Oil prices, US exchange rates, and stock market: evidence from Jordan as a net oil importer

Hammami, Algia and Ghenimi, Ameni and Bouri, Abdelfatteh

20 June 2019

Oil prices, US exchange rates, and stock market: evidence from Jordan as a net oil importer

ALGIA HAMMAMI*

AMENI GHENIMI

BOURI ABDELFATTEH

19 September April 2019

Oil prices, US exchange rates, and stock market: Evidence from Jordan as a net oil importer

Abstract:

This paper investigates the long-run and the short-run relationship between oil prices (international oil price), US exchange rates and the Amman Stock Exchange as measured by MSCI stock market index in Jordan. The data used in this paper are monthly time series data from M1 2005 to M12 2015. To meet this ambitious objective, we use VECM method.

Our results show that the Jordan stock market prices have a relationship with two macroeconomic variables. Nevertheless, oil prices have significantly long and short-run negative effect on stock prices contrary to the US exchange rate that has a significant negative effect on stock prices only in the short term.

Keywords: VECM, Crude Oil Price, US Exchange Rate, Jordan Stock Market

1.Introduction

The recent surge of oil prices over the past 8 years has generated a lot of interest in the relationship between oil prices, the economy and the financial markets (see, Herrera and Pesavento, 2009; Blanchard and Gali, 2000). Moreover, during this same time period, the US dollar fell against other major traded currencies and emerging market stock prices rose. The relationship between oil prices and the exchange rate has also attracted attention in the literature. Krugman (1983); Golub (1983) and Rogoff (1991) examined the relationship between these variables.

Through the increasing importance of oil price in the economic activity, the study of the relationship between oil price, the stock market and exchange rate becomes of a greater importance for policy makers, economists and investors. During the Arab Spring and instability in energy markets, the oil small importer countries benefited to low oil prices. More precisely, the Arab Spring period led to oil price shocks, whereas the dynamic change in oil prices leads to the decrease of stock returns and currencies (Bildirici and Turkmen, 2015).

More studies examined the relationship between the exchange rate, the oil prices and the stock markets in the developed countries. However, few studies witnessed greater interest in examining the relationship between the exchange rate, oil prices and stock markets of the developed countries. However, very little attention has been paid to smaller Mediterranean markets, particularly Jordan, which is an oil importer. In addition, the study of Bouri et al. (2016) is probably the only study in the literature that examined the mean and the variance causality between world oil prices and sectoral equity returns in Jordan, before and after the Arab Uprisings that started in 2010, using GARCH model. They found that the influence is not uniform across the equity sectors. The oil return shocks significantly impacted financial and the service sectors, while its effect is insignificant on the industrial sectors. They authors also found that oil is a negligible risk factor and a significant evidence of risk transmission to the industrials sectors, particularly during the Arab Uprising period because of the involvements of the political and civil uprisings which affected the stock and energy markets. On the other hand, no attention was paid to answer the question about the long-run relationship between oil prices, exchange rates and stock market returns in Jordan.

We cannot study the relation between oil prices, exchange rate and stock market without knowing the financial market situation and the Jordanian economy. Firstly, Jordan is a net oil-importing country where energy imports accounted for 88% of the total primary energy demand in 2013. Moreover, the production of petroleum and other liquids has been steadily declining from its peak of 120,000 barrels per day, in the mid-1980s, to 60,000 barrels per day in 2013.

The objective of this empirical work is to use a VECM model to understand the relationship between oil price, US exchange rate and stock market price in Jordan. To meet this objective, we seek to address the following four questions:

1) What is the effect of oil prices on the Jordan stock prices?
2) What is the effect of the US exchange rate on the Jordan stock prices?
3) What is the causal effect between oil prices and stock market prices?
4) What is the causal effect between US exchanges rate and the stock prices?

There are plenty of reasons to choose these three relationships. Firstly, the relationship between stock prices and exchange rates can accurately predict the path of the exchange rate. This can have implications on the ability of multinational enterprises to manage their exposure to foreign contacts and the exchange rate they face. On the other hand, the currency is more often being incorporated as an asset in the investment fund portfolios. The knowledge of the relationship between currency rates and other assets in a portfolio is crucial for the performance of the fund. According to Khalid and Kawai (2003) and Yuko (2004), the knowledge of the link between the stock price exchanges may prove helpful to foresee a crisis. In the same way, these authors claim that the link between the stock and currency markets is due to the propagation of the 1997 Asian financial crisis.

Second, many logics let us think of the relation between oil prices and stock markets. On the one hand, the value of a share is equal to the sum of the expected future dividends discounted. The latter, which are affected by economic factors, can be influenced by the oil prices. In other words, the fluctuations of oil prices are responsible for the economic trough via declining productivity, excessive inflation, and weak economic growth. The increase of oil prices is a consequence of the increased import bill for oil resulting from transport and higher production costs. This leads to higher product prices and a rise of inflation. Apart from this, the volatility of oil prices increases the risk and uncertainty which, in turn, has a negative impact on stock prices and reduces the wealth of investment.

The rest of the paper is organized as follows. Section 2 discusses the literature review. Section 3 presents the data and empirical methodologies. Section 4 describes the results and their interpretations. Section 5 concludes this paper.

2. Brief review of literatures

The literature review is threefold. The literature of the relationship between oil prices and stock markets, the literature of the relationship between oil prices and exchange rate and the literature of the relationship between oil prices, exchange rate and stock markets. We discuss them in turn below.

2.1. Literature of relationship between oil prices and exchange rate

Some researchers (Amano and Van Norden, 1998; Camarero and Tamarit, 2002; Cologni and Manera, 2008; Rautava, 2004; Sai et al. 2010) showed that oil price has a long-term correlation with the exchange rate. Dooley et al (1995) and Nikos (2006) found that exchange rate fluctuations reflect the situations of individual countries. Golub (1983); Krugman (1983b) and Krugman (1983a) showed that there is a relationship between oil prices and exchange rates. Bloomberg and Harris (1995) found that exchange rate movements can affect oil prices. Zhang et al. (2008) found that the US dollar exchange rate has a significant influence on international oil prices in the long-run, but short-run effects are limited. Moreover, Akram (2009) found that a weaker dollar leads to higher commodity prices. Krugman (1983b) examined how exchange rates can either rise or fall in the short-run in response to an increase of oil prices. He showed that an increase of oil prices increases the incomes for oil exporters. If these petrodollars are recycled back into dollars then the demand for dollars rises in the short-run. He also showed that in the long-run, oil importers will experience depreciation in their currencies because of the adverse terms of trade effect. This expectation of future depreciation is enough to produce a drop in the dollar in the short-run even if petro dollars are recycled.

