THE DYNAMICAL RELATIONSHIP BETWEEN OIL PRICE SHOCKS AND SELECTED MACROECONOMIC VARIABLES IN TURKEY

MEHMET ERYIĞIT[1]

ARTICLE INFO

JEL classification:
C01, C2, Q4

Keywords:
- Oil Price shocks
- ISE-100
- Interest rates
- Exchange rates
- Vector –autoregressive (VAR)

ABSTRACT

In many empirical studies, the dynamic relationship among energy sector variables (such as, oil, electricity, gasoline, coal, renewable energy, etc.) and economic variables (such as; financial markets, real economy and the overall economy) are studied. Oil price changes may affect the economic variables more of oil importer countries then oil exporter countries especially emerging markets. In addition to this, oil price changes and shocks may be an important device to explain stock market index return. In this paper, Istanbul stock exchange market index (ISE-100), interest rates, exchange rates and oil price are analyzed by using a vector autoregressive (VAR) approach for Turkey. The results suggest that there is a dynamic relationship among oil price shocks, Istanbul stock market index, exchange rate and interest rate.

[1] Assoc. Prof. Dr., +90-374-254-1000 (1418 ext.), eryigit_m@ibu.edu.tr, Abant Izzet Baysal University, Faculty of Business Administration and Economics, Department of Business Administration, Bolu, Turkey.

I. INTRODUCTION

Oil is the lifeblood of modern economics (Basher and Sadorsky, 2006). When countries urbanize and modernize, demand for oil increases. The forecasting of oil demand for the future is not easy but it can be said that the demand for oil and the industrial development are highly correlated. As the growth rate increases, the demand for energy (especially oil, electricity, renewable energy, etc.,) increases. In the future, most probably China and India (these countries are called emerging economies which are growing very fast according to other emerging countries) are expected to demand and consume the most of the world's oil production (Basher and Sadorsky, 2006). Therefore, the price changes of oil or energy affect emerging economies more than developed economies. The production technologies which based on oil are very dangerous for air pollution and environment. Because of this reason, most developed countries shift their production lines from oil based technology to other types of alternative technologies or they carry their productions to developing or under-developing countries. Thus, emerging economies tend to be more energy intensive than developed economies.

The simple demand and supply rule is valid for the oil prices. If there is a demand surplus for oil, this leads to higher oil prices. According to Basher and Sadorsky (2006) if oil price increases, this will act same as the inflation tax and two things can happen (1) consumers try to find alternative energies, and (2) increasing in the production cost of the non-oil producing companies; oil price volatility increases the risk and uncertainty which negatively affect the stock prices and reduces wealth and investment. Basher and Sadorsky (2006) used a multi-factor model to investigate the relationship between oil price risk and emerging stock market returns. They found strong evidence that oil price risk impacts the stock price returns in emerging markets.

There are many studies on the relationship among oil prices, the stock prices, and real economic activities. However, most of these studies have focused on the stock markets of the developed economies (Sadorsky (1999); Cunado and DeGracia (2005); Lanza et.al, (2005); Basher and Sadorsky (2006); Ghouri (2006); Lardic and Mignon (2008); Henriques and Sadorsky (2008); Park and Ratti (2008); Faff and Brailsford (1999)). Only a few studies concentrated on emerging economies' financial markets (e.g. Papapetrou (2001); Rautava (2004); Hammoudeh and Choi (2006); Farzanegan and Markwardt (2009); Basher, Haug and Sadorsky (2010), Soytaş, et. al., (2009)). The aim of the present study is to investigate the dynamic relationship among oil price, stock market index, interest rate, and exchange rate in Turkey. The rest of the paper is organized as follows: In the second section, a review of empirical studies on the effects of oil prices on macro-economical variables will provided. Afterwards, impulse response functions and variance decomposition analysis results will be presented and discussed.

II. LITERATURE

The effect of crude oil prices on the macro-economical variables has been the subject of many studies. While the most of these studies are concerned with the developed economies, a number of studies dealing with the effect on the emerging markets are also present. Oil price changes and shocks affect real economic activity in several ways (Lardic and Mignon, 2006; Cunado and DeGracia, 2005; Abeysinghe, 2001). One of the effects is the classical supply side effect. An increase in oil prices leads to an increase in the cost of production which in turn causes a decrease in growth of output and productivity. An increase in oil prices impacts trade of oil importer countries negatively. Another effect is about money demand. As oil prices increases, the amount of money demanded also increases. If the government does not give strong reaction to this increase, the inflation rate of the country can rise, investments may decrease and at the end total gross domestic product may decline. The nominal wages may rise while real wages decreasing as a result of an increase in oil prices which leads economy to the price-wage loops. Besides that, in short-term, oil prices may affect the production structure and in turn have negative effect on unemployment but in the long run the increase in oil prices will induce structural changes for the energy sectors.

