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Effect of Oil Price Volatility and Petroleum Bloomberg Index on Stock Market Returns of Tehran Stock Exchange Using EGARCH Model

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ABSTRACT

The present research aims to evaluate impacts of crude oil price return index, Bloomberg Petroleum Index and Bloomberg energy index on stock market returns of 121 companies listed in Tehran stock exchange in a 10 years' period from early 2006 to April 2016. First, explanatory variables were aligned with petroleum products index mostly due to application of dollar data. Subsequently, to check variables stationary, Dickey-Fuller generalized test was considered and ARCH test was adopted to check for Heteroscedasticity in error terms and residual values. Finally, EGARCH was used to address model heteroscedasticity. The results showed that variations of Petroleum Bloomberg index, crude oil price and Bloomberg energy index could explain changes in Tehran stock exchange index returns. Any rise in oil prices increases total Stock Exchange returns. On the other hand, Stock Exchange index returns is aligned with Petroleum Bloomberg index.at the same time changes in Tehran stock exchange index returns was reversely correlated with changes in energy index return among others.
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1. Introduction

Oil importance in Iran's economy as a single-product economy as well as heavy dependence of GDP on revenues from worldwide sales of this product on one hand and effect of political and economic volatility in the international scale that had led to oil revenues instability made and as well as domestic economy vulnerability, implies to necessity of oil price volatility and at the same time stock market role and function in promoting domestic investment to manufacturing process and thereby achieve higher economic growth also indicates importance of stock market [9].

As it is stated in supply leadership theory, In the early stages of economic development, financial development is found to be economic growth trigger and engine; the so that establishing start-ups and increased financial markets will increase the supply of financial services followed by an improvement

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in real economic growth. This is achieved through moving scarce resources from small investors to large investments [11]. To deal with volatility in country production is a great subject in economic analysis. One of the factors affecting volatility in production, especially in oil-exporting countries is oil prices and its volatility. Changes and volatility in oil price affect macroeconomic variables in different ways. It is worthy to note that oil price shocks via different channels affects economy of oil exporting and importing countries.

In addition, the impact of oil prices on the economy can be examined from different perspectives. One aspect of such effects is symmetric or asymmetric effect of oil shocks on economic variables and another one is impact of uncertainties arising from oil price volatility on economic variables [1]. Since most of these shocks are characterized with random nature, are out of control of economic policy makers and for economic actors, nature of future shocks or probability of their occurrence or both of these cases is uncertain and unknown. In such circumstances, economic agents will be uncertain on future prices of crude oil. This uncertainty in the global oil markets, leads to some oil price volatility. These volatilities will also turn to uncertainty in policy making and planning of the economy. In other words, upon oil price volatility, volatility and uncertainty will be transferred from global oil markets to domestic economy. The same issues complicate decisions and future planning for all countries (especially oil-dependent countries such as Iran) [12]. For this, the present research aims to evaluate impacts of crude oil price return index, Bloomberg Petroleum Index and Bloomberg energy index on stock market returns of companies listed in Tehran stock exchange using EGARCH model.

2. Theoretical framework and literature review

Oil and its prices through various mechanisms affect exporting and importing countries. oil prices rise will lead to mobility of both supply and demand sides in the oil-dependent economies, but thanks to government subsidies systems in this sector and basic commodities it will led to sector support for energy and, increased costs in such activities as energy (oil and oil products). As a result, does not transfer supply side curve and only is demand trigger [5]. The increase in oil prices causes extra revenues from oil-importing countries to oil-exporting countries. The oil sector is one of the economic sectors of Petroleum Exporting Countries contributing to the added value of this country. Rising oil prices boost the sector and increase domestic investment and in turn lead to an increase in total production [1]. To analysis relationship between changes in prices for energy and economic analysis is complicated. When oil prices increases, the households and firms that use petroleum products (including gasoline and diesel fuel, they specify their consumption so that less amount of their income to be spent on their oil products.