2.2. Relationship between oil prices and stock market

Filis et al. (2011) showed that any change of cash-flows or the required rate of return will have a significant effect on the stock prices. Kling (1985) used an Vector auto regression (VAR) to examine the impact of oil price movements on the S&P 500 and the index of five US industries over the 1973-1982 period. Chen et al. (1986) used a multivariate factor framework covering a larger set of monthly data over the 1953-1983 period. Qinbin and Mohammad (2012) employed a regression analysis to study if changes in monthly oil prices can reasonably predict the return of 49 US industry indices from 1979 to 2009. On the other hand, Hamao (1988) used a multi-factor analysis covering Japanese monthly data over the 1975-1984 period, whereas Faff and Brailsford (1999) examined the sensitivity of Australian stock returns to changes in oil prices. Jones and Kaul (1996) examined the effect of oil price changes on the activities of several developed stock markets, including Japan, Canada, US, and the UK, using quarterly data from 1970 to 19991. Driesprong et al. (2008) and Miller and Ratti (2009) showed a negative impact of oil price shocks on stock market activities. Tarak et al. (2014); Narayan and Narayan (2010) ; Nguyen and Bhatti (2012) studied the potential relationship between oil price shocks and stock returns of the developing countries. Mohanty et al. (2011) used a factor analysis to examine the relationship between oil return and stock return in GCC countries. These authors found a positive relationship between oil return and stock return in GCC countries, except for Kuwait. Fayyad and Daly (2011) employed a vector auto-regression analysis, and indicated the predictive power of oil for stock returns in the GCC, UK, and USA, during the financial crisis. Hammoudeh and Choi (2006) applied a vector-error correction model, and found that the US oil market has an indirect effect on the GCC stock markets. Maghyereh and Al-Kandari (2007) studied the importance of nonlinearity in describing the relationship between oil prices and GCC stock prices. Bouri et al. (2016) examined the mean and variance causality between world oil prices and the sectoral equity returns in Jordan before and after the Arab Uprisings that started in 2010 using GARCH process. They showed that the influence is not uniform across the equity sectors but is insignificant on the industrial sector. They also showed in terms of risk transfer, that oil is a negligible risk factor and there is still a significant evidence of risk transmission to the industrials sector during the Arab Uprising period. Al Janabi et al. (2010) found no relationship between oil price shocks and the stock market activities whereas, Basher et al. (2012) found a negative relationship between them. Malik and Hammoudeh (2007) employed a multivariate GARCH and found a significant volatility transmission from oil to all GCC stock markets except the Saudi market. On the other hand, Arouri et al. (2011) applied a vector auto-regression GARCH model, and suggest a substantial volatility linkages between oil and GCC stock markets. Park and Ratti (2008) examined the impact of oil price shock on the real stock returns in the US and 13 European countries. They found that Norway, as an oil exporter, shows a statistically significant positive response of real stock returns to an oil price increase. They also that, for many European countries, increased volatility of oil prices leads to the decrease of real stock returns. Jammazi and Aloui (2016) studied the impact of crude oil price on the stock market and found that the stock market variables negatively and temporarily react to the crude oil changes during moderate (France) and expansion (UK and France) phases but not at level to plunge them into a recession phase. Law et al. (2014) investigated the role of economic globalization in financial development in eight East Asian economies using the heterogeneous panel cointegration test. They showed that cointegration is present in economic globalization, institutions, financial development, real gross domestic product per capita, and financial reforms. Economic globalization is also found to have a favorable causal impact on the stock market development without going through the institutional quality channel. Law et al. (2014) investigated the role of economic globalization in financial development of eight East economies using the heterogeneous panel cointegration test. They showed that cointegration is present among economic globalization, institutions, financial development, real gross domestic product per capita, and financial reforms. They also found that economic globalization has a favorable causal impact on the stock market development without going through the institutional quality channel.

2.3. Literature of the relationship between the exchange rate and the stock market

Di Matteo et al. (2005) investigated the scaling properties of daily foreign exchange rates and stock market indexes. They showed that emerging stock markets show persistent characteristics, whereas developed stock markets are mean-reverting. They also found that the exchange rates present some persistence in general. Yang and Doong (2004) found that stock market movements have a significant impact on future exchange rate changes for the G7 countries from 1979 to 1999. They also found that stock markets have a more important informative content than foreign exchange markets. Phylaktis and Ravazzolo (2005) showed that stock market is positively related to foreign exchange market using the cointegration methodology and multivariate Granger causality test to a group of Pacific Basin countries. Pan et al. (2007) examined the links between the exchange rates and the stock markets for seven East Asian countries employing a VAR approach. They found that there is a significant bidirectional relationship between these markets before the Asian financial crisis. Chkili et al. (2011) applied a Markov-Switching EGARCH model to examine the dynamic relationship between the exchange rates and the stock returns in four emerging countries (Hong Kong, Singapore, Malaysia and Mexico) during both normal and turbulent periods. They found evidence of regime-dependent links and asymmetric responses of the stock market volatility to shocks affecting foreign exchange market. Diamandis and Drakos (2011) investigated the long and short-run dynamics between stock and foreign exchange markets for four Latin American countries, as well as their interactions with the US stock markets. They found that both economies are positively related and the US stock market represents a transmission channel for these links. Lin (2012) applies a similar approach to examine the comovement between exchange rates and stock prices for several Asian emerging markets. He showed evidence of stronger comovement during crisis periods, after some economic and policy events such as market openings and crises are accounted for. Ning (2010) employed different static copulas to investigate the dependence between equity and foreign exchange rate markets for six industrialized countries in the periods before and after the launch of the EUR. He found evidence of symmetric tail dependence. Michelis and Ning (2010) showed evidence of asymmetries between Canadian stock returns and the exchange rate against the USD. Lin (2011) examined copulas dependence in five East Asian economies. He found evidence of tail independence and asymmetric tail dependence. Wang et al. (2013) examined dependence between stock and foreign exchange markets in six major industrial countries applying a Markov switching copula. These authors showed that dependence and tail dependence were asymmetric in regimes where local currency values against the USD and stock returns were negatively correlated, but symmetric in regimes where local currency values against the USD and stock returns were positively correlated.