Cunado and DeGracia (2005) studied the oil prices and macro economy relationships to shed a light on the impact of oil price shocks on both economic activity and consumer price indices in six Asian countries (Malaysia, Japan, Singapore, South Korea, Philippines, and Thailand). They found two important results. First, oil prices have a significant effect on economic activity and price indices, and second, this effect is more significant when oil price shocks are defined in local prices.

Cheung and Ng (1998) have studied the long run co-movements among five national stock market indices (Canada, Germany, Italy, Japan, and USA) and measures of aggregate real activity including the real oil price, real consumption, real money and real output by using Johanson co-integration. They found that oil prices are negatively correlated with stock prices. According to Cheung and Ng (1998) increases in oil prices generally cause a rise in the production cost which leads to a fall in the aggregate economic activity.

Papapetrou (2001) studied to explain the dynamic relationship among oil price changes, real sector prices, interest rates, real economic activity and employment for Greece. He used both industrial production and employment as the measure of economic activity and found that the oil price shocks have negative effect on industrial production and employment. The results, also, suggest that a steep increase in oil price depresses the real stock returns.

In addition to its effects on the real economic activity and employment oil price changes are very important tools to explain stock price movements. According to Cong et.al., (2008) oil price shocks are not the only factor that affects the stock market prices. Oil price shocks have influences on industries' stock price differently. The relationship between oil price and stock market is complicated and it is not easy to explain for many countries. Cong at. al. (2008) investigated the interactive relationship between oil price shocks and Chinese stock market using multivariate vector auto-regression methodology. They found that oil price shocks have statistically significant effects only on the manufacturing index and some oil companies' stock prices. Some important oil price shocks depressed the oil company stock price in China. To explain the changes in the return of manufacturing index, both world and Chinese oil price shocks were found to be better explanation tools more compared to the interest rates. Sadorsky (1999) tried to explain the oil price and oil price volatility effects on real stock returns for USA. After 1986, oil prices explain a larger fraction of the forecast error variance in real stock returns compared to the interest rates. In addition to this, there is evidence that oil price volatility shocks have asymmetric effects on economy.

Henriques and Sadorsky (2008) used four variables vector autoregressive model to develop and estimate the empirical relationship between alternative energy stock prices, technological stock prices, oil prices and interest rates. They found Granger causality between technology stock prices and oil prices with the alternative energy companies' stock prices. Simulation results showed that a shock to technology stock prices has a larger impact on alternative energy stock prices than does a shock to oil prices.

According to Park and Ratti (2008), oil price shocks have a statistically significant impact on real stock returns contemporaneously. A multivariate VAR analysis is conducted with linear and nonlinear specification of oil price shocks in USA and 13 European countries[1]. Oil price shocks have a statistically significant impact on real stock returns in the same month or within one month. Authors stated that the stock market's response to oil price shock partly depend on whether the country was oil importing or oil exporting countries. Another study (Hammoudeh and Li, 2005) compared the relationship between oil price changes and stock returns for oil-based countries (Mexico and Norway) and oil-sensitive industries (US oil and transportation industries) by using vector error – correction model (VEC) and they also examined the oil sensitivity of those returns with their sensitivity to systematic risk with respect to the world capital market using international arbitrage pricing model (APT). Also, they tested whether or not asymmetry in return sensitivity exist when the world capital market is an up or down. Their findings showed that the oil price growth leads the stock returns of oil exporting countries and the US oil-sensitive industries and this industry showing the greatest sensitivity. According to Hammoudeh and Li (2005), the oil sensitivity is positive in the case of the US AMEX Oil Index and the Norway Oslo All-Shares index but negative for US transportation index, but the Oil sensitivity does not sensitivity for Mexico.