On the other hand, oil-producing countries also have a positive effect by proceeds from the sale of oil wealth from their experience. Asset prices in the stock market, according to information about the future prospects and the current economic conditions leading company are determined. In general, although the change in the price of crude oil is considered an important factor for volatility in stock prices, but economists in a general does not confirms relationship between stock prices and oil prices [11]. Effect of stock price can be realized in oil prices through the pricing stock or assets model. Accordingly, the price per share or asset at any point of time is equal to the present value of its expected future cash flows or assets [2] (P. In this context, changes can affect oil prices the present value of expected future cash flows as well as interest rates. Volatility in oil prices through influencing macro-

economic variables (such as inflation, interest rates, economic growth, consumer confidence and investment), affects discount rate and as a result affects the share price mostly due to adjustment in cash flow variations [19]. To the best of our knowledge, there have been many experimental and theoretical studies on modeling and forecasting uncertainty and volatility, especially in the stock market, exchange rates, inflation. Volatility and uncertainty is one of the important concepts in economic and financial issues. Uncertainty circumstances or events that may occur in the future, and it is not clear if certain events are known probability of occurrence of these events is not available when either or both of these occasions is complex and difficult decisions about the future and hence the uncertainty over the sovereign decisions.

So uncertainty is a space in which decision-makers and economic agent's variables are not sure about the amount and direction of change. Uncertainty from various sources, changes in methods and decisions of economic agents that these decisions ultimately affect on their actual activities [4]. Uncertainty is often defined as standard deviation or variance, so that in each instance, and case it has particular concept for example as for stock returns, standard deviation represents a risk. Let time series variable is called as y, yt indicates the value of this variable at time t. a regression equation in the simplest case is as yt = α + βXt + ut. What is estimated Yt is conditional mean equation as E (yt l Xt) = α + βXt and to estimates it we apply $\hat{y}_t = \hat{\alpha} + \hat{\beta} x_t$. In this case, the implicit assumption is that conditional variance yt is constant. In general, the topics that unforeseen changes caused by accidental factors, uncertainty about the yt equivalent to consider and, as we have seen, a measure of uncertainty, including error varianceσ^2. However another issue is risen on uncertainties in yt and is that σ^2 cannot be constant as an uncertainty criteria. For example, in the case of stock returns, as the average yield increase may be uncertainty about it (for example, variance and standard deviation represents a risk that is) is also increasing. In this case, σ^2cannot prove that it will beσ_t^2. So σ_t^2represents some variations stemmed from random factors and is function of uncertainty of Yt [4] . So as to define and estimate the conditional mean a regression equation, it is necessary to define and estimate the conditional variance equation, following they will be taken into account.

2.1. Econometric models

Financial markets are characterized with Autoregressive Conditional Heteroscedasticity of return shocks and their fat-tailed distribution and as a result, eliminate the possibility of using linear regression [15]. So to explain this volatility Engel developed Autoregressive conditional heteroscedasticity (ARCH). But then Blefsuof extended the model and introduced a host of models called generalized autoregressive conditional heteroscedasticity (GARCH). These models were developed according to the characteristics of financial markets and models such as (FGARCH), (IGARCH) and (EGARCH) were presented to the financial markets.

2.2. Autoregressive conditional heteroscedasticity models (ARCH)

Engle 1972, argued that mean and variance of a set of data to can be modeled simultaneously.

$\varepsilon_t = \sigma_t v_t \qquad v_t \sim iid(0,1)$

$\varepsilon_t^2 = \alpha_\circ + \alpha_1 \varepsilon_{t-1}^2 + \cdots + \alpha_q \varepsilon_{t+1-q}^2 + \cup_t$

If conditional variance value is not constant residual squares of autoregressive model can be modeled as follows.

If all α_i=0, then $\alpha_\circ$will be constant.

But if the condition is not met, autoregressive conditional heteroscedasticity models can be used to predict the conditional variance [8].

$$E_t\varepsilon_{t+1}^2 = \alpha_\circ + \alpha_1\varepsilon_t^2 + \alpha_2\varepsilon_{t-1}^2 + \cdots + \alpha_q\varepsilon_{t+1-q}^2$$

Since the residuals may be derived from AR or ARMA with different models, so different models of ARCH can be developed. Where Ut is mainly "error terms and using maximum likelihood method yt equation and the conditional variance equation can be estimated simultaneously.

Product-error terms include:

$$\varepsilon_t = \upsilon_t\sqrt{\alpha_\circ + \varepsilon_{t-1}^2}$$

This model is designed in such a manner in which residuals structure has a conditional and non-conditional mean zero and the error terms are correlated with each other, although this is not linear. As a result, this causes the ARCH model can explain turbulent periods (extreme stability and change) in the data series. So that the more past shocks$\{\varepsilon_t - k\}_{k=1}^{q}$, the more period shock variance and the more present period shock will be.