2.4. Literature of relationship between oil prices, exchange rate and stock market

Basher et al. (2012) examined the dynamic relationship between oil prices, exchange rates and emerging market stock prices using a structural vector auto-regression model. They found that positive shocks to oil prices tend to depress emerging market stock and US dollar exchange rates in the short run. They also found that increase in emerging market stock prices increases oil prices. Aloui and Ben Aissa (2016) investigated the dynamic relationship between energy, stock and currency markets using vine copulas based GARCH method. They found a significant and symmetric relationship between energy, stock and currency markets. They also found that the dependence structure is highly affected by the financial crisis and Great Recession over the 2007-2009 period. Jainn and Biswal (2016) examined the relationship between global prices of gold, crude oil, the USD-INR exchange rate, and the stock market in India using DCC-GARCH models and symmetric and asymmetric Nonlinear Causality tests.

They found a fall of gold and crude oil prices, which causes fall the value of the Indian Rupee and benchmark stock index.

All the above mentioned empirical studies consider the mean or variance effects in their identification of causal effects between oil prices, exchange rates, and stock markets. However, no study as far as we are aware has considered the relationship between oil prices, exchange rate and the stock market in Mediterranean countries very crucial in terms of intentional portfolio risk management. To fill this gap, we characterize the relationship between these three variables in Mediterranean countries, in particular, Jordan using VECM model.

On the basis of the findings of the macroeconomic models, the extension and the latest papers presented above, we assume the three following hypotheses about the relationship between three variables (US exchange rate, oil price, and Stock Market), which are formulated to test the validity of our findings.

H1: Oil prices and US exchange rate have a significant effect on the stock market prices in Jordan in the short and long-run.

H2: There is a unidirectional causality between the stock market prices and oil prices in Jordan.

H3: There is a unidirectional causality between the stock market prices in Jordan and the US exchange rate in Jordan.

3. Methodology and Data

First, we present the data, and then we examine the VECM model.

3.1. Data

The data used in this study are collected monthly between 2005 M1 and 2015M12. This period is chosen because it takes into account the occurrence of major political, financial and economic changes in the world market, such as, the financial crisis period and the political turmoil that started in the Arab world on December 17, 2010 and the banking and financial crisis of autumn 2008. These two phenomena also strengthen the ties between oil prices, exchange rate and stock market, among others.

We consider the West Texas Intermediate (WTI) which represents the crude oil market (measured in US dollars), exchange rate represents the movement of the dollar against the currencies of a broad group of major US trading partners. For stock market prices in Jordan is measured employing the MSCI stock market index in Jordan (measured in US dollars). Stock price, oil price, and exchange rate data are available from Datastream.

First, the series of stock index returns in Jordan is calculated from the series of the closing price index, according to the following formula:

$$\mathrm{rp_t = lnp_t - lnp_{t-1}}$$

$$rp_t = \ln(p_t/p_{t-1})$$

Where:

rp_t : The stock return, at time t,

p_t: The closing price of the stock market index, at time t,

p_{t-1} : The closing price of the stock market index, at time t-1.

When the stock market returns are calculated, w deflation to inflation (calculated as the log difference in the consumer price index in each country).

Second, the variable of crude oil price WTI, which we examine in real terms and then correcting it by the index of the world consumer prices. Subsequently, we apply the log difference to get real returns of WTI, according to the following formula:

$$ro_t = lno_t - lno_{t-1}$$

$$ro_t = ln(o_t/o_{t-1})$$

Where:

ro_t : The return of oil prices at time t

o_t: The WTI closing at time t

o_{t-1}: The WTI closing at time t-1

Third, the real effective exchange rate of the US dollar is estimated using logarithmic differences.

3.2. Methodology

The empirical model (VECM) uses the stock market price in Jordan, the real oil prices, the trade-weighted US dollar index. In this empirical work, we study the causal relationship between oil price, US exchange rate, and stock market price. To analyze this relationship, we apply the following steps. First, unit root tests are considered to identify the nature of the stationary (order of integration) of the time series variables as shown presented by the Equation (1) and (2). Second, the cointegration tests are considered to examine the existence of a long-term relationship between the time series variable, which is shown in Equations (3) and (4). Thirdly, if the variables are co-integrated, a standard VECM model is shown in Equations (5) and (6). Finally, we present our own model in equation (7).

3.2.1. Unit Root Test

First, the stationary approach is called a unit root test. A series is considered stationary if it does not have a unit root problem. Some tests have been developed for results, whether a series is stationary or not or includes a unit root. The fact whether a time series used in this model has unit roots or not has been investigated by employing the Augmented Dickey-Fuller (ADF-1979) and Phillips-Perron (PP-1988) test methods. It is decided upon rejection or acceptance of the H0 hypothesis by comparing the statistics obtained by the test with critical value (Enders, 1995). H0 hypothesis shows that the series is not stationary and has a unit root; H1 shows that the series is stationary. If the calculated value is higher than the absolute critical value, then H0 hypothesis is rejected and the series is decided to be stationary.

The equations applying in ADF (1) and PP (2) tests are given as follows:

$$\Delta Y_t = \beta_0 + \beta_{1t} + \delta Y_{t-1} + \sum_{i=1}^{m} \beta_i \, \Delta Y_{t-i} + u_t \quad (1)$$

$$\Delta Y_t = \omega_0 + \omega_1 (\frac{t-T}{2}) + \omega_2 Y_{t-1} \sum_{i=1}^{m} \Delta Y_{t-i} + \mathcal{E}_t \quad (2)$$

Where ΔY_t=$Y_t - Y_{(t-1)}$; t is the trend variable, stockastic error terms and T coefficient is the total number of observations.

In KPSS unit root test is calculated from two aspects being constant and constant-trend rather than three aspects as constant, constant-trend and none in ADF and PP tests. The null hypothesis of the KPSS stationarity test is the reverse of the null hypothesis of ADF and PP unit root tests (Basar and Temurlenk, 2007). Thus, the hypothesis to be built for KPSS test means that null hypothesis time series is stationary and on the other hand alternative hypothesis means that time series is not stationary (Sevuktekin and Nargelecekenler, 2005). Accordingly, KPSS tests have been implemented in addition to ADF and PP tests.

3.2.2. Johansen's co integration test

Second, cointegration method has been developed by Granger as a new method in research of long -term equilibrium relationships between variables. This method has been developed by Engle-Granger to look of the long and short-term equilibrium relationship. Thus, this last method has been developed by Engle and Granger and Johansen cointegration test and developed by Johansen and Juselius (1990).