Hammoudeh and Aleisa (2004) investigated the links between the stock market indices of GCC[2] and NewYork Mercantile Exchange (NYMEX) oil futures prices for the period of 1994-2001. The results of the study revealed that Saudi Arabia has a predictive power for oil futures prices since there is a bidirectional relationship between stock market indices of Saudi Arabia and NYMEX future oil prices. Hammoudeh and Choi (2006) made a similar study to investigate the relationships among five GCC stock markets and their links to three global factors (Western Texas Intermediate (WTI) oil spot prices, US 3-months Treasury bill rate and S&P index) by using vector-error correction (VEC) model for the weekly data and they found that five GCC stock markets and three global variables have several long-run equilibrium relationships and are co-driven by common stochastic forces. In addition to this, they found that the US T-bill has a short term impact on some of the GCC stock markets.

Lanza, et.al (2005) focuses on the long run financial determinants of the stock prices of six major oil companies (BP, Chevron-Texaco, Eni, Exxon-Mobil, Royal Dutch Shell, Total-Fina-Elf). They used multivariate co-integration techniques and vector correction models,

[1] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain, Sweden, U.K

[2] Members of Gulf Cooperation Council (GCC) includes Bahrain, Kuwait, Oman, Saudi Arabia and The United Arab Emirates

and found that the major financial variables are statistically significant in explaining the long-run dynamics of oil companies' stock values.

Rautava (2004) used vector autoregressive model and co-integration techniques to analyze the impact of international oil prices and real exchange rate on Russian economy and its fiscal policy. It is found that Russian economy and real exchange rate are influenced by oil price fluctuations in a statistically significant way.

Basher et al. (2010) examined the dynamic relationship between oil prices, exchange rates and emerging stock markets[3] using structural vector autoregression approach and they found that positive shocks to oil prices tend to depress emerging market stock prices and US dollars exchange rates in short run. Their results support that exchange rates respond to movements in oil prices and most of the dynamic relations takes place in short run. Also, they highlighted that oil prices respond negatively to an unexpected increase in oil supply and oil prices respond positively to an unexpected increase in demand and positive shocks to emerging stock markets.

Soytaş et al. (2009) examined the long and short-run relationships among the world oil price, Turkish interest rate, Turkish lira/US dollar exchange rate, and domestic spot gold and silver price by using Vector Autoregressive (VAR) model. They found that the world oil price has no predictive power of the precious metal prices, the interest rate and the exchange rate market in Turkey. Turkish spot precious metals, exchange rate and bond markets do not also provide information that would help improve the forecasts of world oil prices in the long run and there are no any significant influence of developments in the world oil markets on Turkish markets in the short run either.

As a summary of the above cited empirical researches, it can be said that there is an important relationship among the oil prices, macro economical variables and stock market index. In this paper, the main focus is to examine the relationship of oil price, macro-economical variables and stock market for Turkish market.

III. DATA AND METHODOLOGY

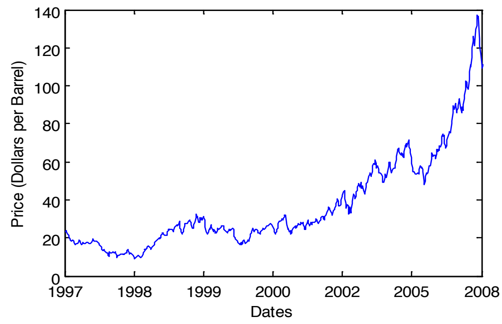
A. Data

The data used in the present study are crude oil price, exchange rate, interest rate and the main index of Istanbul Stock Market Exchange (ISE100) for the period 01.07.2005 – 10.31.2008. Oil price data are gathered from the American Energy Information Administration's web page (http://www.eia.doe.gov/), ISE100 data are collected from the web page of Istanbul Stock Exchange (http://www.ise.org/), and the interest and the exchange rates are collected from web page of Central Bank of the Republic of Turkey (http://www.tcmb.gov.tr/yeni/eng/). The empirical analysis has been carried out using weekly data. The variables of the model are Istanbul Stock Market index –*ISE100*, interest rate – *IR*, exchange rate – *ER*, and oil price – *OP*. The weekly World oil price (US Dollars per Barrel) is shown in Figure 1. The oil price has been increasing very sharply for last three years. The World oil price is all countries spot price FOB weighted by estimated export volume.

