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An Investigation of the Volatility Spillovers between the Stock Markets of Selected Members of OPEC and OPEC's Oil Market using a Multivariate Dynamic Model

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Abstract
Stock market indices are under the influence of macroeconomic and non-economic conditions. The multiplicity and unknown nature of the factors that affect capital market has led to uncertainty in investments. Therefore, identification of the behavior of investors, the variables that affect stock price and returns, and the increasing expansion of capital markets by turning small individual investments into manufacturing activities are of utmost importance.The present article mainly focuses on modeling volatility and the resulting spillover effect in the stock market of certain members of OPEC using a multivariate VAR-BEKK model. It tries to examine volatility spillover between the studied countries as well as volatility spillover from the oil market to the stock market of these countries. The results show that oil price volatility has a significant spillover effect on stock market volatility in the selected members of OPEC. Moreover, stock market volatility in each of these countries and OPEC's Oil Market volatility are significantly associated with market volatility in the other studied countries as well as with their past volatility.
Keywords: money markets, OPEC members, multivariate GARCH models, volatility, spillover effect
JEL Classification: C4, Q43, G1

1. Introduction

Having efficient financial institutions is one of the indices of economic growth and development in any country. Investigating the trend of changes in industrialized countries reveals that one of the reasons for achieving such advancement is the establishment of active money markets. Thus, capital market indices are the most important macro variables that are taken into account in the analysis of economic conditions, and the response of these variables to economic events is of special importance. Therefore, it is imperative to pay more attention to financial institutions in order to achieve a certain degree of development.

Capital market is regarded as a subcategory of money markets, such that the financial resources of manufacturing businesses are provided by this sector of the financial system. The primary role of money markets in general and capital market in particular is to transform the savings of individuals and businesses into investments by other economic entities. Considering the importance of capital markets in financing economic entities, there can be a close link between production and funding. With the connection of production and society's capacities to the huge resources of the capital market, we will witness many capabilities at different economic levels. Meanwhile, the national resources mobilized toward capital market not only reduce demand-side pressures, but also flourish the capabilities of the supply-side. The sum of these advantages results in a desirable environment for investment.

Since capital market is a long-term financing source, we can simply conclude that lack of all-embracing and efficient financial institutions is the main obstacle on the way of economic development, especially in the industries of a country. Therefore, it is imperative to understand the features of capital market and remove its difficulties and this requires much effort and extensive research.

Stock market indices are under the influence of macroeconomic and non-economic conditions. The multiplicity and unknown nature of the factors that affect capital market has led to uncertainty in investments. Therefore, identification of the behavior of investors, the variables that affect stock price and returns, and the increasing expansion of capital markets by turning small individual investments into manufacturing activities are of utmost importance (Fama, & French, 1993). Hence, in the present research we tried to examine the spillover effect, conditional mean (returns), and volatility (second moment of returns) in the stock market of selected members of OPEC as well as OPEC's Oil Market. The present article mainly focuses on modeling volatility and the resulting spillover effect in the stock market of certain members of OPEC using a multivariate VAR-BEKK model. It tries to examine volatility spillover between the studied countries as well as volatility spillover from the oil market to the stock market of these countries.

The questions that the present article seeks to address can be summarized as follows: Do the stock market returns in the studied countries and OPEC's Oil Market returns[1] affect each other? Do stock market volatility in the studied countries and OPEC's Oil Market volatility have any significant relationship with their past volatility? The following hypotheses can be developed to address these questions:

1. There is a significant spillover effect between the stock market returns of the selected countries and OPEC's Oil Market returns.
2. Stock market volatility in the studied countries and OPEC's Oil Market volatility have a significant relationship with their past volatility.

To examine these hypotheses, the next section of the article reviews the empirical experiences in this context. Then, the methodology and the data of the research are presented. Finally, the model is estimated and the results are analyzed.

2. Extant Empirical Experiences

Moon and Yu (2009) examined the effects of volatility spillover between US and China stock markets. Using GARCH-M model, they investigated the short-run spillover effects of daily stock returns and volatilities between S&P's 500 stock index in the US and the Shanghai Stock Exchange (SSE) index in China during the period 1999-2007. They found evidence of a symmetric and asymmetric volatility spillover effect from the US to the China stock market. A close review of the literature shows that there has not yet been a model that accounts for the effect of memory and examines volatility spillover between stock indices followed by theoretical and empirical development and the present article is the first step toward such an analysis.