Generalized autoregressive conditional heteroscedasticity models (GARCH)

Because of the weakness of the ARCH model because it requires a large number of parameters to calculate it and as well as to avoid negative variance estimated values, Blursef (1986), presented GARCH models. Regressive Conditional generalized anisotropic model (GARCH) volatility in financial modeling to provide a measure and measures can be used in portfolio selection, risk management and pricing of derivative instruments [6].

Each of these models focus on specific features of financial data. The model is as follows:

$$\varepsilon_t = \sigma_t v_t \qquad v_t \sim iid(0,1)$$

$$\sigma_t^2 = \alpha_0 + \sum_{k=1}^{q}\alpha_k\varepsilon_{t-k}^2 + \sum_{k=1}^{q}\gamma_h\sigma_{t-k}^2$$

Where γ_h represents GARCH coefficients and $\alpha_k \geq 0$,$\beta_h \geq 0$ 0 α_0 k≥ 1. For example, in the model (p, q) GARCH for simultaneous estimation of return and volatility following formula is used:

$$R_t = \mu_t + \varepsilon_t = \varepsilon_t \sim D(0, \sigma_t^2)$$

$$\mu_t = \alpha_0 + \sum_{i=1}^{m}\alpha_i r_{t-1} - \sum_{j=1}^{m} b_j\varepsilon_{t-j}$$

$$\varepsilon_t = \sigma_t \qquad v_t \sim iid(0,1)$$

$$\sigma_t^2 = \alpha_0 + \sum_{k=1}^{q} \alpha_k \varepsilon_{t-k}^2 + \sum_{k=1}^{q} \lambda_h \sigma_{t-h}^2$$

It should be noted that in the estimation of the model, best interruptions and volatility at the same time determined and averaged equation effect of higher-order correlations are included in the model [8].

2.3. Exponential Generalized autoregressive conditional heteroscedasticity models (EGAARCH)

Glisten, Jungians and Rangel by developing a model investigated the effects of good and bad news on their stock prices. They said that if μ (t-1) = 0 we consider a basic threshold The differences can be larger as well as smaller shock effects threshold was evaluated on changes in stock prices. A model is as follows:

$$\log(\sigma_t^2) = \omega + P \sum_{j=1}^{q} \beta_i \log(\sigma_{t-j}^2) + \sum_{t=1}^{p} \alpha_i \left| \frac{\varepsilon_{t-i}}{\sigma_{t-i}} - \sqrt{\frac{2}{\pi}} \right| + \sum_{t=h}^{r} \gamma \frac{\varepsilon_{t-k}}{\varepsilon_{t-k}}$$

This model has several advantages. First, in this model, the dependent variable, $\sigma_t^2$is logarithmic right variable coefficients can be positive or negative, which in any case will be positiveσ_t^2. So no need to impose restrictions on the coefficients is non-negative. Second, this model is also considered the effects of asymmetric shocks. Because the factor $\gamma\ \varepsilon_{t-1}$can be positive or negative. For example, if σ_t^2 represents the variability of stock returns is, γ expresses the shock effect of negative and positive, while the coefficient α is just $|\varepsilon_{t-1}|$ Here, too, if γ = 0, the symmetric and asymmetric is otherwise. Positive shocks impact is + γ α and the impact of negative shocks equal to α - γ . If γ is negative, the positive effect of negative shocks is more of a shock. So, Positive and negative shocks only if it is identical to that γ = 0 [10].

3. Literature review

Naifar and Al Dohaiman studied nature of the relationship between crude oil prices, stock markets' return and macroeconomic variables. Their analysis has been conducted in two steps. Firstly, the authors examined the impact of oil price change and volatility on stock market returns under regime shifts using a sample composed of the Gulf Cooperation Council (GCC) countries. Their results show also an asymmetric dependence structure between inflation rates and crude oil price and that this structure orients toward the upper side during the recent financial crisis. They found moreover a significant symmetric dependence between crude oil prices and the short-term interest rate during the financial crisis [16].

At the same time Reboredo and Rivera-Castro examine the connection between oil price and stock market returns using daily data that consists of the aggregate S&P 500 and Dow Jones Stoxx Europe 600 indexes and US and European industrial sectors (automobile and parts, banks, chemical, oil and gas, industrial goods, utilities, telecommunications, and technologies) over the period from 01 June

2000 to 29 July 2011. Based on wavelet multi-resolution analysis they found that oil price changes have no much effect on stock market returns in the pre-crisis period at either the aggregate as well as the sectoral level. With the onset of the financial crisis, their findings support the positive interdependence between oil price shocks and the stock returns at both the aggregate and the sectorial level [18].