For the use Johansen cointegration test, the financial time series are non-stationary and became stationary after differencing, i. e. integrated I (1). If there are two variables that are integrated after differencing, this means that they are non-stationary, and therefore it would be expected that the linear combination of them is also non-stationary.

The non-stationary in both series cancels each other and the error term becomes stationary (Asteriou and Hall, 2007). According to Veerbek (2008), when two variables are cointegrated, the relationship will show long term stability. Johansen cointegration test results are purposes to statistics; one is trace test and second is max Eigen values test.

To determine the number r, co-integrating, we will support the following equations:

$$\Delta lnY_t = \alpha_0 + \sum \beta_i \, \Delta lnY_t + \sum x_j \, \Delta lnX_t + \varepsilon_t \quad (3)$$

$$\Delta lnX_t = y_0 + \sum \sigma_i \, \Delta lnY_t + \sum \tau_j \, \Delta lnY_t + \varepsilon_t \quad (4)$$

Where, Δ is a difference operator, ε_t is a random error term with mean Zero, β_i , σ_i and x_j are the coefficient estimate of the independent variables, $y_0$and α_0 are drift terms.

To carry out the co-integration test, we have established the null hypothesis as there is no co-integration (r=0) among, the series variables, if Trace statistics or Max Eigen values exceed, the critical value, we will reject the null hypothesis of no cointegration, which suggests that coefficients values of the explanatory variables are not equal to zero. Consequently, the null and the alternative hypothesis of Johansen's cointegration test are presented in detail below:

HO: no co-integration exists between X_t and y_t ,(r=0)

H: co-integration exists between X_t and y_t ,(0 < r)

3.2.3. Vector Error- Correction Modeling (VECM)

If the variables are co-integrated, that is to say, 0<r, it will be possible to apply the VECM estimation method. In the opposite case, if both series have one unit root and are not cointegrated, then the bivariate VAR is estimated. Indeed, the error correction model (ECM) enables to capture the short-run dynamics and long-run equilibrium relation between two series. A number of authors confirmed this representation Theorem. For example, Durr (1993) showed that the error correction model (ECM) is appropriate when the dependent variable is known to exhibit short run changes in response to changes in the independent variables. According to Engle and Granger (1987), if a number of variables, for example, X and Y, are found to be cointegrated, there always exists a ECM representation, which implies that changes in the dependent variable are a function of the level of disequilibrium in the cointegrating relationship as well as changes in other explanatory variables (s). The short-term variation can be predicted by using ECM. According to Masih and Masih, the ECM takes the form of the following equation.

The equation used to test causality from income X_t to Y_t

$$\Delta Y_t = \alpha_O + \sum \beta_i \Delta X_{t-1} + \sum x_i \Delta Y_{t-1} + y_i ECT_{t-1} + \varepsilon_t \quad (5)$$

The equation used to test causality from income Y_t to X_t

$$\Delta X_t = \alpha_O + \sum \beta_i \Delta Y_{t-1} + \sum x_i \Delta X_{t-1} + y_i ECT_{t-1} + \varepsilon_t \quad (6)$$

Where: ECT=Y_t-δX_t

Where X_t and Y_t are the dependent and independent variables, respectively, Δ is a difference operator, ε_t is a random error term with mean Zero, β_i , σ_o and x_i are the coefficient estimates of the independent variables which need to be estimated by a VAR model, δ is the co-integrating factor, which may be derived through OLS regression in the first stage, y_i is the coefficient estimates for error correction term (ECT_{t-1}). Consequently, the null and the alternative hypothesis of the VECM causality test are presented in detail below:

HO: Coefficient estimates of β_i and x_i are equal to 0.

H1: At least one of the estimated coefficients of β_i and x_i is no equal to 0.

3.2.4. Econometric modeling of this study

According to the empirical literature analyzing causality between oil prices, US exchange rate, and emerging stock market, we have seen that in most cases, causality flows from oil price and US exchange rate to the stock market. Conversely, when causality flows in the opposite direction, the stock market in the small importers of oil, such as Jordan, does not have an impact on the exchange of US dollar and the world oil price. Thus, to analyze the causality between the studied variables series, this research has developed a VECM model. The model can be written as follows.

$$\Delta lnSM_t = \sigma_{10} + \sum \sigma_{11} \Delta lnSM_{t-1} + \sum \sigma_{12} \Delta lnOIL_{t-1} + \sum \sigma_{13} \Delta lnUSEX_{t-1} + y_{it} ECT_{t-1}\, \varepsilon_t \quad (7)$$

Where

$*ECT_{t-1} = lnSM_{t-1}$-$\Phi_0 - \Phi_1 lnOIL_{t-1} - \Phi_2 ln\ USEX_{t-1}$

*SM: Stock Market Returns in Jordan

*OIL: Oil prices

*USEX: US Exchange Rate

4. Main Results and interpretations

We have estimated the relationship between crude oil price, US exchange rate and Jordanian stock market for equation (7). These estimation results are presented step by step as follows.

4.1. Descriptive statistics

The following table reports the basic statistics of three series, including mean (Mean), standard deviations (Std-Dev), Skewness (Skew), Kurtosis (Kurt) and Jarque-Bera test (JB), of stock market returns, oil price returns and US exchange rate.

Table.1. Descriptive statistics

	US exchange rate	Oil prices	Stock Market
Obs	528	528	528
Mean	-6.32E-05	-0.004476	-0.009355
Std Dev	0.009348	0.088909	0.057121
Min	-0.024217	-0.297766	-0.252235
Max	0.039874	0.206417	0.177192

The summary statistics of monthly return series in three variables are noted in Table 1. We have seen that all the return series (US exchange rate, Oil prices, and Stock Market) have a negative mean at -6.32E-05, -0.004476 and -0.009355. Regarding the volatility, which is measured by the standard deviation, the highest standard deviation (volatility in stock returns) is found in oil prices at 0.088909. These values indicate the large fluctuations of oil prices during the period of our study. However, the lowest standard deviation is attributed to the US exchange rate at 0.009348.

4.2. Unit Root Test Results

Before looking at cointegration, we have to determine the order of integration of monthly return series in three variables. It is, as you know, the cointegration relationship is located within a set of non-stationary time series except where a linear combination of the variables that yields stationary finding can be identified. In order to prove this, we perform a unit root test using both the augmented Dickey- Fuller test (1979) and Phillips-Peron test (1988) with a lag of 2. These tests are applied to the level variables as well as to their first differences. The null hypothesis states that the variable under investigation has a unit root, whereas the alternative one does not. The finding of these two tests is presented in Table 2.

