HOW OIL PRICES AFFECTS THE STOCK MARKET'S SUB-INDUSTRIAL INDICES: AN EMPIRICAL STUDY OF ISTANBUL STOCK EXCHANGE (ISE)

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ABSTRACT

Although there are many researches in literature examining the interaction between the oil prices and the stock markets, the studies on the impacts of the changes in the oil prices on the stock industry indexes that are the sub-indexes are rather limited in number. Our study intends to reveal which industrial branches are sensitive to change in the oil prices that have become a strategic parameter in economic and financial sense due to expanding demand for energy and to measure the severity of this sensitiveness. Our study comprising the period of 2000: 01 – 2008: 12 has been prepared on the basis of the daily changes in the oil prices and 19 stock indices (composite, industry, service, and technology) within the scope of Istanbul Stock Exchange (ISE). The cointegration association between each industry and service index within the scope of ISE and the oil prices has been examined for the given period, and the impacts of the oil price changes on the indexes has been analyzed. It is seen that the Defence and Electricity daily return indices have been affected maximally by the daily change in the oil prices while the Non-Metal Products and Food and Beverage index returns have been affected minimally. It is understood that there is an adverse interaction between the oil prices and the Transportation and Tourism index returns.

Keywords: Emerging Markets, Stock Markets, Oil Prices, Stock Market Indices, ISE.

1. INTRODUCTION

The stock markets occupy an important position among the financial markets the diversity and impact area of which are expanding rapidly. The stock price movements watched carefully by the local and global investors and all the other economic actors and the price indices that are projection of these movements allow the analysis of both the past and the present and also constitute an important tool for the future-oriented forecasts. The efficient and effective use of this tool, however, depends on the correct definition of the factors influencing the direction and acceleration of the tool as well as the impact degree of such factors.

The oil prices top the list of the important factors whose degree of effectiveness on the stock indices has been increasing gradually especially lately. It is seen that the oil prices that had showed a stabile trend with $5 per barrel before 1973 has created the high volatility period after the Yom Kippur War at the end of 1973, when the fast price fluctuations that meant the end of the cheap oil has experienced. These upward trends were followed by the shock price increases in the year, and the barrel price of the Brent type crude oil rocketed from approximately $30 to $143.95 on July 3rd, 2008. The prices that dropped below $100 in September closed the year 2008 at $35.82. (http://www.wtrg.com/prices.htm -11.03.2009)

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This rapid movement in the prices of oil that tops the list of strategic raw materials in both the economic and political senses must be expected to have important impacts on the macroeconomic variables of both the net oil exporter countries and the net oil importer countries.

The studies carried out by Jones and Kaul (1996), Billmeier and Massa (2009), and Kaneko and Lee (1995) on this subject mention strong evidences indicating that this impact is negative on the oil importer countries and positive for the oil importer countries in general.

Besides, the empirical studies carried out by the researchers such as Hamilton (1983), Mork (1989), Mory (1993), Mork et al. (1994), and Guidi et al. (2006) and covering the countries where the oil is used as input have revealed that impacts of the increases in the oil prices on the macroeconomic factors are asymmetric, and that the decreases in the oil prices, however, have failed to created the required positive impact to the same extent.

In this respect, the impacts of the volatility of the oil prices on the stock markets that is an important macroeconomic variable tops the list of the subjects that must be studies empirically. Although there are many studies in this field, examining especially the impacts of the oil prices on the general stock indices, the empiric studies analyzing their impacts on the sub-indices such as the industry, service, and technology are rather limited. The limited number of studies based on the industry indices within the scope of Istanbul Stock Exchange (ISE), however, analyzes the impacts of the oil prices as well as several macroeconomic variables. On the other hand, there is no study examining only the impacts of the volatility of the oil prices on the industry and service sectors indices.

Our study that intends to fill a gap in the literature on this subject examines the relation between the daily oil prices in the period of 2000:01-2008:12 and the daily values of the composite index and 19 indices composed of industry, service, and technology within the scope of ISE. Our study aims at discovering whether the oil prices have any impact on the industry, service, and technology indices, measuring and comparing the degree of sensitivity of the indices to the volatility of the oil prices, bringing a different point of view to the arguments in the literature, and thus making a contribution.

The second part of our study is composed of a literature review including the theoretical and empirical researches made in this field, and the third part gives information on the data used in the study and describes the methodology of the study. The fourth part presents the empirical findings, while the fifth part includes the discussions and conclusions reached in this study.

2. LITERATURE REVIEW

Although there are many empirical studies in the literature, which have been observed to intensify especially in the recent period, about the impacts of the oil prices on the stock yields and indices, the researches about their impacts on the sub-industrial indices are rather limited. The researches made on the Istanbul Stock Exchange (ISE), however, examine generally the impacts of the oil prices on the stock yields, together with other macroeconomic factors, but there is no study based on solely the oil prices.