Kodres and Pritsker (2002) applied a rational expectations model of asset prices for explaining financial market contagion. The results indicated that financial contagion depends on macroeconomic risk factors and the amount of information asymmetry between markets.

GARCH models and their development are the most famous ways for modeling financial time-series volatility with high frequency. Multivariate GARCH models are widely used for examining volatility among different markets (McAleer, M. (2005)). Hassan and Malik (2007) used a multivariate GARCH model and simultaneously estimated the mean and conditional variance among different US sectors. The results suggested a significant volatility spillover between different sectors.

Kim (2005) used GARCH model for examining the co-movements between Korea, Japan, and US markets. The results indicated that spillovers from Japan and the US have increased since the Korean market became open for outsiders to own shares.

Sangbae Kim and Francis In (2002) examine the impact of the major stock markets (US, UK and Japan) and of the domestic and US macroeconomic news announcements on Australia's financial markets. It also investigates the dynamic interaction between the Australian futures market and the stock market, using a bivariate GJR–GARCH model. Their results indicate that the movements of these three major foreign stock markets significantly influence the Australian futures and stock markets. Some US and Australian macroeconomic news has a significant effect on the first and second moments of Australian financial markets. The data confirms that the futures market leads the stock market.

3. VAR-BEKK Model and Estimation Method

The VAR-BEKK model allows us to model the first and second moments of financial series simultaneously. The VAR component of the model is used for examining market returns spillover and the BEKK[2] component is used for examining market volatility spillover. Considering the relationship between conditional mean and returns volatility, these two are simultaneously estimated through one model, i.e. VAR-BEKK. VAR is an extension of autocorrelation models (AR) and BEKK is a widely used variant of multivariate GARCH models. Multivariate GARCH models are in turn extensions of simple GARCH models.

If r_t is the vector of market returns for N markets during time t, then:

$$r_t = \mu_t + \varepsilon_t$$

In this model, ε_t is the residuals vector and μ_t is the returns conditional mean vector or, more precisely, the vector of expected returns for time t with respect to past information. In order to demonstrate the linear relationship between the returns of one market and its past returns and with the returns of other markets, we can consider μ_t as a VAR model:

[1] These returns are due to oil price fluctuations

[2] *Baba-Engle-Kraft-Kroner*

$$\mu_t = A_0 + \sum_{i=1}^{p} A_i r_{t-i}$$

where A_0 is a matrix of constants and A_i is the matrix of coefficients. In addition, for showing the relationship of volatility of one market with its past volatilities and the volatility of other markets, we define vector of residuals (ε_t) as follows:

$$\varepsilon_t = H_t^{\frac{1}{2}} Z_t$$

where $H_t^{\frac{1}{2}}$ is a positive $N \times N$ matrix and the stochastic vector Z_t has the following first and second moments:

$(Z_t) = 0$

$Var(Z_t) = I_N$

where I_N is an identity matrix of order N. We can simply show that the conditional variance matrix r_t equals H_t. Thus, H_t must be positive definite. Since in a multivariate model with conditional variance the positiveness of H_t cannot be guaranteed without strong constraints, Engle and Kroner (1995) suggested the BEKK model which is still widely used in multivariate modeling with conditional variance (H_t). A BEKK(0,1) model is defined as follows:

$$H_t = C'C + B'H_{t-1}B$$

where B and C are $N \times N$ matrices and C is a upper triangular matrix. Given these explanations, the extended form of the model will be as follows:

$$\begin{bmatrix} r_{1,t} \\ r_{2,t} \\ r_{3,t} \\ r_{4,t} \\ r_{5,t} \\ r_{6,t} \end{bmatrix} = \begin{bmatrix} Q_{0,1} \\ Q_{0,2} \\ Q_{0,3} \\ Q_{0,4} \\ Q_{0,5} \\ Q_{0,6} \end{bmatrix} + \begin{bmatrix} Q_{1,11} & \cdots & Q_{1,16} \\ Q_{1,21} & & Q_{1,26} \\ Q_{1,31} & & Q_{1,36} \\ Q_{1,41} & & Q_{1,46} \\ Q_{1,51} & & Q_{1,56} \\ Q_{1,61} & \cdots & Q_{1,66} \end{bmatrix} \begin{bmatrix} r_{1,t-1} \\ r_{2,t-1} \\ r_{3,t-1} \\ r_{4,t-1} \\ r_{5,t-1} \\ r_{6,t-1} \end{bmatrix} + \begin{bmatrix} Q_{2,11} & \cdots & Q_{2,16} \\ \vdots & & \vdots \\ & & \\ Q_{2,61} & \cdots & Q_{2,66} \end{bmatrix} \begin{bmatrix} r_{1,t-2} \\ r_{2,t-2} \\ \vdots \\ r_{6,t-2} \end{bmatrix} + \ldots + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \\ \varepsilon_{5,t} \\ \varepsilon_{6,t} \end{bmatrix}$$

$$, \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \\ \varepsilon_{5,t} \\ \varepsilon_{6,t} \end{bmatrix} = \begin{bmatrix} h_{11,t} & \cdots & h_{16,t} \\ h_{21,t} & & h_{26,t} \\ h_{31,t} & & h_{36,t} \\ h_{41,t} & & h_{46,t} \\ h_{51,t} & & h_{56,t} \\ h_{61,t} & \cdots & h_{66,t} \end{bmatrix}^{\frac{1}{2}} \begin{bmatrix} z_{1,t} \\ z_{2,t} \\ z_{3,t} \\ z_{4,t} \\ z_{5,t} \\ z_{6,t} \end{bmatrix}$$

where r_{it} denotes the returns of the ith market (Iran=1, Saudi Arabia=2, the Emirates =3, Qatar=4, Kuwait=5, and oil market=6) in time t, Q_{it} denotes the conditional mean parameters of the model, ε_t is the residuals vector, and the elements of vector z_t are white Gaussian. Further, the conditional variance-covariance matrix according a BEKK(0,1) is as follows:

$$\begin{bmatrix} h_{11,t} & \cdots & h_{16,t} \\ h_{21,t} & & h_{26,t} \\ \vdots & & \vdots \\ h_{61,t} & \cdots & h_{66,t} \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} & \cdots & C_{16} \\ 0 & C_{22} & & C_{26} \\ \vdots & & \ddots & \vdots \\ 0 & \cdots & 0 & C_{66} \end{bmatrix}^T \begin{bmatrix} C_{11} & C_{12} & \cdots & C_{16} \\ 0 & C_{22} & & C_{26} \\ \vdots & & \ddots & \vdots \\ 0 & \cdots & 0 & C_{66} \end{bmatrix} + \begin{bmatrix} b_{11} & \cdots & b_{16} \\ b_{21} & & b_{26} \\ \vdots & & \vdots \\ b_{61} & \cdots & b_{66} \end{bmatrix}$$

$$\begin{bmatrix} h_{11,t-1} & \cdots & h_{16,t-1} \\ h_{21,t-1} & & h_{26,t-1} \\ \vdots & & \vdots \\ h_{61,t-1} & \cdots & h_{66,t-1} \end{bmatrix} \begin{bmatrix} b_{11} & \cdots & b_{16} \\ b_{21} & & b_{26} \\ \vdots & & \vdots \\ b_{61} & \cdots & b_{66} \end{bmatrix}$$

where C is constant and B is GARCH coefficient matrix.

4. Research Data

The present research used OPEC oil price data (dollars per barrel) and the total stock market index of the five studied countries which is converted to returns. The returns of the variables of interest are defined as follows:

$$RO = \log\left(\frac{p_{oil}}{p_{oil}(-1)}\right) \quad , \quad RI = \log\left(\frac{index_{iri}}{index_{iri}(-1)}\right) \quad , \quad RS = \log\left(\frac{index_{su}}{index_{su}(-1)}\right)$$

$$RE = \log\left(\frac{index_{uae}}{index_{uae}(-1)}\right) \quad , \quad RQ = \log\left(\frac{index_{qat}}{index_{qat}(-1)}\right) \quad , \quad RK = \log(\frac{index_{ku}}{index_{ku}(-1)})$$

where RO is changes in OPEC oil prices and RI, RS, RE, RQ, and RK denote the stock market returns of Iran, Saudi Arabia, the Emirates, Qatar, and Kuwait respectively.