Table.2. Unit roots tests.

Variables		ADF			PP		
		C	CT	None	C	CT	None
US Exchange ra	Level	7.613 **	-7.583***	-7.642***	-7.556***	-7.526***	7.5863***
	Δ	10.956***	-10.918***	-10.99***	-23.658***	-23.56***	-23.74***
Oil Price	Level	-7.806***	-7.935***	-7.812***	-7.806***	-7.887***	-7.812***
	Δ	-17.25***	-17.185***	-17.31***	-33.541***	-33.44***	-33.39***
Stock Market	Level	-9.548***	-9.511***	-9.365***	-9.547***	-9.511***	-9.368***
	Δ	-10.73***	-10.693***	-10.77***	-50.568***	54.304***	-50.68***

Notes: ADF stands for Augmented Dickey Fuller test; PP stands for Phillips Perron test; C stands for constant; CT stands for constant and trend, *** denote significance at 1%,**denote significance at 5% and *denote significance at 10%.

To test the stationary of the series, we apply two different unit root tests: (i) the Augmented Dickey-Fuller (ADF) test; and (ii) the Phillips -Perron (PP) test. In fact, table 3 shows the findings of these tests for variables in levels and in first differences. All the tests reject the null hypothesis of non-stationary on the entire sample when the variables are used at level. These indicate that the variables (oil price, US exchange rate and stock market price) are stationary and therefore can be cointegrated I(0).

4.3. Number of lags selected

Before carrying the Johansen Cointegration test, we will determine the number of lags. For this reason, the lag selection criteria are used to determine the number of delays because it is necessary to avoid over-parameterized model, (al-qudah, 2014; Al-Eitan 2012). The optimal lag is appropriate to perform Cointegration test, Granger Causality test, the VAR and the VECM model. To select the appropriate number of delays length for the Vector Error Correction Model, the likelihood ratio statistic is employed, which follows the chi-squared distribution. The results obtained from the analysis are shown in the table (3). We use Schwarz information Criterion (SC) criteria and Akaike Information Criteria (AIC).

Table.3.Lag Order Selected Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	723.4281	NA	1.80e-09	-11.6198	-11.5515	-11.5920
1	747.1626	**45.9376***	**1.42e-09***	**-11.8574***	**-11.5845***	**-11.7465***
2	752.5574	10.1805	1.51e-09	-11.7993	-11.3216	-11.6052
3	758.0677	10.1316	1.60e-09	-11.7430	-11.0607	-11.4658
4	761.4538	6.0623	1.75e-09	-11.6524	-10.7654	-11.2921
5	764.0985	4.6067	1.94e-09	-11.5499	-10.4582	-11.1064
6	770.7743	11.3059	2.02e-09	-11.5124	-10.2160	-10.9858
7	777.5798	11.1960	2.10e-09	-11.4770	-9.9759	-10.8673
8	779.0593	2.3624	2.39e-09	-11.3557	-9.6499	-10.6628

Notes:*indicates lag order selected by the criterion

On the basis of Final Prediction Error (FPE), Akiake Information Criteria (AIC), Shwarz Information Criteria (SC) and Hamman-Quinn information criteria, we have seen that the optimal lag is one lag.

4.4. Johansen Cointegration Test

Table.3. Johansen cointegration tests with Trace and Maximum Eigenvalue.

(a) Cointegration Test (Trace)				
Hypothesized No.of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob***
None (k0)*	0.222817	68.10873	29.79707	0.0000
At most 1 (K 1)	0.160476	36.09471	15.49471	0.0000
At most 2(K 1)	0.103530	13.87991	3.841466	0.0002

(b) Cointegration Test (Maximum Eigenvalue)				
Hypothesized No.of CE(s)	Eigenvalue	Max-Eigen Statistic	0,05 Critical Value	Prob***
None (k0)*	0.222817	32.01402	21.13162	0.0010
At most 1 (K 1)	0.160476	22.21480	14.26460	0.0023
At most 2(K 1)	0.103530	13.87991	3.841466	0.0002

According to Yoo (2006), co-integration is defined as a systematic long-term co-movement between two or more variables. Table (3) shows the results and critical values of the ltrace and lmax tests for k=3. The result of Johansen cointegration test in the maximum eigenvalue and trace statistics watch that no more than two cointegration test in the maximum eigenvalue and trace statistics watch that no more than two cointegrating vectors exist. More specifically, that both tests reject r £ 3 in favor of r=2 at the 1% level of significance. Consequently, we conclude that there are two cointegrating vectors or r=2 and the variables are cointegrated and there is a long term relationship. Therefore, we apply the Granger causality test employing a vector error-correction model (VECM).

4.5. Vector error correction model (VECM) Results

In practice, the assumptions used for the construction of the VECM (see methodology) are all verified. As a consequence, a VECM model with two cointegration relationship and three variables I (1) is estimated.

Table.5. Vector Eroor-Corretion (VEC) Model-Estimation Results for logarithmic series

Long Term Block Estimation	
Amman Stock Market Index (-1)	1.000000
US Exchange Rate (-1)	-0.212065
	(0.87386)
	[-0.24268]
Oil Prices (-1)	-0.212329
	(0.08659)
	[-2.45199] **
C	
Short Term Block Estimation	
US Exchange Rate (-1)	-0.2643
	(0.5069)
	[-0.5215]**
US Exchange Rate (-2)	-0.6244
	(0.5034)
	[-1.2404]**
Oil Prices (-1)	-0.1227
	(0.0575)
	[-2.1330]**
Oil Prices (-2)	-0.2054
	(0.0560)
	[2.0976]**
C	
R-Squared	0.4476
Adj. R-squared	0.4156
F-statistic	14.0085

Note. T-statistic is provided in parenthesis [].

The normalized equation can be constructed as follows:

The estimated VEC model is presented in table 5. The result shows a significant relationship from oil price and US exchange rate to the Jordanian stock market. For oil price, the estimated coefficient on error correction is negative and statistically significant. This indicates that there is a significant long-run relationship between the Jordanian stock market and oil price. For the US exchange rate, the estimated coefficient on error correction is negative and statistically insignificant, which, implies that the US exchange rate does not have any impact on the Jordanian stock market in the long run. Therefore, it can be said that oil price is the only significant variable with a negative value of one lags when the Jordanian stock market is used as a dependent variable. In numerical terms, an increase of 1% in the oil prices leads to a decrease of the stock market to 0.212329%.