[3] Brazil, Chile, Colombia, Mexico, Peru, Czech Republic, Egypt, Hungary, Israel, Morocco, Poland, Russia, South Africa, Turkey, China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand

Weekly World Oil Price (US Dollars per Barrel)

FIGURE 1



SOURCE: Author

B. Methodology

The dynamical relationship among ISE100 changes, interest rate changes, exchange rate changes, and oil price changes are analyzed by the carrying out the following procedure. First, in order to determine whether the series are non-stationary in the levels and whether they are stationary in the first difference, one needs to perform a unit root test (Nandha and Hammoudeh, 2007). Co-integration test is necessary to see the co-integration equations after unit root test. Then, vector autoregressive (VAR) model or Vector Error Correct Method (VECM) can be applied. If the variables are stationary at level, VAR model can be applied. If the variables are non-stationary at the level, it must test for first difference for examining the stationary level. If the co-integration equations are statistically significant, the VECM might be used to analyze the long term relationship between variables with appropriate lag. Otherwise, VAR model can be used with the appropriate lag. VAR model applied, the impulse-response function analysis and variance decompositions could be done.

Unit root test

In order to avoid artificial regression results, it must be used as stationary state level. According to Rautava(2004), there are two reasons for unit root test and co-integration test. First, the risk of spurious correlation between variables and the second one is using only first differences of the variables runs the losing relevant information. Because of these reasons, unit root tests are necessary to see the variables are at stationary or non-stationary. If the variables are not stationary, co-integration test should be applied to understand the actual behavior of the variables. Augmented Dickey-Fuller (ADF), Phillips-Perron Test Equation (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), Elliott-Rothenberg-Stock (ERS), Ng-Perron (NP) are the methods to test unit root of variables.

Phillips-Perron (PP) unit root test was used to investigate whether the variables in this study are integrated in the same order or not. The null hypotheses of PP test for the interest rate, exchange rate, stock market index and oil price is that log level of each variable has a unit root. The PP unit root test results are presented in Table1. According to results, the three variables *(Ln (ISE100), Ln(ER)*, and *Ln(IR)*) are non-stationary and the *Ln(OP)* variable is stationary at the significance level of 5% in level state with constant term. In levels and constant + trend position, just *Ln(IR)* is stationary at 5% significance level, *Ln(ER), Ln(OP)* and *Ln(ISE-100)* are non-stationary. In the first difference all of the variables are stationary at the 1% significance level for both constant and constant + trend position.

TABLE 1 - Results of Phillips-Perron Unit Root test (The null hypothesis is that the variable is non-stationary) $(y_t = \alpha + \beta y_{t-1} + u_t)$

	Variable	**Constant – Z(t_α)**	**Constant + trend – Z(t_α)**
In Levels	Ln(IR)	-1.11	-2.07**
	Ln(ER)	-0.67	0.06
	Ln(ISE-100)	-1.31	0.56
	Ln(OP)	-2.14**	-0.02
In the first difference	Ln(IR)	-13.99*	-14.01*
	Ln(ER)	-10.14*	-10.23*
	Ln(ISE-100)	-11.13*	-11.42*
	Ln(OP)	-9.62*	-9.77*

Notes: ** and * denote that a test statistic is statistically significant at the 5% and 1% level of significance, respectively. Unit root computations are made by using Eviews employing the Bartlett Kernel estimation method with Newey-West Bandwith selector. The null hypothesis of PP test is the series has a unit root.
SOURCE: Author

Co-integration Test

Table 2 presents the results of Johanson co-integration test. Johanson maximum likelihood approach was used to test cointegration and it employed both maximum Eigenvalue and trace statistics. According to Trace test statistics and Max-eigenvalue test, there is no cointegration at both 5% and 1% levels.

TABLE 2 - Johansen Cointegration Test results for the variables (OP, ISE100, ER, IR)

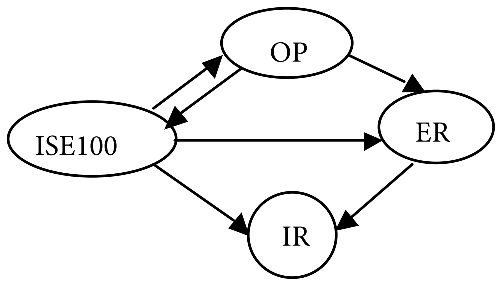
Hypothesized No. of CE(s)	Trace Statistic	5% Critical Value	1% Critical Value	Max-Eigen Statistic	5% Critical Value	1% Critical Value
None	44.89			21.60		
At most 1	23.29	29.68	35.65	12.38	20.97	25.52
At most 2	10.91	15.41	20.04	7.82	14.07	18.63
At most 3	3.09	3.76	6.65	3.09	3.76	6.65