The data used in the present research were monthly and due to the limitations in accessing the total market index of these counties certain periods were available: 2001/4 to 2011/11 for Iran, 2007/1 to 2011/11 for Saudi Arabia, 2003/12 to 2011/11 for the Emirates, 2003/7 to 2011/11 for Qatar, and 2001/6 to 2011/11 for Kuwait[1].

5. Statistical Analysis of the Data

5.1. Unit Root Test

The results of augmented Dickey-Fuller test suggest that the research variables are stationary at 1% significance level.

Table 1: The results of unit root test (augmented Dickey-Fuller test)

	Oil Price	Stock Return				
	Oil Price	Iran	Saudi Arabia	Emirates	Qatar	Kuwait
Dickey-Fuller test statistic	-8.16	-6.25	-6.85	-4.00	-8.45	-6.35
1%	-3.48	-3.48	-3.55	-3.50	-3.50	-3.48
Probability	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Notes. Values in brackets indicate the possibility of acceptance of the null hypothesis

5.2. Descriptive Statistics of the Data

The oil price returns series has a significantly negative skewness and its kurtosis is higher than that of normal distribution. Considering Jarque-Bera statistic (Jarque&Bera , 1980) this series is not normal at any conventional significance level.

The market return series of Iran, Saudi Arabia, the Emirates, Qatar, and Kuwait has positive, negative, negative, negative, and positive skewness respectively. Since their kurtosis is higher than that of the normal

[1] Iran stock market index was taken from www.tse.ir, the stock market indices of other countries were taken from www.btflive.net, and OPEC oil prices were extracted from www.opec.org.

distribution and given Jarque-Bera statistic and the combination of skewness and kurtosis in these series, none of these series has normal distribution.

Table 2: The statistical properties of the variables

Returns	Mean	Max	Min	SD	Skewness	Kurtosis	Jarque-Bera	Probability
Iran Stock M	0.016	0.188	-0.118	0.05	0.659	4.273	17.78	[0.00]
Saudi Arabi	-0.002	0.178	-0.297	0.084	-0.573	4.634	9.63	[0.00]
Emirates Sto	0.003	0.347	-0.403	0.114	-0.1	4.947	15.17	[0.00]
Qatar Stock	0.008	0.259	-0.296	0.097	-0.384	3.914	5.94	[0.05]
Kuwait Stoc	0.01	0.157	-0.217	0.057	-0.939	5.732	57.28	[0.00]
Oil Price	0.011	0.182	-0.336	0.088	-1.313	5.882	81.73	[0.00]

Notes. Values in brackets indicate the possibility of acceptance of the null hypothesis

6. Estimation of the Model

Based on AIC and SBC criteria, VAR(1)–BEKK(0,1) was chosen as the best system model. Now, by estimating VAR(1)–BEKK(0,1) on the market returns of the selected countries and OPEC oil price returns, we form vectors r_t and H_t and analyze the amount of market returns spillover and market volatility.

As shown by the estimation of the system model (the results are presented in the appendix), the market returns coefficients are not significant, while the coefficients of the conditional variance-covariance matrix—i.e. market volatility coefficients—are significant. In other words, stock market spillover does not occur in the studied countries while market volatility (second moment of market returns) has spillover effects. At this point we rewrite matrix H_t based on the coefficients obtained from the estimation of the system model.

EViews Estimation:

Variance-covariance matrix:

$$GARCH = \mathrm{M} + B_1 GARCH(-1) B_1$$

$$\begin{bmatrix} GARCH1 & COV1-2 & COV1-3 & COV1-4 & COV1-5 & COV1-6 \\ COV1-2 & GARCH2 & COV2-3 & COV2-4 & COV2-5 & COV2-6 \\ COV1-3 & COV2-3 & GARCH3 & COV3-4 & COV3-5 & COV3-6 \\ COV1-4 & COV2-4 & COV3-4 & GARCH4 & COV4-5 & COV4-6 \\ COV1-5 & COV2-5 & COV3-5 & COV4-5 & GARCH5 & COV5-6 \\ COV1-6 & COV2-6 & COV3-6 & COV4-6 & COV5-6 & GARCH6 \end{bmatrix}$$