Rahman and Serletis using models VARMA, GARCH and BEKK showed that the process of conditional variance - covariance between productivity growth and real change is significant and asymmetric oil prices as well as increasing oil price uncertainty, low growth economic activity in Canada [17].

Chen and Hsu using panel data in 84 countries, showed that oil price volatility reduced international trade [14].

Joher Ali Ahmed et al. upon separating the constant fluctuation and volatility of oil price vitalities to both short-lived (transfer) model by CGARCH, showed that oil price shocks have asymmetric effects on the volatility of oil prices and the continued temporary use VaR method showed that transient vitalities had a negative impact on American industry production has also increased vitalities in the general price level and the price of non-energy commodities [15].

Vo and minh in a paper titled vitalities in oil and stock markets, random vitalities multivariate approach, trying to model the volatility of the stock market and oil futures market aimed at extracting information intertwined, it has been a market for risk prediction [19]. This study has four major findings:

1. Futures oil and stock are interdependent and they tend to increase when the market becomes more volatile

2. The volatility in any market is very varies upon past information.

3 - Each market internal conditions may lead to increased volatility in other markets, for example, innovations in one of the markets could create volatility in other markets.

4 - Based on common standards in the financial markets, a more accurate model is used to calculate value at risk.

Arouri Nguyen in a paper titled as Further Evidence on the Responses of Stock Prices in GCC Countries to Oil Price Shocks, transfer efficiency and vitalities in world oil prices and stock markets of member countries of the Persian Gulf Cooperation Council (GCC) during the years 2005 to 2010 based on VAR-GARCH's methodology. Their research results indicate a remarkable return and volatility spillover effects between oil prices and the stock market is the Persian Gulf Cooperation Council member states. They also stress that international portfolios to better manage risks arising from vitalities in the price of oil is non-negligible [13].

Aloui, C. and Jammazi, using a MS-EGARCH model evaluated relationship between vitalities in the oil market and stock prices to France, Britain and Japan, for the period 1989 to 2007. Based on these findings, the increase in oil prices has significant impacts on both the volatility of stock returns and the likelihood of transmission over the regime leaves. The effects of oil shocks on the dynamics of the stock market, it should be noted that the literature were focused on models of MS-GARCH, MS-AR and MS-EGARCH [20].

Heidari et al, to evaluate the effects of oil price uncertainty and volatility in gold prices on the Tehran Stock Exchange price index, GARCH multivariate model was tested using BEKK approach. Their results show the impact of oil prices and the price index of Tehran Stock Exchange there is no significant relationship between price volatility of gold and the index of Tehran Stock Exchange but has significant negative correlation was observed [4].

Semnani et al. studied the effects of vitalities in crude oil prices; Iran on Tehran Stock Exchange examined the return index. The results of this research, on the one hand and the lack of a significant positive relationship in the long run Iranian heavy crude oil price vitalities in the short-term variables and performance indicators in Tehran Stock Exchange on the other hand, based on the results of the VECM, inverted long-term relationship between variables was found [9].
Hosseini-Nasab, et al. shed lights on effect of oil shocks on stock return in Tehran Stock Exchange, in the period April 1997 to August 2010 were examined. Based on the results, the phase of recession and stock market returns with high volatility and boom phase of stock market returns with moderate volatility, fluctuations in oil prices on stock market returns are positive. In addition, the phase of recession, stock market returns with moderate volatility, fluctuations so that rising oil prices as a factor of recession in the Tehran Stock Exchange [3].

4. Research Methodology and variables

Here, monthly data index of Tehran Stock Exchange as dependent variable, and the price of crude oil and petroleum index and energy index Bloomberg as explanatory variables were considered. Data were extracted from Rahavard Novin software and Bloomberg site.
First explanatory variables were mixed because due to presence of data dollar, with the dollar and the riyal in specific date and using the following equation with the benchmark index petroleum was adopted:

$$V_t = V_{t-1} * \frac{X_t}{X_{t-1}} * \frac{FX_t}{FX_{t-1}}$$

Vt: the price of crude oil and petroleum Bloomberg index and energy index after conversion at the time of t
Xt: the price of crude oil and petroleum Bloomberg index and energy index before conversion in time t
FXt: rate against the dollar and rial on the open market at time t
Data from previous stage and final value for Tehran Stock Exchange Index in relation to the scale below for data series ranged 1-100.

$$(((X_{old} - \text{Min(Old)}) * (\text{Max(New)} - \text{Min(New)}))/(\text{Max(Old)} - \text{Min(Old)})) + 1$$

Xold: Old and initial data Min (Old): The minimum old data in each data series
Max (Old): the maximum old data in each data series Min (New): new minimum (1)
Max (New): maximum new data (equal percentage).

