

A Study on the Effect of Oil Price Variations on Stock Returns under Environmental Uncertainty (Sales)

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Abstract

Oil is a commodity considered the most important export product in many countries, playing a key role in the economies. That is why oil price variations can have direct effects on economic sectors. Uncertainty caused by unpredictable oil prices can have a huge impact on the economic body. The main purpose of this study was to find the relationship between oil price variations on stock returns under environmental uncertainty during 2005-2014. The effect of environmental uncertainty on the relationship between oil price variations and stock returns were examined. The regression method and EVIWSE9 were used to evaluate the hypothesis. The results of regression showed that uncertainty, i.e. sales fluctuation at confidence level of 95% did not have a significant effect on the relationship between oil price variations and stock return.

Keywords: oil prices variations, stock return, environmental uncertainty, sales

1. Introduction

Proceeds from the oil sales in the exporting countries play a major role in increasing the general prosperity of the nations. Such proceeds are a component of the country's national income and could be used through domestic investment and foreign investment over economic development (Mehrara and Haeri, 2008, p. 12). Holding 11 percent of global oil reserves, Iran is considered one of the largest oil-rich countries. In fact, revenues from the production and sale of oil have tremendously affected the performance and efficiency of the entire economy. Therefore, oil revenues play a strategic role in the structure of the Iranian economy. On the other hand, Iran as the second-largest producer among OPEC oil-exporting countries and a major supplier of oil in the global energy market can influence the global oil market and be influenced by it (Central Bank economic indicators, fourth quarter of 2008). In this situation, any shock to the oil market could affect economic structure from different

channels. This study sought to answer the question: could the sales volatility significant affect the relationship between oil price variations and stock returns?

In this study, the theoretical background was explored following the introduction. The third section reviewed a few relevant studies in Iran abroad. The fourth section proposed the theoretical model. The fifth section used the quarterly data during 2005-2014, examining the effect of oil price variations on stock returns under environmental uncertainty (sales). The sixth provided the summary and conclusions.

2. Theoretical background

Uncertainty is one of the dimensions of the external environment arising from three scenarios: 1) lack of information on the environmental factors associated with the decision situation, 2) inability to determine the likelihood with any degree of certainty about how environmental factors affect the success or failure of organizations. 3) lack of information about the costs associated with a decision or improper activity (Duncan 313: 1972).

Douglas Hubbard defined uncertainty as lack of confidence when knowledge of individual(s) is limited and full description of the situation or outcome cannot be achieved. Risk is concept close to uncertainty, defined by Hubbard as: A state of lack of confidence where the possible outcomes might result in adverse effects or incur certain losses.

Given the widespread impact of oil price fluctuations on various sectors of the Iranian economy, the effectiveness of the policies hindering the negative effects of oil price volatility on the stock exchange and the reaction of investors who need to understand the exact impact of oil price variations on stock returns, it is critical to gain a good understanding of the impact of oil price fluctuations on the market. The oil market instability will jeopardize planning and long-term policy based on oil revenues.

Hamilton (1983) explored the impact of sharp rise in oil prices since 1973 on the American macroeconomic performance. This study demonstrated that the 1970s recession in the US caused a sudden rise in oil prices. The results of this study led to the sensitivity of many policy-makers about changes in oil prices. Because such oil prices variations were recognized as one of the most important causes of the economic crisis among oil exporting and importing countries. The price of this non-renewable energy have experienced numerous fluctuations over the years. This continuous increase and decrease in oil prices created an atmosphere of uncertainty in the macroeconomic environment.

3. Literature review

Chortareas and Noikokyris (2014) studied the effect of oil supply and demand shocks on the dividend yield of US companies. The relationship between oil price shocks and the dividend yield indicated the impact of a series of factors determining the rising oil prices and assessment of the stock market and transparent information about the price of oil through the mechanism.