$$= \mathrm{M} + \begin{bmatrix} B1(1,1) & 0 & 0 & 0 & 0 & 0 \\ 0 & B1(2,2) & 0 & 0 & 0 & 0 \\ 0 & 0 & B1(3,3) & 0 & 0 & 0 \\ 0 & 0 & 0 & B1(4,4) & 0 & 0 \\ 0 & 0 & 0 & 0 & B1(5,5) & 0 \\ 0 & 0 & 0 & 0 & 0 & B1(6,6) \end{bmatrix}$$

$$\begin{bmatrix} GARCH1(-1) & COV1-2(-1) & COV1-3(-1) & COV1-4(-1) & COV1-5(-1) & COV1-6(-1) \\ COV1-2(-1) & GARCH2(-1) & COV2-3(-1) & COV2-4(-1) & COV2-5(-1) & COV2-6(-1) \\ COV1-3(-1) & COV2-3(-1) & GARCH3(-1) & COV3-4(-1) & COV3-5(-1) & COV3-6(-1) \\ COV1-4(-1) & COV2-4(-1) & COV3-4(-1) & GARCH4(-1) & COV4-5(-1) & COV4-6(-1) \\ COV1-5(-1) & COV2-5(-1) & COV3-5(-1) & COV4-5(-1) & GARCH5(-1) & COV5-6(-1) \\ COV1-6(-1) & COV2-6(-1) & COV3-6(-1) & COV4-6(-1) & COV5-6(-1) & GARCH6(-1) \end{bmatrix}$$

$$\begin{bmatrix} B1(1,1) & 0 & 0 & 0 & 0 & 0 \\ 0 & B1(2,2) & 0 & 0 & 0 & 0 \\ 0 & 0 & B1(3,3) & 0 & 0 & 0 \\ 0 & 0 & 0 & B1(4,4) & 0 & 0 \\ 0 & 0 & 0 & 0 & B1(5,5) & 0 \\ 0 & 0 & 0 & 0 & 0 & B1(6,6) \end{bmatrix}$$

$$= \mathrm{M} + \begin{bmatrix} 1/022GARCH1(-1) & 1/008COV1-2(-1) & 1/012COV1-3(-1) & 1/015COV1-4(-1) & 1/010COV1-5(-1) & 1/013COV1-6(-1) \\ 1/008COV1-2(-1) & 0/995GARCH2(-1) & 0/998COV2-3(-1) & 1/001COV2-4(-1) & 0/996COV2-5(-1) & 0/9999COV2-6(-1) \\ 1/012COV1-3(-1) & 0/998COV2-3(-1) & 1/002GARCH3(-1) & 1/005COV3-4(-1) & 1/0003COV3-5(-1) & 1/0002COV3-6(-1) \\ 1/015COV1-4(-1) & 1/001COV2-4(-1) & 1/005COV3-4(-1) & 1/007GARCH4(-1) & 1/003COV4-5(-1) & 1/006COV4-6(-1) \\ 1/010COV1-5(-1) & 0/996COV2-5(-1) & 1/0003COV3-5(-1) & 1/003COV4-5(-1) & 0/998GARCH5(-1) & 1/001COV5-6(-1) \\ 1/013COV1-6(-1) & 0/9999COV2-6(-1) & 1/0002COV3-6(-1) & 1/006COV4-6(-1) & 1/001COV5-6(-1) & 1/004GARCH6(-1) \end{bmatrix}$$

All the above coefficients are significant at the 1% level, since in the output of the software type I error probability (Prob) is zero for all variance-covariance matrix coefficients except the intercept[1].

7. Diagnostic Tests

As we mentioned earlier, probability distribution of the residuals of the regression model can affect the choice of estimation method. Thus, we extracted the standardized residuals in the form of $Z_{it} = \varepsilon_{it}/\sqrt{h_{it}}$ for $i = RI, RS, RE, RQ, RK, RO$ from the system model and examined their normality using Jarque-Bera test. The results show that standardized residuals RI, RE, and RK are normal, but the rest are not normal.