With regard to the impacts of the oil prices on the stock indices, Billmeier and Massa (2009) have made an empirical study covering 17 countries and selected these countries from among the oil exporter Middle Eastern countries and the oil importer Central Asian countries. In their study, they have indicated that the increase in the oil prices have had positive impact on the stock yields of the exporter countries but negative impact on the stocks of the importer countries. Chiou et al. (2008) have found out the existence of the asymmetric relationship of the negative shocks in their study covering the period of 1992:01-2006:10 and based on the long-run relationship between daily S&P 500 stock yields and daily West Texas Intermediate (WTI) oil prices, and concluded that the impact of the oil prices on the economic activity is high whereas the sensitivity of the oil prices to the economic activity is weak. Among the studies giving the similar conclusions, the empirical studies by Gisser and Goodwin (1986), Papapetrou (2001), Kaneko and Lee (1995), Amoateng and Kargar (2004), Hayo and Kutan (2005), Basher and Sadorsky (2006), Goriaev and Zabotkin (2006), Malik and Hammoudeh (2007) can be listed. In their empirical study where they have examined the impacts of the oil prices on the macroeconomic variables of the oil importer and oil exporter countries, Lescaroux and Mignon (2008) have indicated that the change in the oil prices have had important impacts on the stock yields and the other macroeconomic variables in both the short run and the long run. Huang and Guo (2008) and Hondroyiannis and Papapetrou (2001) have made studies confirming these conclusions.

On the contrary, there are also arguments suggesting that the oil prices have no impact. Chen et al. (1986) have suggested that there is no evidence indicating that the oil prices risk is priced by the stock markets, and Huang et al. (1996) have suggested that the oil price shocks do not have impacts on the whole economy. Sadorsky (1999) has stated that there is no evidence indicating that the shocks caused by the volatility of the oil prices have an asymmetric impact on the economy.

The studies examining the impacts of the oil prices on the sub-industrial indices are rather limited in number. In one of them, the research where Kwon et al. (1997) have examined the impacts of 4 macroeconomic variables on the Korean stock market using the regression models, they have suggested that the sensitivity of the Korean stock market to the variables is higher than the US and the Japanese markets; that the oil prices have significant level of impact on the industrial indices; that the impact on the Fishing Industry Index and the Food and Beverage Index is positive, whereas the impact on the Fabricated Metal Products, Machinery and Equipment Index, the Wholesale Trade Index, and the Transport and Storage Industries Index is negative. Faff and Brailsford (1999) have provided empirical evidences indicating that the increase in the oil prices has had statistically significant impacts on the sub-industrial indices; and that the said impacts are positive on the Oil and Gas and Diversified Resource industries, but negative on the Paper and Packaging and Transportation industries. Contrary to his previous study (1999), Sadorsky (2003) has defended that some macroeconomic variables and the oil prices have significant impacts on the stock yields of the technology firms. In their study based on the period of 1970-1979 when the oil prices have increased rapidly, Hilliard and Danielsen (1984) have subjected the risk-adjusted yields of the stocks of 4 big oil companies and 4 big automobile companies in the US to cross-spectral and regression analysis test, and concluded that the oil prices have had a considerable level impact on the shareholders' welfare in this period, and that the yields of the oil firms have been in rise compared to the automobile firms. In their empirical study where they have examined 35 DataStream global industry indices for the period of 1983:04-2005:09, Nandha and Faff (2008) have indicated that the increase in the oil prices have had negative impacts on the stock yields of all the other sectors including the food, beverages, chemicals, textile, electricity and electrical equipment, transport, and information and communication industries, whereas only on the mining, and oil and gas industries this impact was positive. Hammoudeh and Li (2004) have suggested that the oil price increases have had positive impacts on the US, Mexico, and Norway oil and transportation industries stock yields; while Boyer and Filion (2007) have found out the similar impact for the Canadian oil and gas stock returns. El-Sharif et al. (2005) have made a study supporting these conclusions for the UK as well, and expressed additionally that the sensitivity of the stock yields of the non-oil and gas sectors to oil prices is weak. It is also possible to find a similar conclusion in the empirical study by Osmundsen et al. (2007) including the oil and gas companies.

Among the researches covering ISE, there are three studies examining the impacts of the oil prices. The study by Türsoy et al. (2008) based on the monthly data covers the period of 2001.02-2005:09, and examines the impacts of 13 macroeconomic variables on 11 industry portfolios through the ordinary least square (OLS) technique. The study reveals that there is a negative and significant relation between the crude oil price and the sub-industrial returns. Kandir (2008) has tested the impacts of 6 macroeconomic variables on the yields of the ISE-listed non-financial firms using a multiple regression model for the period of 1997:07-2005:06 and concluded that, in contrast to the other variables, the industrial production, the money supply, and the oil prices do not have any significant impact on the stock yields. In his study regarding the ISEN 100 price index, Özdemir (2008) has considered the oil price shocks in addition to the other macroeconomic factors and suggested that the market has the weak-form efficiency feature.

3.1. Data Description

In our study, the period of 2000:01-2008:12 has been examined. The dollar-based daily closing barrel price of the Brent type cure oil prices in this period have been used and the required data have been acquired from www.inflationdata.com /inflation/inflation_rate /Historical_Oil_Prices.asp (access date: 11.03.2009). The daily closing values of the composite index and 18 industrial, service, and technology sector indices within the scope of ISE in the research period have been obtained from CEIC Data Manager (www.ceicdata.com). Each time series includes 2,188 data. For the tests to process the data, the eviews (5.1) package software has been used.

