025]	0.058178 [0.86485]	-6.997350 [-0.49019]	0.013418 [0.00094]	-0.287848 [-4.60101]	(ΔPF_{t-1}; ECT_{-1})	$\chi^2(2)$ = 21.82895

Values in [ ] show t statistics.

Table 6. *Results of Short and Long Term Causality Relationships*

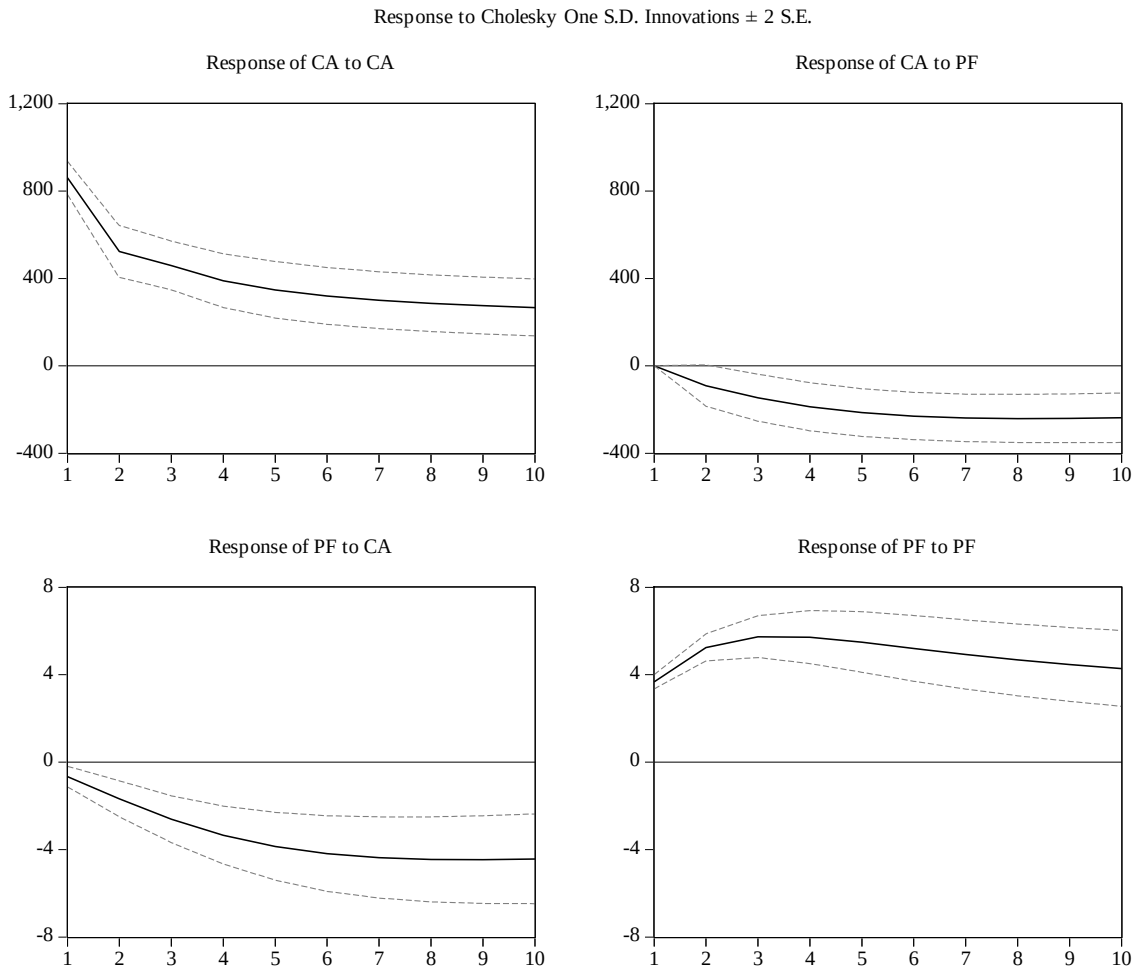

Figure 4. *Impulse - Response Functions*

While Wald test results confirm that a causality relationship from international oil prices to current account deficit exists in the long term, t test results show that oil prices are not an explanatory variable on the current account deficit in the short term.

Whether any variable is effective on a macroeconomical structure is determined initially with the causality tests used above. Whether the effective variable can be used as a policy instrument is analyzed with the impulse-response functions (Sarı, 2008). The impulse-response functions reflecting the response given by a variable against the shock applied to another variable in the system was plotted taking into account 10 period. The horizontal axis on the graphs shows duration of the response as monthly periods and vertical axis show the magnitude of the response as standard error. While the continuous lines demonstrate response of the shock-dependent variable for 1 standard error occurring in the error terms of the model over time, dashed lines

represent the confidence intervals attained for ± 2 standard error. Presence of the dashed lines in the positive and negative area at the same time means that the response is statistically significant (Yamak and Korkmaz, 2005; Erkılıç, 2006).

As shown in the Figure 4 with the straight line, one standard deviation shock to an oil price change results in a decline in the change in current account balance. Therefore, we can say that oil price shocks have the expected impact on the current account deficit.

Another method used for dynamic characteristics of the system is variance decomposition. By variance decomposition, sources of the change in variance of the variables in the models can be decomposed, it can be seen to what extent the change in variance of a variable is attributable to itself and to what extent the same is attributable to the other variable (Pekkaya and Tosuner, 2004).

Period	Standard Error	Current Account Deficit (CD)	International Oil Prices (OP)
1	860.1016	100.0000	0.000000
2	1010.861	99.19331	0.806685
3	1119.928	97.63576	2.364237
4	1200.355	95.49397	4.506034
5	1267.971	93.10195	6.898054
6	1327.690	90.69978	9.300220
7	1381.890	88.43814	11.56186
8	1431.678	86.38762	13.61238
9	1477.684	84.56781	15.43219
10	1520.327	82.97020	17.02980

Table 8. *Variance Decomposition Results*

According to variance decomposition results, the whole change in the current account deficit in the period can be explained by itself. But beginning from the second period, explanatoriness of the international oil prices begin to increase, and in the tenth period, around 17% of the change in the current account deficit is explained by the international oil prices.

6 Conclusion and Evaluation

The international oil prices determined by the supply&demand conditions as well as social factors can influence the macro dimensions such as current account balance particularly in developing countries that are external dependent in energy. In this study, the relationship between international oil prices and current account deficit was tested with the aid of the monthly data for the period 1992:01-2013:02 for Turkey's economy using VAR analysis. The data obtained showed existence of a causal relationship from international oil prices to current account deficit. Hence, very critical steps are required to be taken in the field of energy in order to reduce to a certain extent the current account deficit that has reached very high levels due to reasons attributable to both domestic demand increase and production structure. In this respect, it is required to support the efforts aimed at determining domestic energy resources and mobilizing the said resources, modernize the existing energy sites, reduce the demand for fossil fuels by supporting the private and public investments in renewable energy resources, and minimize the losses and illicit uses on energy lines.

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