Baltachy (2007) believed this research is important for the economy of Iran because the Iranian capital market relies on oil income and insignificant tax income. Hence, it is critical to explore the volatility of stock returns and trading volume and its impact on other variables in the stock market. In the past, the relationship between macroeconomic variables and the stock market attracted the attention of many researchers. However, the difference between this study and previous ones lies in the stock return volatility as an outcome of Stock returns.

Sadorsky (1999) used the monthly data from 1947-1996 under a Vector Autoregressive (VAR) so as to examine the relationship between price and stock market. It was revealed that both oil prices and the volatility of oil prices play a key role in the stock market. Moreover, the petroleum negative shocks affect more than positive shocks in the stock market.

Ebrahimi (2011) evaluated the effects of oil prices on economic growth and financial variables in the Iranian government: The price of oil is one of the variables that affect the economies of all countries (both oil exporting and importing). One aspect of the impact of oil prices is uncertainty. Such uncertainty was extracted by GARCH model. The results of this study revealed that oil prices affect the Iranian economy through the government budget.

Emami, Adibpur (2011): In a study using the LSE methodology, the effect of shock to Iran's oil revenues on GDP was examined. They found that short-term and long-term oil shocks have an asymmetric effect on the production. The effect of shocks is more negative in the short term and positive in the long term.

Nematollahi, Tabatabai (2011): This research explored the effect of OPEC oil price fluctuations on Iran's trade balance. In this way, using a 6-variable model, the long-term and short-term relationships between the variables during 1967-2006 were examined through an autoregressive distributed lag model (ARDL) within the Iranian economy. It was concluded that the OPEC oil price variations over short-term and long-term will have a significantly negative effect on the trade balance.

Heidari et al. (2010) argued that uncertainty refers to a situation where possible events may occur in the future, and it is not clear whether the events are known. The probability of occurrence of these events is not available, and when it comes to such situation it becomes complex and difficult to make decisions about the future. Hence, the atmosphere of uncertainty prevails decisions. Uncertainty refers to a space in which decision-makers and economic agents are not sure about the change direction of variables. Uncertainty arises from various sources, leads to change in methods and decisions of economic agents, which in turn affect their actual activities.

Since the price of and sales rate of oil in such economies is considered to be an exogenous variable whose scope is beyond the national economy and the other economic activities are particularly susceptible to oil shocks, any fluctuation can affect the national economy.

Delavari et al. (2008) adopted the asymmetric integration to examine the long-term relationship between the oil price and Iranian economic growth with quarterly data over the period 1989-2008. The results showed that oil shocks in Iran one of the petroleum exporting

countries can leave an asymmetric effect on economic growth, which means that the fall in oil prices affects the GDP.

Using a simultaneous equations system (1971-1992), Samadi (1999) concluded that increase in oil revenues when there is sensitivity to government expenditure higher than overall government expenditure can improve the GDP and investment.

4. Methodology

This was a descriptive-correlational applied study. The methodology involved post-event using past data. The main purpose was to determine there is a relationship between the variables (changes in oil prices, stock returns, uncertainty (sales)). Moreover, the methodology involved regression analysis. The E-Views was used to test the hypotheses.

Type of variable	Variable	Variable symbol	Calculation procedure
Dependent variable	Stock return	R	$\frac{P_t(1+\alpha+\beta)-(p_{t-1}+c\alpha)+Dir}{P_{t-1}+c\alpha} = Ret$
Independent variable	Market return	R _{mt}	$R_{mt} = \frac{TEDPIX_t - TEDPIX_{t-1}}{TEDPIX_{t-1}}$
Independent variable	Type of industry	ind	Companies within the oil industry are assigned one and other assigned zero.
Independent variable	Oil price variations	Δ Oil	$\frac{[\ln(OP_t) - \ln(OP_{t-1})] \times 100}{OP_t}$ OP:Crude oil price
Control variable	Growth Opportunities	BTM	MVE / BVE book value / market value
Control variable	Company size	Size	The natural logarithm of the total assets of the company
Intervening variable	Environmental uncertainty	D	Uncertainty, sales fluctuations: Products (standard deviation net sales at oil companies)

Calculation of stock return (Return R)

Return= end of period wealth - beginning of period wealth

Beginning of period wealth

Calculation of oil prices variations (Δ oil)

$$\Delta OIL = OIL_t - OIL_{t-1}$$

OIL_t: Current year oil price

OIL_{t-1}: Last year oil price

The crude oil price was obtained based on OPEC oil. It is the price of one barrel of OPEC heavy crude oil in Iran.