3.2. Methodology

There are 28 indices to measure and monitor the price movements of ISE. Four of them are general indices. The industrial indices, on the other hand, are separated into 4 main indices. Under the Industrials main index, 7 sub-industries are monitored, whereas this figure is 6 for the Services main index, 5 for the Financials main index, and 2 for the Technology main index.

The general indices ISE 100, ISE 50, ISE 30, the Financials industrial index, and 5 sub-industrial indices under this index are excluded from our study as they are in the position of financial intermediary. Nineteen indices constituting the subject of our research are shown in Table: 1.

Table 1: ISE Industrial Indices (2000:01-2008:12)

INDICES	CODES	INDICES	CODES
1. Composite	**COM**	11.Electricity(1)	ELE
2. Industrials	**IND**	12.Transportation	TRA
3. Food and Beverage	FOO	13.Tourism	TOU
4. Textile and Leather	TEX	14.Wholesale and Retail Trade	WRT
5. Wood, Paper and Printing	WOO	15.Telecommunication(2)	TEL
6. Chemical, Petroleum and Plastics	CHE	16. Sports(3)	SPO
7. Non Metal Mineral Products	NMP	**17.Technology(4)**	**TEC**
8. Basic Metal	BMT	18.Information Technology(4)	ITE
9. Metal Products and Machinery	MPM	19.Defense(4)	DEF
10.Services	**SER**		

(1) From 01.19, 2000.
(2) From 07.25, 2000.
(3) From 04.01, 2004.
(4) From 11.08, 2000.

The study tries to find out whether the daily change in the crude oil prices has any impact on the daily industrial indices and measure the degree of the impact of the oil price change on the industry indices. Thus, it is targeted to determine the sensitivity degrees of the industry indices defining the yield change of a portfolio composed of the groups of firms operating in the similar area to the changes in the oil prices.

In this context, the stationarity of the level values of the time series composed of the oil price and each index has been tested with the unit root test, and the long-term balance relations have been examined with the Engle-Granger cointegration analysis. Finally, the Engle-Granger error correction mechanism model of the error correction term has been estimated to ensure the stability of the model.

4.1. Testing the Stationarity of the Time Series with the Unit Root Test

The relation between two time series may be nonstationary due to trend. Since their averages, variances, and covariances change time-dependently in general, i.e. they have heteroscedasticity, the financial time series and especially the long-term stock indices are not stationary (Engle and Yoo, 1987). Since they tend to display left-side skewness and leptokurtosis, they have such problems as fat-tail and white noise as well as the feature of paretian distribution based on non-linear relation. The stationary series is the series that shows normal distribution, the average and variance values of which are constant, and the covariance of which is independent of time but likely to be dependent of time range (Enders and Granger, 1998).

A common stochastic trend between the stationary time series of the same degree indicates that there is cointegration between these series, and this situation indicates that the regression between two series is not spurious (Pippenger and Goering, 1993). It is possible to find out whether two time series are stationary to the same degree by applying the unit root test.

In this context, the Augmented Dickey-Fuller (ADF) test has been used to test first the stationary of the long-run time series composed of the daily crude oil prices and the industrial stock indexes. The optimal delay length (p) in application of the ADF test has been set using the Schwarz Information Criterion (SIC) as it gives more unbiased results in comparison to the other information criteria such as Akaike, Hannan-Quinn. Upon having found out that the series are not stationary, they have been made lognormal by taking their first-degree differences [$\ln(P_t) - \ln(P_{t-1})$] to stabilize their averages and variances, and subjected to the unit root test again. As also seen in the Table: 2, it has been concluded that the variables are first-degree stationary, *I*(1).

Table 2: Stationarity Test Results of the Series

VARIABLES	CRITICAL VALUES	PROBABILITY*	LAG LENGTH
$lOIL_t$ *I*(1)	-47.23806	0.0001	0
$lCOM_t$ *I*(1)	-46.53913	0.0001	0
$lIND_t$ *I*(1)	-46.42073	0.0001	0
$lFOO_t$ *I*(1)	-30.36272	0.0000	2
$lTEX_t$ *I*(1)	-44.70230	0.0001	0
$lWOO_t$ *I*(1)	-45.58678	0.0001	0
$lCHE_t$ *I*(1)	-48.31292	0.0001	0
$lNMP_t$ *I*(1)	-45.39068	0.0001	0
$lBMT_t$ *I*(1)	-47.13001	0.0001	0
$lMPM_t$ *I*(1)	-45.57430	0.0001	0
$lSER_t$ *I*(1)	-46.87128	0.0001	0
$lELE_t$ *I*(1)	-45.63945	0.0001	0
$lTRA_t$ *I*(1)	-30.87623	0.0000	1
$lTOU_t$ *I*(1)	-43.58959	0.0000	0
$lWRT_t$ *I*(1)	-46.84257	0.0001	0
$lTEL_t$ *I*(1)	-45.95119	0.0001	0
$lSPO_t$ *I*(1)	-18.93696	0.0000	2
$lTEC_t$ *I*(1)	-42.64855	0.0000	0
$lITE_t$ *I*(1)	-42.70964	0.0000	0
$lDEF_t$ *I*(1)	-43.19309	0.0000	0

* MacKinnon (1996) one-sided p-values

The formula of the ADF test equation used in the study is as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha\ i\ Y_{t-i} \sum_{i=1}^{p} \Delta Y_{t-i} + \varepsilon_t$$

where

Y_t = the normalized cointegrator vector of the industrial stock index series,
$\Delta Y_t = Y_t - Y_{t-1}$,
t = trend variable,
ε_t = stochastic disturbance term, and
i = 1,2,3,…., p.