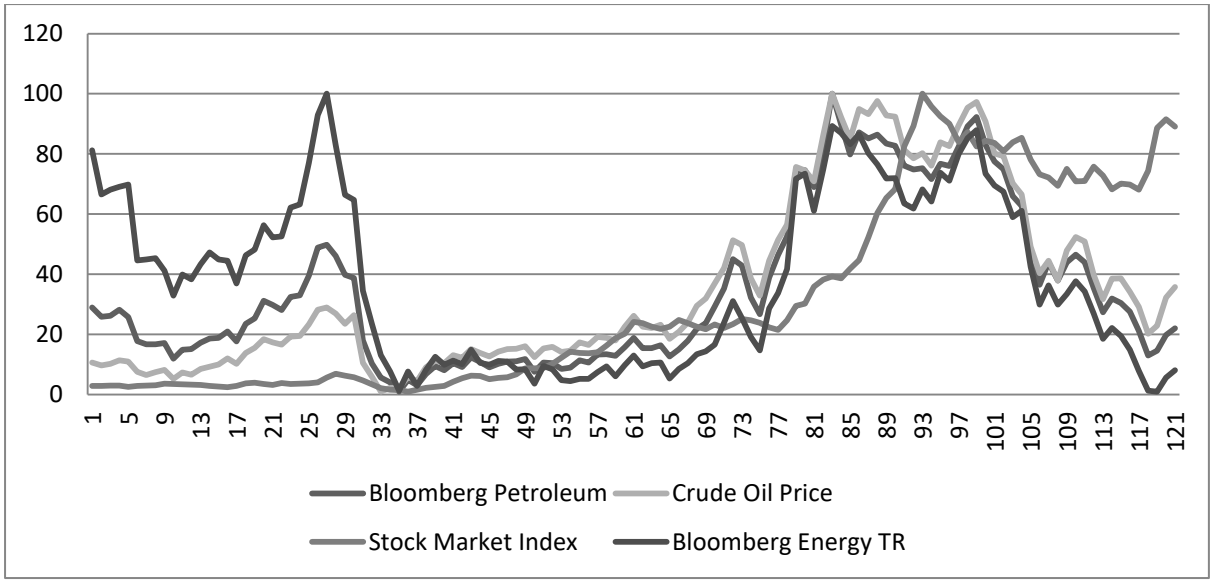

Fig 1: variables after adjustment

As stated above, the relationship was fit together all the data in terms of monetary value and in terms of scale is consistent with each other. Using the natural logarithm dividing each prior period data have been calculated according to the following equation monthly returns.

$$R_i = \ln\left(\frac{X_t}{X_{t-1}}\right)$$

In Figure (1) variables after adjustment are given.

Figure 1 shows the time series variables (Source: RAHAVARD Novin software Bloomberg) (Source: research findings)
Descriptive statistics for variables are as Table1.

Table 1. Descriptive Statistics (Source: research findings)

	Crude oil prices	**Bloomberg Petroleum index**	**Stock market index**	**Bloomberg Energy Index**
Mean	35.39496	34.87718	31.43022	38.26613
Median	23.21131	26.16184	21.52013	34.29726
Max	100	100	100	100
Min	1	1	1	1
Standard Deviation	29.04786	26.50178	32.15253	28.32821
Skewness	0.922773	0.873981	0.772962	0.351028
Kurtosis	2.472963	2.454845	1.991179	1.736021
Jarque-bera	18.57254	16.90251	17.17999	10.53974
Probability	0.000093	0.000214	0.000186	0.005144

Descriptive statistics on return variables yields are given in Table 2.

Table 2: Descriptive Statistics (Source: research findings)

	Crude oil prices	**Bloomberg Petroleum index**	**Stock market index**	**Bloomberg Energy Index**
Mean	0.010097	-0.002281	0.028427	-0.01925
Median	0.020525	0.006678	0.019093	-0.00416
Max	0.958716	1.591454	0.458952	1.731913
Min	-1.790985	-1.413329	-0.482631	-1.84134
Standard Deviation	0.279525	0.291037	0.135192	0.442027
Skewness	-2.025243	0.259299	-0.224317	-0.0159
Kurtosis	18.0829	13.85343	5.575699	9.702526
Jarque-bera	1219.501	590.3298	34.17749	224.6243
Probability	0	0	0	0

To avoid spurious regression in the relationship between variables, time series data must have stability. The returns achieved in the previous steps using the Dickey-Fuller test generalized have been studied. The results of the tests in Table 3 for a summary that shows all four variables are stable at 95% and 99%.