Calculation of sales deviation

$$\Delta S = \frac{S_n - S_{n-1}}{S_{n-1}}$$

S_n: Current year sales

S_{n-1}: Last year sales

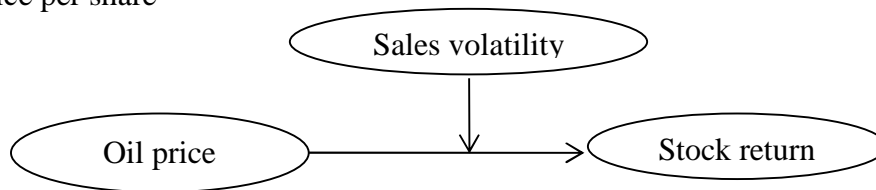
The ratio of book value to market value (BTM):

$$BTM = \frac{N * \text{Nominal price}}{N * \text{Market Price}}$$

Number of shares: N

Nominal price per share

Market price per share



The second hypothesis was tested by dividing the samples companies based on the environmental uncertainty. One group was assigned H, one was assigned L, then the following model was separately tested for each group. Wang’s Z test was used. If the company had high environmental uncertainty, number 1 was assigned. If the company had low environmental uncertainty, number 0 was assigned.

5. Data analysis

Having outlined the methodology, the researcher employed the appropriate tools to collect the data required for testing the hypotheses. At the next stage, the statistical techniques were adopted in accordance with the methodology and type of variables. The data were then classified and analyzed. Finally, the question was answered. In this chapter, the statistical data were analyzed and the research hypotheses were examined through Eviews. Moreover, the descriptive and inferential statistics compatible to the data type and variables were employed. At first, the descriptive measures such as mean, standard deviation etc. were used to prepare the frequency distribution table. The regression was adopted to evaluate the hypotheses. frequency distribution, dispersion indicators markers, standard deviation and variance. The research hypotheses were evaluated through the Pearson's correlation coefficient in SPSS 19.

Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Standard deviation	Skewness	Kurtosis	Number of observations
Growth opportunities	0.626	0.495	4.625	-5.0504	0.575	-0.044	19.910	1020
Sales volatility	0.145	0.100	2.760	0.003	0.173	7.403	99.728	1020
Type of industry	0.078	0	1	0	0.268	3.136	10.835	1020
Oil price variations	1.905	1.932	2.039	1.704	0.115	-0.333	1.651	1020
Market return	0.2516	0.075	1.077	-0.219	0.443	0.581	1.966	1020
Stock return	0.420	0.141	8.201	-0.795	1.001	3.628	21.583	1020

Company size	11.907	11.866	14.520	10.254	0.661	0.549	3.6763	1020
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Sales volatility conditions significantly affect the relationship between oil price variations and stock return

Table (4.11) Regression-Hypothesis

Results	Significance level	T-statistic	Regression coefficient	Independent variables	
Significant	0.0000	-6.910	-0.115	Oil price variations	OIL
Significant	0.0000	-10.960	-0.277	Growth opportunities	BTM
Significant	0.0000	21.447	0.332	Market return	R_M
Insignificance	0.5992	-0.525	-0.046	Type of industry	IND
Insignificance	0.9734	0.0333	0.0009	Company size	SIZE
Insignificance	0.7761	-0.284	-0.007	Sales volatility	D_SALE
Significant	0.0006	-3.421	-0.092	Constant value	C
99.831	F statistic		0.371	Coefficient of determination	
0.000000	Significance level		0.367	Corrected coefficient of determination	
			1.882	Durbin-Watson statistic	