Table 3: Jarque-Bera test for standardized residuals from BEKK(0,1) estimation

	Skewness	Kurtosis	Jarque-Bera statistic	Probability
standardized residuals of RI	0.26	2.64	0.97	[0.61]
standardized residuals of RS	-0.43	5.63	17.91	[0.00]
standardized residuals of RE	0.03	3.32	0.26	[0.87]
standardized residuals of RQ	-2.85	16.46	498	[0.00]
standardized residuals of RK	-0.48	2.79	2.3	[0.31]
standardized residuals of RO	2.22	13.25	291	[0.00]

Notes. Values in brackets indicate the possibility of acceptance of the null hypothesis

Moreover, comparing standardized residuals with raw data reveals that their skewness and kurtosis have decreased during estimation and this justifies the validity of the estimation method in the form of maximum likelihood estimation. Further, running a Ljung–Box test on the rank and square of standardized residuals from BEKK system model showed no signs of autocorrelation and heteroscedasticity.

Table 4: Ljung-Box test on the rank and square of market returns and oil price returns residuals obtained from the estimation of BEKK(0,1) model

	Q(1)	Q(4)	Q(12)			
standardized residuals of RI	0.06 [0.80]	2.10 [0.71]	5.40 [0.94]	0.01 [0.89]	2.67 [0.61]	10.28 [0.59]
standardized residuals of RS	2.42 [0.11]	5.26 [0.26]	22.47 [0.03]	1.78 [0.18]	2.55 [0.63]	15.08 [0.23]
standardized residuals of RE	0.00 [0.96]	1.42 [0.83]	14.71 [0.25]	0.00 [0.96]	3.27 [0.51]	6.20 [0.90]
standardized residuals of RQ	0.08 [0.76]	1.91 [0.75]	6.95 [0.86]	0.02 [0.88]	0.25 [0.99]	0.61 [1.00]
standardized residuals of RK	0.63 [0.42]	18.61 [0.00]	38.64 [0.00]	0.21 [0.64]	3.84 [0.42]	16.81 [0.15]
standardized residuals of RO	0.24 [0.61]	3.89 [0.42]	7.97 [0.78]	0.04 [0.82]	0.41 [0.98]	1.71 [1.00]

Notes. Values in brackets indicate the possibility of acceptance of the null hypothesis

8. Interpretation of the Results and Conclusion

The present research estimated the effects of spillovers between the stock markets of certain OPEC members and OPEC's Oil Market using a multivariate dynamic model (VAR-BEKK). GARCH(-1) coefficients are related to volatility spillover effect of each market on the same market with a delay and COV(-1) coefficients are related to the mutual spillover effect of one market on the other with a delay. Coefficients greater than 1 signify positive spillover effects and coefficients less than 1 signify negative spillover effects.

The results of the present research suggest that oil price volatility has a positive spillover effect on the

[1] However, the coefficients related to the VAR(1) component of the model, i.e. market returns, are not significant and thus analysis of spillover (contagion) effects is only done for the coefficients of BEKK(0,1) model or market volatility coefficients.

stock market volatility in all the studied countries except Saudi Arabia. The amount of effect is greatest for Iran, Qatar, Kuwait, and the Emirates respectively. The volatility spillover effect between Iran, the Emirates, Qatar, and Kuwait stock markets is mutually positive and this effect is greatest in case of Iran's stock market.

The volatility spillover effect of Saudi Arabia on stock market volatility of Iran and Qatar is positive, while this effect is negative for the Emirates and Kuwait stock markets. In addition, market volatility of these countries is little affected by their previous volatilities and this spillover effect is positive in Iran, the Emirates, and Qatar, but negative in Saudi Arabia and Kuwait. This effect is greatest in Iran's stock market and least in the Emirates' stock market. However, stock market returns of the studied countries and the returns due to oil price fluctuations (first moment of the research variables) have no significant spillover effect on one another, and there is only a significant contagion effect in market volatility (second moment) between these countries.

Given the little spillover effects of oil price volatility on stock market volatility of the studied countries, we can conclude that investors in these petroleum exporting countries cannot consider oil price fluctuations as a criterion that affects stock market investment decisions. On the other hand, this insignificant effect indicates the deviation of oil revenues toward non-productive economic activities, for the growth of the capital market of any country at the time of rising oil prices suggest the shift of liquidity from oil revenues toward productive economic activities.

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