Table 3: Generalized Dickey Fuller Test (Source: research findings)

Confidence Interval	%95			%99		
	t-Statistics	Critical value	P-Value	t-Statistics	Critical value	P-Value
Stock Market Index	- 6.86	- 3.44	0.000	- 6.86	- 4.03	0.000
Crude oil Price	- 6.6		0.000	- 6.6		0.000
Bloomberg Petroleum index	- 6.26		0.000	- 6.26		0.000
Bloomberg Energy Index	- 12.14		0.000	- 12.14		0.000

The mean equation to estimate the relationship between the variables of interest is considered as follows.

$$RT_t = \beta_0 + \sum_{i=0}^{n} \beta_i RC_{t-i} + \sum_{j=0}^{n} \beta_j RP_{t-j} + \sum_{k=0}^{n} \beta_k RE_{t-k} + \varepsilon_t$$

RTt: Total index returns at time t
RCt: Crude oil return at time t
RPt: Bloomberg Petroleum index returns in time t
REt: Energy Bloomberg index return at time t
β: Coefficient
ε: Error terms

In this study the research hypotheses are as follows:

- There is a significant relationship between crude oil prices and of Tehran Stock Exchange index return
- There is a significant relationship between Bloomberg Petroleum index returns and of Tehran Stock Exchange index return
- There is a significant relationship between Bloomberg energy index returns and of Tehran Stock Exchange index return

5. Results

The results of the model estimation using ordinary least squares are given in Table 4. It should be noted that Iran's capital market is often lagged because of international factors influenced intervals of one to three explanatory variables included in the model because of the significant factors that in the end some of them have been removed from the model in Table 4.

Table 4: Results of the mean equation (Source: research findings)

Variable	Coefficients	Std. Error	t-Statistics	Probability
Intercept	0.020188	0.009873	2.044801	0.0434
RC	0.161024	0.05774	2.788802	0.0063
RC(-1)	0.055899	0.054767	1.020679	0.3098
RC(-2)	0.057869	0.066504	0.870163	0.3862
RC(-3)	0.273106	0.067543	4.043447	0.0001
RP	0.066317	0.096924	0.684213	0.4954
RP(-1)	0.187919	0.1006	1.867986	0.0646
RP(-2)	0.141328	0.103036	1.371635	0.1731
RP(-3)	-0.172572	0.098859	-1.745642	0.0838
RE	-0.097032	0.047933	-2.024345	0.0455

RE(-1)	-0.083834	0.048016	-1.745942	0.0838
RE(-2)	-0.070518	0.060914	-1.157661	0.2497
RE(-3)	0.031846	0.061809	0.515241	0.6075
R-squared	0.506457	Mean dependent var	0.029095	
Adjusted R-squared	0.449509	S.D. dependent var	0.136835	
S.E. of regression	0.101525	Akaike info criterion	-1.632584	
Sum squared resid	1.071962	Schwarz criterion	-1.325675	
Log likelihood	108.5061	Hannan-Quinn criter.	-1.507983	
F-statistic	8.893427	Durbin-Watson stat	1.364779	
Prob(F-statistic)	0			

T is clear from the chart above statistics to estimate the number of coefficients less than the critical value and the concept of the estimated coefficients are significant. Therefore, the variable with the least significant variables and we start to remove the following model all coefficients are significant at 95% is obtained. Results are shown Table 5.

Table 5: Results mean equation estimation (Source: research findings)

Variable	**Coefficients**	**Standard error**	**t-Statistics**	**Probability**
Intercept	0.021462	0.009437	2.274268	0.0249
RC	0.190637	0.043676	4.364775	0
RC(-2)	0.103719	0.036937	2.807992	0.0059
RC(-3)	0.273603	0.058553	4.672705	0
RP(-1)	0.231244	0.074852	3.089343	0.0025
RP(-3)	-0.124583	0.048062	-2.59213	0.0108
RE	-0.061619	0.028233	-2.18249	0.0312
RE(-1)	-0.097163	0.044568	-2.1801	0.0314
R-squared	0.485696	Mean dependent var	0.029095	
Adjusted R-squared	0.452667	S.D. dependent var	0.136835	
S.E. of regression	0.101233	Akaike info criterion	-1.67685	
Sum squared resid	1.117055	Schwarz criterion	-1.48798	

Log likelihood	106.0957	Hannan-Quinn criter.	-1.60017
F-statistic	14.70525	Durbin-Watson stat	1.422373
Prob(F-statistic)	0		

Following to assess heteroscedasticity in error elements and residual values ARCH test is used. The results indicate the presence of heteroscedasticity in the model has been used to solve the problem of model EGARCH. Test results are given in Table 6.