Based on the above table, the variables of oil price variations, growth opportunities and market return had insignificant effects on industry type, company size and sales fluctuations. The sign of regression coefficient determines whether the impact of the independent variable on the dependent variable is positive or negative. According to the sign of regression coefficient, it can be said that changes in oil prices and growth opportunities have negative impact and market return have positive impact on stock returns. Moreover, the constant value of the equation is significant and inserted into the final equation.

According to the table above, the Durbin, Watson showed no autocorrelation problem. According to statistics probability F ($F < 0.05$) the regression equation was overall significant. The adjusted coefficient of determination was 0.367, indicating that 36.7 percent of the changes dependent variable could be explained by the changes in the independent variables, while the rest of changes were overlooked. Before using the regression results, it was essential to analyze the normality of the residuals. The results of Jarek-Bra test showed that residuals did not have normal or near-normal distribution. Therefore, the Johansson transfer was used to normalize the variables through maintaining the characteristics of the variable. After conversion, the results indicated that the residuals of the regression model had nearly normal distribution.

6. Results

This paper intended to investigate the effect of the sales volatility on the relationship between changes in oil prices and the volatility of stock returns. For this purpose, a sample of 102 companies was selected. The hypotheses were tested using regression methods. The results showed that oil prices have a negative impact on stock returns, whereas sales fluctuation had a significant impact on the relationship between changes in oil prices and stock return at confidence level of 95%. Oil and its products as the main source of energy are used in manufacturing processes in the world. Therefore, fluctuations in the price of oil can affect the cost of production and profitability of companies. Since oil revenues (crude oil) account for a large part of Iran's GDP, the increase in the price of the product, heightens the GDP and thereby increases the level of aggregate demand. This in turn is not accompanied by appropriate responded from domestic producers due to the weakness of productive structure and the lack of infrastructure. It leads to excess demand and rising prices, so any increase in oil prices and a rise in prices could lead to greater costs, limiting gains, resulting in a change in the discounted cash flow of an asset considering that, according to economic theory, the price of any asset is determined based on discounted cash flow. Change in discounted cash flow will have a significant impact on the price of these assets. As a result, the rising oil prices will curtail the stock prices.

7. Suggestions for future research

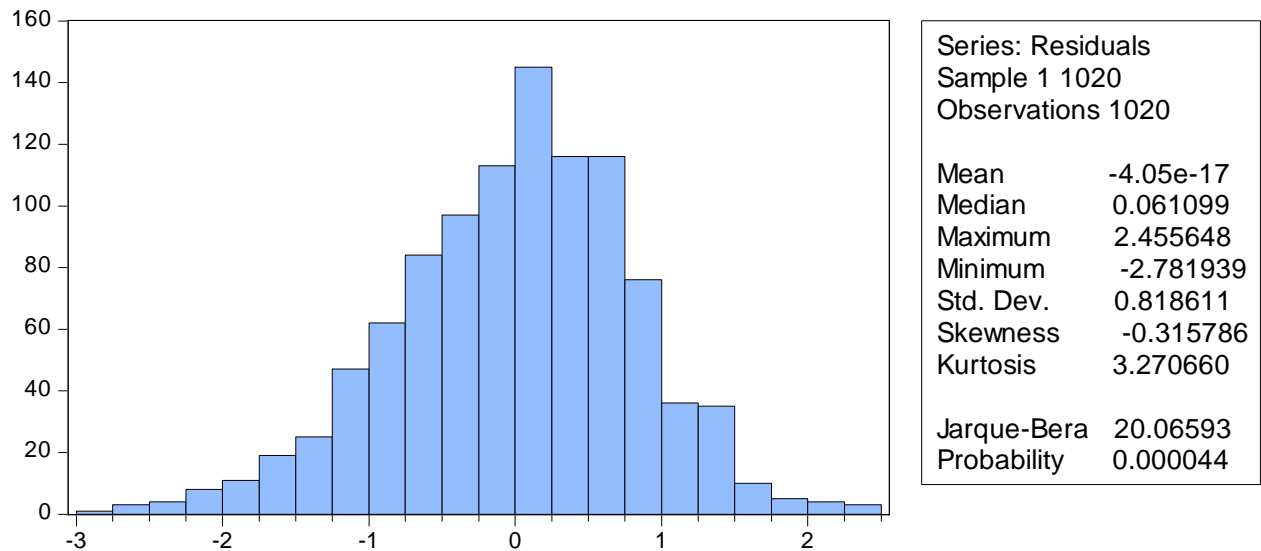
This study focused on several variables for a period from 2005 to 2014. It is recommended that future researchers explore the topic in this period while taking into account additional variables and compare the results against those of previous ones.