In the short run, the result shows that the Jordanian stock market is affected by the change of US exchange rate and the oil prices of two lags. For oil prices, we see that an increase of 1% of oil price leads to a significant decrease of the domestic stock market index by 0.6244 %.

We also remark that an increase by 1% of the US exchange rate leads to a significant decrease of the stock market by 0.2054 %. Namely, if the US exchange rate declines in value, the prices of goods and services tend to rise. Consequently, the imports become more expensive, which increases the export volume. As exports increase, profits rise and stocks in companies rise in value. Investors attempting to profit from the rising stock prices may shift their from bonds to stocks. Increased competition for stocks drives prices up even further.

This result is consistent with some of the studies presented in the literature review. The negative relationship between oil prices and the stock market is consistent with Basher et al. (2012) who examined the dynamic relationship between oil prices, exchange rates and emerging market stock prices using a structural vector auto-regression model. They found that positive shocks to oil prices tend to depress the emerging market stock. This result is also in line with that of Miller and Ratti (2009).Moreover, this result is not consistent with the results of Aloui et al. (2008) (for Canada) and Liu et al. (2013) and Malik and Ewing (2009), (for the industrial, financial and consumption sectors).

On the other hand, according to the academic literature, the negative relationship between the US exchange rate and stock market is completely consistent with that of Wang et al. (2013) who examined dependence between the stock and foreign exchange markets in six major industrialized countries. These authors showed that local currency values against the USD and stock returns are negatively correlated. Moreover, this result is not consistent with the early studies of Aggarwal (1981) who found that stock returns and U.S. exchange rates are positively correlated. Phylaktis and Ravazzolo (2005) showed that the stock market is positively related to the foreign exchange market using the cointegration methodology and the multivariate Granger causality test to a group of Pacific Basin countries.

These results can be explained as follows:

We begin first by explaining the presence of the long-run causality from the crude oil price to the stock market. This may justify that the rise of world oil prices improves the trade balance, leading to a higher current account surplus and improving net foreign asset position. At the same time, higher oil prices tend to decrease private disposable income and corporate profitability, which decrease the domestic demand and stock prices and causes the local stock market to decline .The result may also be explained by the degree of dependence of the Jordan as a net importer of oil on the right amount of barrels imported per day and the extent of the complexity of economic and trade relations with the petroleum exporting countries.

In contrast, an absence of the long-run relationship between the stock prices and the real exchange rates in Jordan can be explained as follows: The increase or decrease of the real effective exchange rate index is not more attractive for the domestic investors. As a result, they do not sell their foreign currency to buy the domestic stocks, which leads to the rise of the domestic stock price index.

Table.6. Speed of Adjustment Towards long-term

Series	Unrestricted adjustment parameters
Amman Stock Market Index US Exchange Rate Oïl prices	

4.6. Granger Causality tests

Table.7. Granger causality tests.

Hypothesis	F-Statistic	Prob.	Results
Stock market does cause US exchange rate	0.26525	0.7674	No Causality
US exchange rate does cause stock market	4.19540	0.0164	Existence of Causality
Stock market does cause oil price	0.58964	0.5561	No Causality
Oil price does cause stock market	4.25068	0.0164	Existence of Causality

Note: *, **, *** denotes p-value statistical significance at 10%, 5% and 1% level

According to the obtained results from table 5, it can be said that there is a unidirectional short run causal relationship from the Jordanian stock market to oil price and US exchange rate macroeconomic variables, since P value is (0.0164) and (0.0164), which is significant at 5%.This means that there is a short-run impact of the oil price and US exchange rate changes on the Jordanian stock market. It can also be said that the absence of causality in the opposite direction can be explored by the fact that Jordan is one the smallest importers of oil in the World, therefore it is obvious that its stock prices do not exert a significant influence on oil prices and on the US exchange rate. Therefore, it is fair to say that these two variables (US exchange rate and oil prices) are strongly exogenous since no other variables cause them in Granger's sense.

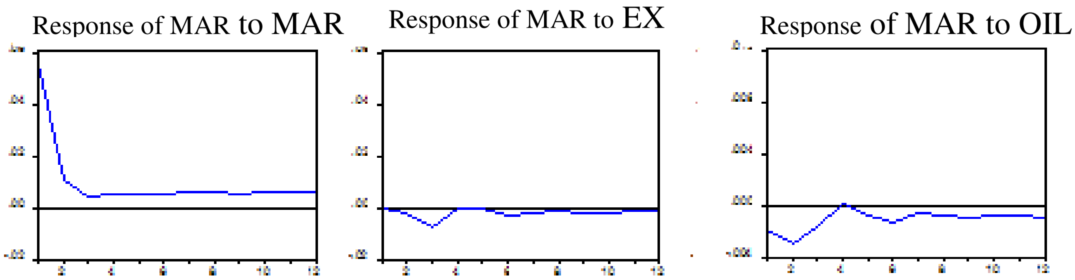
4.7. Impulse Response Function

How and what measures the shocks in stock markets are determined by innovations in the oil markets and the US exchange rate? Testing of impulse response functions (IRF) is an adequate tool to answer this question. The impulse response functions make it possible to measure the amplitude of the shocks over time and the time necessary for the market to assume its equilibrium after a shock. Based on the VECM model, it can be said that the impulse response function makes it possible to determine the amplitude and the duration of the response of the performance following the impact.

In order to interpret the analysis of the impulse response functions, we used the inverse of the Cholesky factor of the residual covariance matrix to orthogonalize the impulses. We have imposed a scheduling of variables on the basis of economic theory and Granger causality tests. The variables have been classified from the most exogenous to the most endogenous. In our study, the first two variables (Oil prices and US exchange rate) cannot be predicted by the evolution of the Amman Stock Market Index. This order implies that Jordan's stock market does not respond to the shocks of crude oil prices and the US exchange rate. Moreover, this order is in line with Basher et al. (2012).

Oil prices → US Exchange Rate → Amman Stock Market Index

The figure below shows only the impulse response functions of Jordan's equity returns, that is the stock market shocks (in the first column), US dollar exchange shocks (in the second column) and oil prices shocks (in the third column).



Note: Response Jordanian stock market to own shocks (MAR), US exchange rate shocks (EX) and oil price shocks (OIL).