For ε_t error term, it has supposed that

$E(\varepsilon_t) = 0$,
$\sigma^2(\varepsilon_t) = \sigma^2 \varepsilon_{t,}$
$\sigma(\varepsilon_t, \varepsilon_{t-s}) = 0$, and
$s \neq 0$

4.2. Cointegration Analysis

In order to apply the tests developed by Engle and Granger (1987), Johansen (1988a), Johansen (1991b), Johansen (1995c), and Johansen and Juselius (1990) to test the long-run cointegration relation and used in the literature widely, all the time series must be stationary at the same degree; otherwise it is not possible to search for the cointegration relation. After confirming that the time series are stationary, the long-run balance relations become analyzable.

With this approach, the level values of the variables in model have been taken, the regression between them ($\ln INDICES_t = \alpha_0 + \alpha_1 \ln OIL_t + u_t$) has been estimated using the Least Squares Method (LSM). The estimation results are shown in the Table: 3.

Table 3: Regression Equations of the Variables

ln**COM** $_t$ = 5.87810 + 1.077789 lnOIL $_t$ + u_t (146.8948)[1] (101.8657)[2]	lnELE $_t$ = 6.674215 + 0.256591 lnOIL $_t$ + u_t (229.1056) (33.29776)
ln**IND** $_t$ = 5.979587 + 1.009299 lnOIL $_t$ + u_t (165.7735) (105.7119)	lnTRA $_t$ = 7.354047 + 0.460181 lnOIL $_t$ + u_t (217.1376) (51.33313)
lnFOO $_t$ = 5.971690 + 1.069527 lnOIL $_t$ + u_t (141.2277) (95.55957)	lnTOU $_t$ = 5.218687 + 0.852008 lnOIL $_t$ + u_t (79.91176) (49.28933)
lnTEX $_t$ = 7.466719 + 0.271181 lnOIL $_t$ + u_t (242.3598) (33.25444)	lnWRT $_t$ = 6.236118 + 0.930455 lnOIL $_t$ + u_t (161.6580) (91.12516)
lnWOO $_t$ = 6.213554 + 0.938374 lnOIL $_t$ + u_t (121.6822) (69.42614)	lnTEL $_t$ = 4.925907 + 1.152808 lnOIL $_t$ + u_t (105.1764) (93.72027)
lnCHE $_t$ = 6.486185 + 0.817083 lnOIL $_t$ + u_t (210.5705) (100.2154)	lnSPO $_t$ = 6.676721 + 0.907181 lnOIL $_t$ + u_t (95.38837) (53.96924)
lnNMP $_t$ = 5.406843 + 1.225927 lnOIL $_t$ + u_t (99.02769) (84.82765)	ln**TEC** $_t$ = 8.123352 + 0.236930 lnOIL $_t$ + u_t (188.6584) (21.02588)
lnBMT $_t$ = 3.619031 + 1.612805 lnOIL $_t$ + u_t (72.985530) (122.8810)	lnITE $_t$ = 9.035838 – 0.075712 lnOIL $_t$ + u_t (197.1263) (-6.311479)
lnMPM $_t$ = 7.212035 + 0.725726 lnOIL $_t$ + u_t (154.8388) (58.86462)	lnDEF $_t$ = 5.784925 + 1.036849 lnOIL $_t$ + u_t (81.63405) (55.90906)
ln**SER** $_t$ = 5.837694 + 0.964584 lnOIL $_t$ + u_t (141.9414) (88.60691)	

1) lnOIL Coefficient 2) lnOIL t-Statistic

In order to find out the existence of the cointegration between the time series, on the other hand, the estimated stochastic disturbance terms of the equation constituting the model (u_t) must be subjected to the unit root test. At this point, if the model created with the minimum delay number (p) selected includes autocorrelation problem, it is necessary to take the second minimum delay number [AR(1)], and if the autocorrelation problem of the model is still continuing, this process must be continued by increasing the delay number [AR(p)] until the autocorrelation problem is solved.

Discovering that the regression residuals do not include the unit root indicates the existence of co-integration between the time series.

In this part of our study, the Augmented Dickey-Fuller (ADF) test has been used to test the regression residuals. As the function of the error correction mechanism, the following formula has been used:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 u_{t-1} + \varepsilon_t$$

And the Schwarz Information Criterion (SIC) has been preferred to set the optimal delay length.

It has been tested with the ADF test whether the regression residuals include unit root, and the acquired results are shown in the Table: 4.