Note: *(**) denotes rejection of the hypothesis at the 5%(1%) level
SOURCE: Author

IV. IMPULSE RESPONSE AND VARIANCE DECOMPOSITION ANALYSIS

In this study a VAR analysis was used to explain oil price changes and its effects on stock returns, interest rate changes and exchange rate changes. VAR analysis allows the analyzer to test for the endogeneity of all variables and the responses of oil price changes, stock returns, interest rates, and exchange rate to oil prices, exchange rate, interest rate and exchange rate shocks in order to capture the short-run dynamics of the variables. To construct the VAR vector, relationships among variables was examined with the Granger causalities test. Results of Granger causality test can be illustrated as follows;

FIGURE 2



SOURCE: Author

To determine the appropriate number of lag length of the VAR model the likelihood ratio statistic is employed which follows the chi-squared distribution. The results of this analysis are shown in Table 3. Five criteria (LR, FPE, AIC, SC, HQ) are used to select appropriate lag length of the VAR model. According to results, lag length is 1 based on three criteria (FPE, AIC and HQ).

Each equations of the VAR model are tested for the serial correlation with LM-statistics, and normality test. There was no serial correlations between variable but results rejected the normality. Since the Johanson procedure does not strictly depend on the normality assumption (Papapetrou, 2001), the VAR is employed for analysis.

Next, the generalized impulse response functions and the generalized variance decomposition are employed to analyze the short-run dynamics of the variables. The purpose of the analysis is to find each variable responds to one standard deviation shocks of other variables.

TABLE 3 - VAR Lag Order Selection Criteria

Endogenous variables: ***D(OP) D(ISE100) D(ER) D(IR)***

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	1738.649	NA	1.38E-13	-8.25946	-8.19110*	-18.23177
1	1778.387	77.38624	1.08E-13*	-8.50934*	-18.16755	-8.37089*
2	1793.548	28.88492	1.09E-13	-18.50051	-17.88528	-18.25129
3	1799.625	11.32314	1.21E-13	-18.39606	-17.50740	-18.03607
4	1808.281	15.76297	1.30E-13	-18.31875	-17.15666	-17.84800
5	1824.176	28.27650*	1.31E-13	-18.31765	-16.88212	-17.73614
6	1830.936	11.73991	1.44E-13	-18.22038	-16.51142	-17.52810
7	1840.210	15.71759	1.56E-13	-18.14958	-16.16719	-17.34654
8	1852.177	19.77637	1.63E-13	-18.10712	-15.85130	-17.19332