Figure. 2. Response to Cholesky one Standard Deviation Innovations

The first column of Figure (2) shows the response of the stock market returns in Jordan to own shocks. Whereas the second column shows the response of the stock market to the US dollar exchange rate shocks, and the third column shows the response to oil price shocks.

The first column of Figure (2) shows the response of Amman's stock market index to its own shocks. We can see from the graph that the real stock return reacts positively to its own shocks for the first 2 months, then it becomes positive. This may be due to the Arab Spring, the international financial crisis and the crisis in Syria in the last 5 years.

From the second column in Figure (2), we can see that a positive shock on the US dollar exchange rate leads to a decrease of Amman's stock market index during the first months. Once passed the first period, the influence of the US dollar exchange rate on the stock returns becomes non-significant for the remaining 10 months. Therefore, how, can one explain this result? According to the annual report, the Jordanian fiscal situation is marked by significant debt, which reached 91, 7% of the GDP to its main partners (the United States, the Gulf countries, the EU, Japan and France). As a result, the Jordanian stock market declined but increased again in recent years.

The third column shows the impulse response that a shock to oil price has a significant and negative effect on Jordan's equity returns. As a result, how, can one explain this result? Jordan has very limited energy resources, which forces it to import a large part of these needs and makes its economy vulnerable. This refers to an increase of oil prices, which leads to an increase of the production cost, the increase prices of goods and services produced, and the decrease of demand. All this will decrease firms' production, profits and will be negatively reflected on Amman's stock market index. In addition, Jordan imported most of its oil from Iraq, but due to the Iraq war of 2003 it become more dependent on other oil- producing nations, which forced the government to raise the retail oil prices and taxes. Jordan's stock market, which is dependent on rising oil prices, has also been affected by the war and is therefore slowing its stock index.

5. Conclusion and Policy Implications

In this paper, we analyze the link between the oil price, the US exchange rate, and the stock market index in Jordan as a net oil importer country in the MENA region that has a well-diversified stock market and an economy highly sensitive to the changes of oil prices by using VECM model in the 2005-2015 period. The research goal is to see if there is a significant relationship between these three variables, to identify the nature of this relationship and to check whether it's a long-run or short-run relationship.

The vector error correction model and the cointegration test show that the stock price index in Jordan is cointegrated with two of macroeconomic variables, such as oil prices and US exchange rate that provide a direct long-run equilibrium link with the stock price index. Additionally, the paper concludes that both macroeconomic variables are significantly negative in the short-run in predicting changes in the stock prices. In the long term, we have seen significant changes. In addition, oil prices have long and short-run negative effect on stock prices whereas the US exchange rate has a significant negative effect on the stock prices only in the short term. Therefore, our basic hypothesis, according to which (Oil prices and US exchange rate have a significant effect on the stock market prices in Jordan in the short and long-run), is not completely confirmed since the exchange rate has an impact only in the short term.

As we have seen, the U.S. dollar has an impact on every segment of the economy, including the stock market. A strong dollar is synonymous with falling equity prices, while a weaker dollar can cause stock prices to rise. In our study, the absence of a relation between the USD currency valuations and the stock market in Jordan in the long-run means that a weak dollar is not necessarily good news for the stock market. From this reason, how, can one explain this result? In1995, Jordan pegged its national currency to the US dollar, because it into consideration that the dollar represented the biggest currency in the world and constituted the international reserve currency. For this very reason, the central bank has large reserves in US dollars to meet its needs for goods and services. For the same reason, companies and investors bought dollars when other nations experience economic problems. Conversely, investors often sold dollars when the U.S. economy went into a recession.

From a political point of view, the statistically significant negative relationship between crude oil price and Jordanian stock market in the long-run can be explained as follows: between 750,000 and 1 million Iraqi refugees fled to Jordan, which has already suffered greatly from the repercussions of the conflict in Iraq, its main export market. In addition, Iraq supplied Jordan with the oil at reduced prices. The occupation of Iraq by the USA caused a sharp rise of oil prices in Jordan. This, in turn, generated a downturn in the economy and the stock market.

Another extensive economic explanation is that a rise of oil prices leads to an increase of production cost, of prices of goods and services produced, and the decrease of demand for oil. All of these points will decrease companies' production profits and negatively affect the stock market prices.

The findings in this study have three limitations related mainly to the data used and the estimated model.

First, the use of monthly instead of weekly data represents a limitation in our study. In most studies, weekly data better represent the dynamics of the stock and oil markets, which is not the case with monthly data. According to the study of Mohamed El Hedi Arouri and Christophe Rault (2012), weekly data may adequately capture the interaction between oil and stock prices in the region.

In the second case, the number of intervening variables is limited. In addition, we can consider several other macroeconomic and financial variables, such as inflation, credit to the private sector, real gross demotic product (GDP) and interest rate.

In the third case, the use of a VECM as an estimation method does not help determine the volatility transmission between oil prices, exchange rate, and stock market index. For this reason, we can use the MGARCH model introduced by Engle (2002).

Recently, and according to the data released by the World Bank report, the fall of oil prices since the 2nd semester of 2014 has been a positive shock to Jordan as it stimulates its growth by lowering production costs. Furthermore, there are several possible studies on the impact of oil prices on Amman's stock market index during the last oil price fall. This version will be a possible line of research in the future. In addition, another interesting question that arises from the above empirical analysis is the following, what is the impact of the last oil price fall on the stock market and the economy of Jordan? In the other words, had there been an increase in the stock market index, would have been there much better economic growth?

References

Aggarwal, R. (1981). Exchange rates and stock prices: a study of the U.S. capital markets under floating exchange rates. Akron Business and Economic Review, 7-12.

Akram, Q.F. (2009). Commodity prices, interest rates and the dollar. Energy Econ, 31, 838-851.

Al Janabi, M; Hatemi, J.A; Irandoust, M. (2010). An empirical investigation of the information efficiency of the GCC equity markets: evidence from bootstrap simulation. Int. Rev. Financ. Anal, 19, 47-54.

Al-Eitan, G.N. (2012). A dynamic model for determining inward foreign direct investment in Jordan, the twenty-fifth PhD conference in economics and business, The University of Western Australia, 7th-9th November.

Aloui, C; Jammazi, R. (2009). The effects of crude oil shocks on stock market shifts behaviour: A regime switching approach. Energy Economics. 31, 789-799.

Aloui, C ; Jammazy, R ; Dhakhlaoui, I. (2008). Crude oil volatility shocks and stock market returns. The Journal of Energy Markets, 1, 3 (2008), p.69–96.