Table 4: Estimation Results of the Regression Residuals

VARIABLES	u_t CRITICAL VALUES	PROBABILITY	LAG LENGTH	RESULTS
ln**COM**/1hpvf	-3.290593	0.0155	0	Cointegrated
ln**IND**/1hpvf	-3.437553	0.0099	0	Cointegrated
lnFOO/1hpvf	-3.052057	0.0305	0	Cointegrated
lnTEX/1hpvf	-2.977409	0.0372	0	Cointegrated
lnWOO/1hpvf	-2.621225	0.0888	0	Not Cointegrated
lnCHE/1hpvf	-4.148966	0.0008	0	Cointegrated
lnNMP/1hpvf	-2.436812	0.1317	0	Not Cointegrated
lnBMT/1hpvf	-3.224140	0.0188	0	Cointegrated
lnMPM/1hpvf	-2.408360	0.1395	0	Not Cointegrated
ln**SER**/1hpvf	-2.930928	0.0420	0	Cointegrated
lnELE/1hpvf	-4.847819	0.0000	0	Cointegrated
lnTRA/1hpvf	-3.559674	0.0067	0	Cointegrated
lnTOU/1hpvf	-2.500523	0.1154	0	Not Cointegrated
lnWRT/1hpvf	-3.065622	0.0294	0	Cointegrated
lnTEL/1hpvf	-3.563150	0.0066	0	Cointegrated
lnSPO/1hpvf	-0.334690	0.9172	0	Not Cointegrated
ln**TEC**/1hpvf	-2.860276	0.0503	0	Cointegrated
lnITE/1hpvf	-2.784155	0.0607	0	Not Cointegrated
lnDEF/1hpvf	-2.347497	0.1572	0	Not Cointegrated

As also seen in the Table: 4, it is understood that 12 indices or variables except the Wood, Paper and Printing (WOO), Non Metal Mineral Products (NMP), Metal Products and Machinery (MPM), Tourism (TOU), Sports (SPO), Information Technology (ITE), and Defence (DEF) are cointegrated with the crude oil barrel prices (α (5%) > prob.).

For the non-cointegrated indices, their first-degree differences have been used, and the regression equations [$\text{lnindices}_t = b_0 + b_1 \text{ lnoil}_t + b_2 \text{ AR}(1) + u_t$] acquired with the regression residuals are given in the Table: 5.

Table 5: Regression Estimation Results

Indice	Variable	Coefficient	t-Statistic	Prob.	Indice	Variable	Coefficient	t-Statistic	Prob.
COM	C	9.986241	16.70130	0.0000	ELE	C	7.256081	70.39257	0.0000
	lnOIL	0.050151	2.298792	0.0216		lnOIL	0.093135	3.794454	0.0002
	AR(1)	0.998959	1029.815	0.0000		AR(1)	0.986725	0.003239	0.0000
IND	C	9.844944	20.45352	0.0000	TRA	C	9.104097	53.64447	0.0000
	lnOIL	0.045875	2.310474	0.0210		lnOIL	-0.004042	-0.161716	0.8715
	AR(1)	0.998811	1053.348	0.0000		AR(1)	0.995473	490.4283	0.0000
FOO	C	10.30078	19.84441	0.0000	TOU1	C	0.010155	1.636006	0.1020
	lnOIL	0.027105	1.222623	0.2216		lnOIL1	-0.002710	-1.649728	0.0991
	AR(1)	0.998629	1036.028	0.0000		AR(1)	0.997679	682.0004	0.0000
TEX	C	8.311818	69.68273	0.0000	WRT	C	9.796642	17.49337	0.0000
	lnOIL	0.043562	2.050750	0.0404		lnOIL	0.039774	1.832197	0.0671
	AR(1)	0.993924	407.8585	0.0000		AR(1)	0.998902	916.8304	0.0000
WOO1	C	0.000282	0.482829	0.6293	TEL	C	9.264380	15.16323	0.0000
	lnOIL1	0.065570	2.871749	0.0041		lnOIL	0.044353	1.433115	0.1520
	AR(1)	0.998401	927.1943	0.0000		AR(1)	0.998644	796.7575	0.0000
CHE	C	9.407758	29.87997	0.0000	SPO1	C	0.000765	1.392922	0.1639
	lnOIL	0.046315	2.080320	0.0376		lnOIL1	0.080969	3.677867	0.0002
	AR(1)	0.998116	0.001313	0.0000		AR(1)	0.998236	610.3191	0.0000
	C	0,000422	0.927929	0.3535		C	8.677855	59.31840	0.0000

NMP1	lnOIL1	0.036527	2.052618	0.0402	**TEC**	lnOIL	0.063472	2.560076	0.0105
	AR(1)	0.999281	1513.614	0.0000		AR(1)	0.994246	429.3131	0.0000
BMT	C	10.35794	6.745830	0.0000	ITE1	C	-0.000837	-1.338283	0.1810
	lnOIL	0.060824	2.354304	0.0186		lnOIL1	0.043894	1.768291	0.0772
	AR(1)	0.999357	1272.748	0.0000		AR(1)	0.993580	443.5091	0.0000
MPM1	C	-4.42E-05	-0.075685	0.9237	DEF1	C	0.000123	0.143843	0.8856
	lnOIL1	0.051630	2.263190	0.0225		lnOIL1	0.100962	2.985064	0.0029
	AR(1)	0.998243	761.8581	0.0000		AR(1)	0.998172	745.1131	0.0000
SER	**C**	9.540630	14.32872	0.0000					
	lnOIL	0.042119	0.021589	0.0512					
	AR(1)	0.999076	0.001039	0.0000					

It is seen that the regression estimation results are insignificant for FOO, TRA, TOU, and TEL indices.