* 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

SOURCE: Author

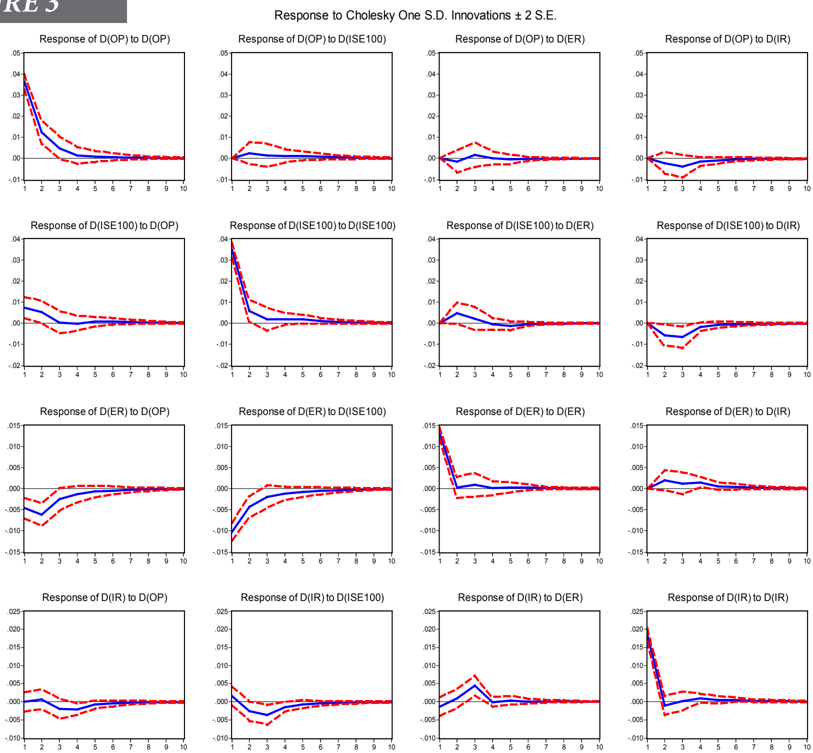
A. Impulse-Response Functions

Plotting the response to Cholesky one standard deviation functions is a practical way to explore the response of each variable to a shock immediately or with various lags. Figure 2 shows the impulse-responses results for one standard deviation of oil price, ISE100, exchange rate, and interest rate shock to oil price, ISE100, exchange rate, and interest rate disturbances. First column of figure 2 is belong to responses of variables to oil price changes, second column is for response of variables to ise100 index, third column is for responses of variables to exchange rate changes and the last column is for response of all variables to one standard deviation changes of interest rate changes. The impulse functions for oil price, ISE100, exchange rate, and interest rate are reported in rates. To see the percentage value, the rates must be multiplied by 100.

First column on figure 2 shows the responses of stock market index, exchange rate, interest rate and oil price to one standard deviation change on oil price shocks. Oil price shock has a positive impact on ISE100 and itself and negative impact on exchange rate. The impacts of oil price shocks on ise100 lost after third week. The impacts of oil price shocks on exchange rate and interest rate lost after seven week.

Impulse and response functions

FIGURE 3



SOURCE: Author

When we look at the second column in on Figure 2, it can be seen that ISE100 shock has a small positive impact on oil price and ISE100 but it has negative impact on exchange rate and interest rates. The exchange rate response is negative in the initial week after the shocks and then increases steadily up to eight week. Nine weeks after shock, the response of exchange rate lost its affects. Interest rate responses to ISE100 shock in the short run with the lowest response occurring third week, after the seventh week it lost its affects.

According to Dimitrova (2005), currency depreciation leads to a decline in stock prices in the short run. Exchange rate depreciation suggests higher inflation in the future and this makes investors doubtful about the companies' future performance. Therefore, stock prices drop in future. The expected thing is this "stock prices react exchange rates". According to author, when stock prices decline, foreign investors sell their financial assets and they buy respective currency. As a result, this leads to currency depreciation.

Third column of the figure 2 shows response of stock market index, exchange rates, interest rates and oil price to exchange rate shocks. Response of stock market index to one standard deviation shock on exchange rate is positive effects for the first four weeks and it reached to the peak level at the second week, after seventh week it lost its affects. Response of interest rate to the exchange rate shock is negative at first week but positive between second and fourth week while the response of oil price is very small and lost its affects on oil price after seventh week.

In fourth column, figures show response of stock exchange market index, exchange rates, interest rates and oil price to interest rate shocks. Response of ise100 to one standard deviation shocks on interest rate is negative effect at the beginning and it reached to the lowest level at the third week. When the interest rate increases, at the beginning, investment can move from stock markets to money markets. But this is not stationary. After a while, the process returns back. According to Maysami et.al (2004) there is a negative relationship between interest rate and stock prices. There are two main reasons of this negative relationship. First, interest rate can influence the level of corporate profits which in turn influence the price investors are willing to pay for the stock through expectations of higher future dividends payments. Second, substantial amount of stocks are purchased with borrowing money, hence an increase in interest rates would make stock transactions more costly. According to Sadorsky (1999), changes in interest rates affect stock returns for three reasons. (a) Changes in interest rates are changes in the price charged for credit which is a major influence on the level of corporate profit. (b) Movements in interest rates change the relationship between competing financial assets. (c) Some stocks are purchased on margin. If the interest rate increases, stock returns will be dampened.

B. Variance Decomposition

Variance decomposition gives the proportion of the movements in the dependent variables that due to their own shocks, versus shocks to the other variables. Table .4 shows the variance decomposition for oil prices, ISE100, exchange rate, and interest rate over a period of 10 weeks. The reported numbers indicate the percentage of the forecast error in each variable. These errors can be attributed to innovations in other variables at four different time horizons (1, 4, 7, and 10 weeks).