References

1. Emami Adibpour (2011). A study on asymmetric effects of oil shocks on production, *Journal of Economic Modeling*.
2. Ebrahimi (2011) the effects of oil prices on economic growth and financial variables in the Iranian government, *Journal of promoting 'planning and budgeting' "Year 16 Issue 112*.
3. Central bank of Islamic Republic of Iran. Central banks of various economic reports
4. Heidari, H, Parvin, Q, Feizi, S. (2010) The effect of economic uncertainty on economic growth in Iran: Evidence of Economic Research's quarterly GARCH models: 14th year Issue 189, 43-210
5. Haeri, M. (2008). A comparative study of the effects of oil shocks on economic variables in selected OPEC member countries. Master's thesis, University of Tehran
6. Samadi, Aminabad V. (1999), Analysis of the effects of oil shocks on macroeconomic variables, Master's thesis.

7. Delavari, Majid, Shamsollah, Z. Dashtbozorgi (2008) "A study of the effect of oil prices on economic growth in Iran using asymmetric convergence" *Energy Economics Studies*, fifth year, 18-80
8. Duncan, R.B.(1972) Characteristics of organizational environments and perceived environmental uncertainty. *Administrative science Quarterly* 17, 313-327
9. Georgios Chortareas. Emmanouil Noikokyris. Oil shocks, stock market prices, and the U.S. dividend yield decomposition. *International Review of Economics and Finance*. (2014)
10. Hamilton, J.D. Oil and Macro economy since world WARII *Journal of political Economy* .(1983).
11. Hamilton, James D. (1983), Oil and the macro economy since world war II, *The journal of political economy*, University of Virginia, V(91), N(2), P:228-247
12. Sador sky P. oil price shocks and stock market Activity *Energy Economics*.(1999)

Appendix:



Regression test

Dependent Variable: R				
Method: Least Squares				
Date: 01/03/16 Time: 20:05				
Sample: 11020				
Included observations: 1020				
White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
OIL	-0.115215	0.016673	-6.910193	0.0000
BTM	-0.277494	0.025319	-10.96003	0.0000
R_M	0.332434	0.015500	21.44761	0.0000
IND	-0.046333	0.088130	-0.525732	0.5992
SIZE	0.000900	0.026981	0.033347	0.9734
D_SALE	-0.007921	0.027842	-0.284506	0.7761

C	-0.092909	0.027158	-3.421045	0.0006
R-squared	0.371584	Mean dependent var		0.013554
Adjusted R-squared	0.367862	S.D. dependent var		1.032652
S.E. of regression	0.821031	Akaike info criterion		2.450328
Sum squared resid	682.8555	Schwarz criterion		2.484145
Log likelihood	-1242.667	Hannan-Quinn criter.		2.463168
F-statistic	99.83168	Durbin-Watson stat		1.882464
Prob(F-statistic)	0.000000	Wald F-statistic		124.3613
Prob(Wald F-statistic)	0.000000			