Table 6: Heteroscedasticity test (Source: research findings)

Heteroskedasticity test: ARCH				
F-statistic	2.222945		Prob. F(4.108)	0.0712
Obs*R-squared	8.595740		Prob.Chi-square(4)	0.0720
Test Equation: Depended variable: RESID^2 Method:least squares Date :08/12/16 Time: 21:20 Sample (adjusted): 2006M12 2016M04 Included observations: 113 after adjustment				
Variable	Coefficient	Std. error	t-statistic	Prob.
C	0.005249	0.001887	2.782167	0.0064
RESID^2(-1)	0.097960	0.094526	1.036333	0.3024
RESID^2(-2)	0.129720	0.094871	1.367329	0.1744
RESID^2(-3)	0.037840	0.094717	0.393503	0.6903
RESID^2(-4)	0.171279	0.093717	1.827610	0.0704
R-squared	0.076068	Mean dependent var		0.009413
Adjusted R-squared	0.041849	S.D. Dependent var		0.012829
S.E. of regression	0.017030	AKaike info criterion		-5.873774
Sum squared resid	336.8682	Schwarz criterion		-5.753093
F –statistic	2.222945	Hannan-Quinn criter		-5.824803
Prob (F-statistic)	0.071248	Durbin-wate on stat		1.970630

The above results showed that the value of F-statistic is greater than its critical value and its associated probability of less than 10 percent. Therefore, ARCH hypothesis is not rejected at a significance level of 90 percent. In other words, the variance cannot be fixed. EGARCH model is used to remove variance heteroscedasticity of the results of this estimate are shown in the table below. EGARCH model suggested by Nelson. Another way to formulate this model conditional variance is as follows:

$$\ln(\sigma_t^2) = \omega + \beta \ln(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right]$$

This model has several advantages. First, the model for log σ2 is the dependent variable, and therefore the right variables can be positive or negative coefficients, which in any case will be positive variance. So no need to impose restrictions on the coefficients is non-negative. Second, this model is also considered the effects of asymmetric shocks. Because Y is the coefficient ut-1, ut-1 can be positive or negative. In the above equation is the total variance showed variability index returns. Y shock

effect of the positive and negative states. If this value is zero due to symmetric shocks. If this expression is negative, indicating that the shock effect is more negative than positive shocks.

Table 7: The results of EGARCH estimation (Source: research findings)

variable	coefficient	Std. error	z-statistic	Prob.
C	0.022894	0.007387	3.099285	0.0019
RCRU	0.188351	0.054595	3.449972	0.0006
RCRU(-2)	0.093879	0.045181	2.077859	0.0377
RCRU(-3)	0.263473	0.114061	2.309919	0.0209
RPETR(-1)	0.250873	0.067842	3.697917	0.0002
RPETR(-3)	-0.144914	0.105196	-1.377558	0.1683
RENRG	-0.053646	0.027559	-1.946586	0.0516
RENRG(-1)	-0.106143	0.025952	-4.089904	0.0000
Variance Equation				
C(9)	0.094005	0.129802	0.724220	0.4689
C(10)	-0.087026	0.143792	-0.605221	0.5450
C(11)	-0.011962	0.057627	-0.207569	0.8356
C(12)	1.007009	1.01E-05	99483.32	0.0000
R-squared	0.482123	Mean dependent var		0.029095
Adjusted R-squared	0.448864	S.D.dependent var		0.136835
S.E.of regressiom	0.101584	Akaike info criterion		-1.814850
Sum squared	1.124816	Schwarz criterion		-1.531550
Log likelihood	118.1687	Hannan- Quinn criter		-1.699834
Durbin- Watson stat	1.424015			

In light of the above and taking into account the table7 it is clear that Y or the C (11) was not statistically significant because of the presumption of z is not less than the critical value. The coefficient is zero. The shocks to aggregate index returns are symmetrical. Another point worth mentioning is that the coefficient Petroleum significant returns due to significant third interval after EGARCH model equations have been removed. This model because the model is asymmetric shocks positive and negative effects are the same is not used. Criteria Results have shown that EGARCH (1,1) without reducing the degrees of freedom can be the best way to eliminate heteroscedasticity. In this section to ensure the fix heteroscedasticity ARCH test is used again which results in the following table and show EGARCH (1,1) has managed to inconsistency variance in errors eliminated. Table 8 reflects this theme.