Since the model has had autocorrelation problem for all indices, the second minimum delay number [AR(1)] has been used and it has been seen that the autocorrelation problem has been solved without any need to continue the process.

5. DISCUSSIONS AND CONCLUSIONS

Our study examining the relation between 19 stock daily return indices monitored under Istanbul Stock Exchange (ISE) representing Turkey and the stock market in Turkey and the daily oil prices indicates that 1% change in the oil prices leads to 050151% in the Composite Index representing all stock yields (Table: 6). This result that indicates the positive correlation means that the change in the oil prices has rather important impact on ISE.

Table 6: Interaction Sorting on the basis of Main and Sub-Indices

Indices	Changes	Indices	Changes	Indices	Changes	Indices	Changes
COM	0,050151	**IND**	0,045875	**SER**	0,042119	**TEC**	0,063472
1.**TEC**	0,063472	1.WOO	0,065570	1.ELE	0,093135	1.DEF	0,100962
2.**IND**	0,045875	2.BMT	0,060824	2.SPO	0,080969	2.ITE	0,043894
3.**SER**	0,042119	3.MPM	0,051630	3.TEL	0,044353		
		4.CHE	0,046315	4.WRT	0,039774		
		5.TEX	0,043562	5.TRA	-0,004042		
		6.NMP	0,036527	6.TOU	-0,002710		
		7.FOO	0,027105				

In fact, it must be expected that the relation must be adverse from the point of view of Turkey that is the net oil importer and importing almost 90% of her annual oil need. However, the strategy of overvalued Turkish Lira supported with the high real interest anchor Turkey has been using as an anti-inflationist policy tool since the year 2002 restricts the impact of the increase in the oil prices. Besides, that an important part of the country's export is made to the net oil exporter Middle Eastern and Caucasian countries as well as Russia leverages the increase in export together with the oil prices.

It is understood that, among three industrial indices constituting the composite index except finance, the one that is the most sensitive to oil is the technology index, and that 1% increase in the oil prices leads to 063472% increase in the technology index. This index is followed by the industry index (045875%) and the service index (042119%). This must be regarded as a reasonable sorting, because the contribution of the technology producer firms to local and global growth and development and their growth acceleration do not have the production and demand elasticity that may be affected negatively by a single factor such as the oil prices. That the services yield index is the least-affected industrial branch is a natural result of the fact that this sector is a sector auxiliary to and dependent on the other two main sectors.

Among the sub-indices under the industrial index, the Wood, Paper and Printing (WOO), and Basic Metal (BMT) indices where the oil is used as an important input show the highest level of interaction with the change in the oil prices. The lowest level of interaction, on the hand, has occurred in the Non Metal Mineral Products (NMP) and Food and Beverage (FOO) indices.

The highest level of interaction in the sub-indices of the services main index has occurred in the Electricity (ELE) and Sports (SPO) indices. The correlation of the Transportation (TRA) and Tourism (TOU) indices with the oil prices are, and the adverse interaction is seen in these two indices only.

In the technology main index, however, the interaction degree of the Defence (DEF) index is higher compared to the Information Technology (ITE) index.

Table 7: General Interaction Sorting

Indices	Changes	Indices	Changes	Indices	Changes	Indices	Changes
1.DEF	0.100962	6.BMT	0.060824	11.TEL	0.044353	16.NMP	0.036527
2.ELE	0.093135	7.MPM	0.051630	12.ITE	0.043894	17.FOO	0.027105
3.SPO	0.080969	8.**COM**	0.050151	13.TEX	0.043562	18.TRA	-0.004042
4.WOO	0.065570	9.CHE	0.046315	14.**SER**	0.042119	19.TOU	-0.002710
5.**TEC**	0.063472	10.**IND**	0.045875	15.WRT	0.039774		

The Table: 7, on the other hand, shows the general sorting of 19 indices used in our study. It is understood from the table that the Defence (DEF) and Electricity (ELE) daily return indices are affected maximally by the daily change in the oil prices, whereas the Non Metal Products (NMP) and Food and Beverage (FOO) index returns are affected minimally. Between the oil prices and the Transportation (TRA) and Tourism (TOU) index returns, however, there is an adverse interaction.

REFERENCES

Amoateng, K.A. and Kargar, J. (2004) Oil and Currency Factors in Middle East Equity Returns, Managerial Finance, Vol. 30, Issue: 3, pp.3-16.

Basher, S.A. and Sadorsky, P. (2006) Oil Price Risk and Emerging Stock Markets, Global Finance Journal, Vol: 17, Issue:2, pp.224-235.

Billmeier, A., and Massa, I. (2009) What Drives Stock market Development in Emerging Markets-Institutions, Remittances, or Natural Resources?, Emerging Markets review, Issue: 10, pp.23-35.