TABLE 4 - Variance decomposition of oil price, ISE100, exchange rate, and interest rate

Variance Decomposition of Oil Price					
Period	S.E.	Oil Price shock	ISE100 shock	Exchange Rate shock	Interest Rate shock
1	0.036339	100.00	0.00	0.00	0.00
4	0.039193	97.64	0.60	0.32	1.44
7	0.039258	97.41	0.73	0.34	1.51
10	0.039262	97.40	0.74	0.34	1.52
Variance Decomposition of Istanbul Stock Exchange Market index (ISE100)					
Period	S.E.	D(OP)	D(ISE100)	D(ER)	D(IR)
1	0.03537	4.41	95.59	0.00	0.00
4	0.037759	5.83	86.70	1.83	5.65
7	0.037881	5.91	86.48	1.95	5.67
10	0.037887	5.92	86.46	1.95	5.68
Variance Decomposition of Exchange Rate					
Period	S.E.	D(OP)	D(ISE100)	D(ER)	D(IR)
1	0.01724	7.26	35.28	57.46	0.00
4	0.019393	18.10	34.30	45.63	1.96
7	0.019457	18.18	34.36	45.36	2.09
10	0.019462	18.19	34.37	45.34	2.10
Variance Decomposition of Interest Rate					
Period	S.E.	D(OP)	D(ISE100)	D(ER)	D(IR)
1	0.018588	0.00	0.70	0.55	98.74
4	0.019996	2.14	6.34	5.71	85.81
7	0.020055	2.37	6.50	5.70	85.43
10	0.020059	2.38	6.51	5.70	85.41

Cholesky Ordering: *D(OP) D(ISE100) D(ER) D(IR)*
SOURCE: Author

The results of variance decomposition suggest that each of the variables can be explained by the disturbances of others. As the table below suggests, the variance decomposition results are consistent with the findings of impulse-response functions. In the first week, 95.59% of the variability in Istanbul stock exchange market index changes is explained its own, 4.41% of the variability is explained by oil price shock. After 10 weeks, shocks to ise100, exchange rate, interest rate and oil price are approximately 86.46%, 1.95%, 5.68% and 5.92% subsequently.

According to the variance decomposition results for exchange rate, most of the exchange rate variability comes from itself and ise100. At the first week, 57.46% of the variability in exchange rate is explained by itself, while 35.28% is explained by ISE100, and 7.26% by oil price. After ten weeks, 45.34% is explained by the exchange rate, while 34.37% by ise100, 2.10% by interest rate and 18.19% by oil price changes. In the long term, the affects of oil price on exchange rate increase.

Table.4 represents that 98.74% of the variability of interest rate comes from itself while 0.70% by ISE100, and 0.55% by exchange rate changes. After seven weeks, ise100, exchange rate, interest rate and oil price account for 6.50%, 5.70%, 85.43%, and 2.37% of the interest rate forecast error variance, respectively.

Finally, table.4 presents the variance decomposition of oil price changes. In the first week, 100% of the oil price variability is attributed to shocks itself. After ten weeks, oil price variations (97.40%) are still mainly due to its changes, while 0.74% to ISE100, 0.34% to exchange rate and 1.52% interest rate.

V. CONCLUSION

The short term relationship between oil prices and interest rate, stock market index, and exchange rate was investigated for Turkish market in the period 07.01.2005 – 31.10.2008 by using a vector autoregressive (VAR) model. The main findings of the study are as follows: The oil price changes shocks have effect on Istanbul stock exchange market index which is similar to the findings of Cheung and Ng (1998) and Cong et.al (2008). The reason might be Turkey is an oil importing country and most of the companies on stock exchange market are affected directly or indirectly from oil price and exchange rate changes. Exchange rate changes influenced by the oil price which is similar to the findings of Rautava (2004). Oil price shocks explain a significant proportion of the Istanbul stock exchange market and interest rates and immediate negative effect on exchange rates. Impulse-Response functions results are also support variance decomposition results.

Acknowledgement

Author wishes to thank to anonymous referees of this journal for their valuable comments.

REFERENCES

Abeysinghe, Tilak. 2001. Estimation of direct and indirect impact of oil price on growth. Economics Letters 73: 147–153.

Basher, Syed A. and Perry Sadorsky. 2006. Oil price risk and emerging stock markets. Global Finance Journal 17: 224–251.

Basher, Syed A., Alfred, A. Haug, and Perry Sadorsky. 2010. Oil Prices, Exchange Rates and Emerging Stock Markets. University of Otago Economics Discussion Papers No. 1014, New Zealand.

Cheung, Yin W., and Lilian K. Ng. 1998. International evidence on the stock market and aggregate economic activity. Journal of Empirical Finance 5: 281–296.

Cong, Rong G., Yi-Ming W., Jian-Lin Jiao, and Ying Fan. 2008. Relationships between oil price shocks and stock market: An empirical analysis from China. Energy Policy 36: 3544– 3553.