Table 8: Heteroscedasticity test (Source: research findings)

Heteroskedasticity Test ARCH				
F-statistic	0.727652	Prob.F(4,108)		0.5750
Obs*R-squared	2.965439	Prob.Chi-squared(4)		0.5636
Test Equation: Dependent Variable:WGT_RESID^2 Method:Least Squares Date: 08/12/16 Time:22:34 Sample (adjusted): 2006M12 2016M04 Included observations: 113 after adjustments				
Variable	coefficient	Std.Error	t-Statistic	Prob.
C	1.116374	0.248590	4.490854	0.0000
WGT_RESID^2(-1)	-0.109895	0.096240	-1.141895	0.2560

WGT_RESID^2(-2)	0.035123	0.096597	0.363606	0.7169
WGT_RESID^2(-3)	-0.031998	0.096639	-0.331109	0.7412
WGT_RESID^2(-4)	0.094043	0.096252	0.977047	0.3307
R-Squared	0.026243	Mean dependent var		1.103200
Adjusted R-squared	-0.009822	S.D.depedent var		1.166161
S-E.of regression	1.171874	Akaike info criterion		3.198324
Sum squared resid	148.3152	Schwarz criterion		3.319005
Log likelihood	-175.7053	Hannan-Quinn criter		3.247295
F –statistic	0.727652	Durbin-watson stat		1.958512
Prob (F-statistic)	0.574954			

The final model after removing third log on Petroleum index return according to the following equation.

$$RT_t = 0.023 + 0.182RC_t + 0.104RC_{t-2} + 0.129RC_{t-3} + 0.28RP_{t-1} - 0.059RE_t$$

According to this equation as well as tables and significance of the estimated coefficients can rise in oil prices so the overall increase is significant returns Stock Exchange. On the other hand returns Stock Exchange index with a lag period has been to change the index returns Petroleum Bloomberg. Energy efficiency should be said about the impact index Tehran stock exchange index returns changes inversely with changes in the energy index returns. Unless oil prices excluding energy and energy variables properly explained to people here know that oil is a component of energy. EGARCH model to explain the conditional variance model estimates more errors have been reported.

$$\ln(\sigma_t^2) = 0.094 + \ln(\sigma_{t-1}^2) - 0.012\,\frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} - 0.087\left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}}\right]$$

Because according to the results of Table 7 shows that the coefficient of 0.012, which significantly reflects the asymmetry of positive and negative news is not significant and is symmetric model results show the effects of shock.

6. Discussion and Conclusion

Changes in significant returns Petroleum, Bloomberg, crude oil prices and the energy index Bloomberg, after adjusting for the rate against the dollar to the rial, it is estimated that explain changes in the Tehran Stock Exchange index returns. The explanatory power as mentioned above on the other hand returns Stock Exchange index with a lag period has been to change the Petroleum Bloomberg returns index. The impact energy index returns have stated that changes the efficiency of the Tehran Stock Exchange index had an inverse correlation with changes in the energy index returns. On the other hand must be stated that the inconsistency variance component model EGARCH well able to meet the average model error suggesting that zero coefficient of Y because statistically, the effects of positive and negative shocks is symmetric. As Iran is an oil exporter country and an increase in the price of oil increased income country results opposed to in terms of its relations with other previous

studies. results of the present research in terms of significance and correlation and relationship between oil prices and stock market returns are in line with findings of Naifar and Al Dohaiman [16], Roberti and Rivera Castro, Rahman and Slorits [17], Chen and Hsu [14], Joher Ahmed et al [15], Veimin [15], Aloui, and Jammazi [20].
Semnani et al [10] and Hosseini-Nasab et al [3] and as for significance, sign of relationship, relation between oil price index and stock exchange return index with findings of Ribordorivra and Castro was confirmed and opposite is true for Hosseini-Nasab et al [3]. The results of the study of the relationship between energy index and return index for the stock market is in line with previous research that there is a negative relationship between the energy index and the index of stock market returns overlaps and confirmed previous research. Heidari et al [4] found no significant relationship between oil prices and stock market return index, which does not confirm findings in this study.

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