Boyer, M.M. and Filion, D. (2007) Common and Fundamental Factors in Stock returns of Canadian Oil and Gas Companies, Energy Economics, Vol. 29, No:3, pp.428-453.

Chen, N.F., Roll, R. and Ross, S.A. (1986) Economic Forces and the Stock Market, Journal of Business, No: 59, pp.383-403.

Chiou, J.S., Lee, Y.H. and Lin, C.M. (2008) Existence of a Long-Run Equilibrium Between the S&P 500 and Oil Prices, International Research Journal of Finance and Economics, Issue: 21, pp.68-75.

El-Sharif, I., Brown, D., Burton, B., Nixon, B. and Russel, A. (2005) Evidence on the Nature and Extent of the Relationship Between Oil Prices and Equity Values in the UK, Energy Economics, Vol. 27, No: 6, pp.819-830.

Enders, W. and Granger, C.W.F. (1998) Unit-Root Tests and Asymmetric Adjustment with an Example Using the Term Structure of Interest Rates, Journal of Business Economics & Statistics, Issue: 16, pp.304-311.

Engle, R.F. and Granger, C.W.J. (1987) Co-integration and Error Correction: Representation, Estimation and Testing, Econometrica, Vol. 55, No: 2, pp.251-276.
Engle, R.F. and Yoo, B.S. (1987) Forecasting and Testing in Cointegrated System, Journal of Econometrics, Issue: 35, pp.143-159.
Faff, R.W. and Brailsford, T.J. (1999) Oil Price Risk and The Australian Stock Market, Journal of Energy Finance and Development, No: 4, pp.69-87.
Gisser, M. and Goodwin T.H. (1986) Crude Oil and the Macroeconomy: Tests of Some Popular Notions, Journal of Money, Credit and Banking, Issue:18, pp.95-103.
Goriaev, A. and Zabotkin, A. (2006) Risks of Investing in the Russian Stock Market: Lesson of the First Decade, Emerging Market Review, Vol. 7, Issue: 4, pp.380-392.
Guidi, M., Russell, A. and Tarbert, H. (2006) The Effect of OPEC Policy Decisions on Oil and Stock Prices, OPEC Review, Issue: 30, pp.1-18.
Hamilton, J.D. (1983) Oil and the Macroeconomy Since World War II, Journal of Political Economy, Issue: 91, pp.228-248.
Hammoudeh, S. and Li, H. (2004) Risk-return Relationships in Oil-sensitive Stock Markets, Finance Letters, Vol. 2, No: 3, pp.10-15.
Hayo, B. and Kutan, A.M. (2005) The Impact of News, Oil Prices, and Global Market developments on Russian Financial Markets, The Economics of Transition, Vol. 13, Issue: 2, pp.373-385.
Hilliard, J.E. and Danielsen, A.L. (1984) World Oil Prices and Equity Returns of Major Oil and Auto Companies, Resources and Energy, Vol. 6, Issue: 3, pp.259-275.
Hondroyiannis, G. and Papapetrou, E. (2001) Macroeconomic Influences on the Stock Market, Journal of Economics and Finance, Vol. 25, Issue: 1, pp.33-49.
Huang, Y. and Guo, F. (2008) Macro Shocks and the Japanese Stock Market, Applied Financial Economics, Vol. 18, Issue:17, pp.1391-1402.
Huang, R.D., Masulis, R.W. and Stoll, H.R. (1996)Energy Shocks and Financial Markets, Journal of Futures Markets, Issue: 16, pp.1-27.
Johansen, S. (1988a) Statistical Analysis of Cointegration Vectors, Journal of Economic Dynamics and Control, Issue: 12, pp.231-254.
Johansen, S. (1991b) Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models, Econometrica, Issue: 59, pp.1551-1580.
Johansen, S. (1995c) Likelihood-based Interference in Cointegration Vectors Autoregressive Models, Oxford University Press.
Johansen, S. and Juselius, K. (1990) Maximum Likelihood Estimation and Inference on Cointegration: With Application to the Demand for Money, Oxford Bulletin of Economics and Statistics, Issue: 2, pp.169-210.
Jones, C.M. and Kaul, G. (1996) Oil and the Stock Markets, The International Finance, Vol. LI, No: 2, pp.463-491.
Kandir, S.Y. (2008) Macroeconomic Variables, Firm Characteristics and Stock Returns: Evidence from Turkey, International Research Journal of Finance and Economics, Issue:16, pp.35-45.
Kanoke, T. and Lee, B.S. (1995) Relative Importance of Economic-Factors in the US and Japanese Stock Markets, Journal of the Japanese and International Economies, Vol. 9, Issue: 3, pp.290-307.
Kwon, C.S., Shin, T.S. and Bacon, F.W. (1997) The Effect of Macroeconomic Variables on Stock Market Returns in Developing Markets, Multinational Business Review, Vol. 5, Issue. 2, pp.63-70.
Lescaroux, F. and Mignon, V. (2008) On the Influence of Oil Prices on Economic Activity and Other Macroeconomic and Financial Variables, OPEC Review, Vol. 32, Issue:4, pp.343-356.
Malik, F. And Hammoudeh, S. (2007) Shock and Volatility Transmission in the Oil, US and Gulf Equity Markets, International Review of Economics & Finance, Vol. 16, Issue: 3, pp.357-369.
Mork, K.A. (1989) Oil and the Macroeconomy When Prices Go Up and Down: An Extension of Hamilton’s Results, Journal of Political Economy, Issue: 97, pp.740-744.
Mork, K.A., Olsen Q. and Mysen, H.T. (1994) Macroeconomic Responses to Oil Price Increases and Decreases in Seven OECD Countries, Energy Journal, Vol. 15, No: 4, pp.19-35.
Mory, J.F. (1993) Oil Prices and Economic Activity: Is the Relationship Symmetric?, Energy Journal, Vol. 14, No: 4, pp.151-161.
Nandha, M. and Faff, R. (2008) Does Oil Move Equity Prices? A Global View, Energy Economics, Issue: 30, pp.986-997.
Osmundsen, P., Mohn, K., Misund, B. And Asche, F. (2007) Is Oil Supply Chocked by Financial Market Pressures?, Energy Policy, Vol. 35, Issue: 1, pp.467-478.
Özdemir, Z.A. (2008) Efficient Market Hypothesis: Evidence from a Small Open-economy, Applied Economics, Vol. 40, No: 5, pp.633-641.
Papapetrou, E. (2001) Oil Prices Shocks, Stock Market, Economic Activity and Employment in Greece, Energy Economics, Issue: 23, pp.511-532.