Cunado, Juncal, and Fernando P. De-Gracia. 2005. Oil prices, economic activity and inflation: evidence for some Asian countries. The Quarterly Review of Economics and Finance 45: 65–83.

Dimitrova, Desislava. 2005. The relationship between exchange rates and the stock prices: Studied in a multivariate model. Issues in Political Economy 14, http://org.elon.edu/ipe/dimitrova%20final.pdf

Faff, Robert W., and Timothy J., Brailsford. 1999. Oil price risk and the Australian stock markets. Journal of Energy Finance and Development 4: 68-87.

Farzanegan, Mohammad R., and Gunther Markwardt. 2009. The effects of oil price shocks on the Iranian economy. Energy Economics 31(1): 134-151.

Ghouri, Salman Saif. 2006. Assessment of the relationship between oil prices and US oil stocks. Energy Policy 34: 3327–3333.

Hammoudeh, Shawkat, and Eisa Aleisa. 2004. Dynamic relationships among GCC Stock Markets and NYMEX Oil Futures. Contemporary Economic Policy 22 (2): 250-269.

Hammoudeh, Shawkat, and Huimin Li. 2005. Oil sensitivity and systematic risk in oil-sensitive stock indices. Journal of Economics and Business 57: 1–21.

Hammoudeh, Shawkat, and Kyongwook Choi. 2006. Behavior of GCC stock markets and impacts of US oil and financial markets. Research in International Business and Finance 20: 22–44.

Henriques, Irene and Perry Sadorsky. 2008. Oil prices and the stock prices of alternative energy companies. Energy Economics 30: 998–1010.

Lanza, Alessandro, Matteo Manera, Margherita Grasso, and Massimo Giovannini. 2005. Long-run models of oil stock prices. Environmental Modeling and Software 20: 1423-1430.

Lardic, Sandrine, and Valérie Mignon. 2008. Oil prices and economic activity: An asymmetric cointegration approach. Energy Economics 30: 847–855.

Maysami, Ramin C., Lee C. Howe, and Mohamad A. Hamzah. 2004. Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore's All-S Sector Indices. Jurnal Pengurusan 24: 47-77.

Nandha, Mohan, and Shawkat Hammoudeh. 2007 Systematic risk, and oil price and exchange rate sensitivities in Asia-Pacific stock markets. Research in International Business and Finance 2: 326–341.

Papapetrou, Evangelia. 2001. Oil price shocks, stock market, economic activity and employment in Greece. Energy Economics 23:511-532.

Park, Jungwook, and Ronald A. Ratti. 2008. Oil price shocks and stock markets in the U.S. and 13 European countries. Energy Economics 30: 2587–2608.

Rautava, Jouko. 2004. The role of oil prices and the real exchange rate in Russia's economy – e cointegration approach. Journal of Comparative Economics 32: 315-327.

Sadorsky, Perry. 1999. Oil price shocks and stock market activity. Energy Economics 21: 449-469.

Soytas, Uğur, Ramazan Sari, Shawkat Hammoudeh, and Erk Hacihasanoglu. 2009. World oil prices, precious metal prices and macroeconomy in Turkey. Energy Policy 37: 5557–5566.

DINAMIČKI ODNOS IZMEĐU NAFTNIH ŠOKOVA I ODABRANIH MAKROEKONOMSKIH VARIJABLI U TURSKOJ

SAŽETAK

Mnoga empirijska istraživanja proučavaju dinamički odnos između varijabli energetskog sektora (kao što su nafta, struja, benzin, ugljen, obnovljivi izvori, itd.) i ekonomskih varijabli (kao što su financijska tržišta, realna ekonomija i opća ekonomija). Promjene u cijeni nafte mogu više utjecati na ekonomske varijable u zemljama uvoznicama nafte nego u zemljama izvoznicama nafte, posebice na tržištima u nastajanju. Osim toga, promjene u cijeni nafte i naftni šokovi mogu biti važni pri objašnjavanju indeksa prinosa na tržištu dionica. Ovaj rad analizira indeks istambulskog tržišta dionica (ISE-100), kamatne stope, tečajne stope i cijenu nafte koristeći pristup vektorske autoregresije (VAR) za Tursku. Rezultati upućuju na to da postoji dinamična veza između naftnih šokova, istambulskog tržišta dionica, tečajne stope i kamatnih stopa.

Ključne riječi: *naftni šokovi, ISE-100, kamatne stope, tečajne stope, vektorska autoregresija (VAR).*