Pippenger, M. and Goering, G. (1993) A Note on the Empirical Power of Unit Root Tests under Threshold Processes, Oxford Bulletin of Economics and Statistics, Vol. 55, Issue: 4, pp.473-481.
Sadorsky, P. (1999) Oil Price Shocks and Stock Market Activity, Energy Economics, Vo. 21, Issue: 5, pp.449-463.
Sadorsky, P. (2003) The Macroeconomic Determinants of Technology Stock Price Volatility, Review of Financial Economics, Vol. 12, pp.191-205.
Türsoy, T., Günsel, N. and Rjoub, H. (2008) Macroeconomic Factors, the APT and the Istanbul Stock Market, International Research Journal of Finance and Economics, Issue: 22, pp.49-57.

ANNEX 1: Data on the Autocorrelation Problem of the Model
(Breusch-Godfrey Serial Correlation LM Test)

Indice	F Statistic	Prob.F	Obs*R-squared	Prob.Chi-Square(250)	Indice	F Statistic	Prob.F	Obs*R-squared	Prob.Chi-Square(250)
COM	385.9606	0.000000	2144.901	0.000000	ELE	247.9603	0.000000	2112.370	0.000000
IND	371.5551	0.000000	2143.328	0.000000	TRA	376.8673	0.000000	2143.945	0.000000
FOO	407.6695	0.000000	2147.212	0.000000	TOU	762.7709	0.000000	2166.010	0.000000
TEX	479.5823	0.000000	2153.231	0.000000	WRT	396.6850	0.000000	2146.104	0.000000
WOO	697.1255	0.000000	2163.962	0.000000	TEL	266.3637	0.000000	1997.048	0.000000
CHE	276.4517	0.000000	2128.380	0.000000	SPO	203.5746	0.000000	1135.825	0.000000
NMP	725.2885	0.000000	2164.885	0.000000	**TEC**	508.6432	0.000000	1949.568	0.000000
BMT	322.8698	0.000000	2136.750	0.000000	ITE	487.0696	0.000000	1948.414	0.000000
MPM	705.0665	0.000000	2164.229	0.000000	DEF	699.6250	0.000000	1956.713	0.000000
SER	426.2221	0.000000	2148.956	0.000000					

ANNEX 2: Data after Solution [AR(p)] of the Autocorrelation Problem
(Breusch-Godfrey Serial Correlation LM Test)

Indice	F Statistic	Prob.F	Obs*R-squared	Prob.Chi-Square(250)	Indice	F Statistic	Prob.F	Obs*R-squared	Prob.Chi-Square(250)
COM	0.988955	0.536733	247.8917	0.525797	ELE	1.206377	0.020425	295.0092	0.056633
IND	0.954525	0.678004	240.2094	0.660483	TRA	1.100533	0.148155	272.3766	0.158189
FOO	1.078325	0.204619	267.5528	0.212731	TOU	1.109325	0.129189	274.2798	0.139598
TEX	1.293384	0.002395	313.2694	0.054024	WRT	1.098696	0.152355	271.9786	0.162285
WOO	0.973988	0.599407	244.5597	0.585198	TEL	1.159378	0.054616	284.7272	0.064767
CHE	0.977171	0.586175	245.2694	0.572618	SPO	1.180228	0.046196	284.6906	0.064957
NMP	1.128703	0.093806	278.4609	0.104371	**TEC**	1.210284	0.019473	295.1627	0.056256
BMT	0.965890	0.632673	242.7519	0.616933	ITE	1.146542	0.069914	281.8358	0.081215
MPM	1.041392	0.325196	259.4762	0.326977	DEF	0.967549	0.625245	243.2561	0.608137
SER	1.170827	0.042989	287.4871	0.051679					