Aloui, R ; Ben Aissa, M.S. (2016). Relationship between oil, stock prices and exchange rates : A vine copula based GAARCH method, North American Journal of Economics and Finance, 37, 458-471.

Al-Qudah, A. (2014). Stock exchange development and economic growth : empirical evidence from Jordan, accepted at, International Journal of Business and Management, 9 (11).

Amano, R. A;Van Norden, S. (1998). Oil prices and the rise and fall of the US real exchange rate. Journal of international Money and finance, vol.17 (2), pp. 299-316.

Arouri, M ; Lahiani, A ; Nguyen, K.D. (2011). Return and volatility transmission between oil prices and stock markets of the GCC countries. Econ. Model, 28, 1815-1825.

Asteriou, D ; Hall, S. (2007). Applied Econometrics : A Modem Approach, Palgrave Macmillan, New York.

Basar, S ; Temurlend, M.S. (2007). Cevreye uyarlanmis Kuznets egrisi : Turkiye uzerine bir uygulama. Ataturk Universitesi Iktisadi ve Idari Bilimler Fakultesi Dergisi, 21 (1), 1-12.

Basher, S. A; Haug, A. A; Sadorsky, P. (2012). Oil prices, exchange rates and emerging stock markets. Energy Economics. 34(1), 227-240.

Bildirici, M.E ; Turkmen, C. (2015). Non linear causality between oil and precious metals. Resour. Policy, 46, 202-2011.

Blanchard, O.J ; Gali, J. (2010). The macroeconomic effects of oil price shocks: why are the 2000s so different from the 1970s? In: Gali, J., Gertler, M. (Eds.), International Dimensions of Monetary Policy. University of Chicago Press, pp. 373–428.

Bloomberg, S.B ; Harris, E.S. (1995). The Commodity-Consumer Price Connection : Fact or Fable ? Federal Reserve Board of New York. Economic Policy Review, 21-38.

Bouri, E ; Awartani, B ; Maghyereh, A. (2016). Crude oil prices and sectoral stock returns in Jordan around the Arab uprisings of 2010. Energy Economics, 56, 205-214.

Camarero, M ; Tamarit, C. (2002). Oil prices and Spanish competitiveness : a cointegrated panel analysis. J. Policy Model, 24 (6), 591-605.

Chen, N.F ; Roll, R ; Ross, S. (1986). Economic forces and the stock market. J. Bus, 59, 383-403.

Chkili, W ; Aloui, C ; Masood, O ; Fry, J. (2011). Stock market volatility and exchange rates in emerging countries : a Markov-state switching approach. Emerging Markets Review, 12, 272-292.

Cologni, A ; Manera, M. (2008). Oil prices, inflation and interest rates in a structural cointegrated VAR model for the G-7 countries. Energy Econ, 30 (3), 856-888.

Di Matteo, T ; Aste, T ; Dacorogna, M.M. (2005). Long-term memories of developed and emerging markets : using the scaling analysis to characterize their stage of development. Journal of Banking & Finance, 29, 827-851.

Diamandis, P ; Drakos, A. (2011). Financial liberalization, exchange rates and stock prices : exogenous shocks in four Latin America countries. Journal of Policy Modeling, 33, 381-394.

Dickey D.A; Fuller W.A. (1979), 'Distributions of the Estimators for Autoregressive Time Series with a Unit Root', Journal of the American Statistical Association, 74, 427-431.

Dooley, M.P ; Isard, P ; Taylor, M.P. (1995). Exchange rates, country-specific shocks, and gold. Appl. Financial. Econ, 5 (3), 121-129.

Driesprong, G ; Jacobsen, B ; Matti, B. (2008). Striking oil : an other puzzle. J. Financ. Econ, 2, 307-327.

Durr, R.H. (1993). What Moves Policy Sentiment ? American Political Science Review, 87, 158-170.

Enders, W. (1995). Applied Econometric Time Series, New York, NY ; John Wiley & Sons, Inc.

Engle, R. F. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. Journal of Business and Economic Statistics, 20, 339-350.

Engle, R.F ; Granger, C.W.J. (1987). Co-integration and Error Correction : representation, estimation and testing. Econometrica, 55, 251-276.

Faff, R.W; Brailsford, T.J. (1999). Oil price risk and the Australian stock market. J. Energy Financ. Dev, 4 (1), 69-87.

Fayyad, A ; Daly, K. (2011). The impact of oil price shocks on stock market returns : comparing GCC countries with the UK and USA. Emerg. Mark. Rev, 12 (1), 61-78.

Filis, G ; Degiannakis, S ; Floros, C. (2011). Dynamic correlation between stock market and oil prices : the case of oil-importing and oil-exporting countries. Int. Rev. Financ. Anal, 20, 152-164.

Golub, S. (1983). Oil prices and exchange rates. Econ. J. 93, 576-593.

Hamao, Y. (1988). An empirical examination of the arbitrage pricing theory : using Japanese data. Jpn. World Econ, 1, 45-61.

Hammoudeh, S ; Choi, K. (2006). Behavior of GCC stock markets and impacts of US oil and financial markets. Res. Int. Bus. Financ, 20 (1), 22-44.

Herrera, A.M ; Pesavento, E. (2009). Oil price shocks, systematic monetary policy, and the « Great Moderation ». Macroecon. Dyn, 13, 107-137.

Jain, A; Biswal, P. C; 2016. Dynamic linkages among oil price, gold price, exchange rate, and stock market in India. Resources Policy. 49, 179-185.

Johansen, S ; Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. Oxf. Bull. Econ. Stat, 52 (2), 169-210.

Jones, C.M ; Kaul, G. (1996). Oil and stock markets. J. Financ, 51 (2), 463-491.

Khalid, E ; Kawai, M. (2003). Was financial market contagion the source of economic crisis in Asia ?; Evidence using a multivariate VAR model. Journal of Asian Economics, 14, 131-156.

Kling, J.L. (1985). Oil price shocks and the stock market behaviour. J. Portf. Manag, 12 (1), 34-39.

Krugman, P. (1983a). Oil and the dollar. In : Bhandari, J.S ; Putnam, B.H. (Eds.), Economic Interdependence and Flexible Exchange Rates. Cambridge University Press, Cambridge.

Krugman, P. (1983b), Oil shocks and exchange rate dynamics In Exchange Rates and International Macroeconomics, University of Chicago Press.

Law, S.H ; Azman-Saini, W.N.W ; Tan, H.B. (2014). Economic globalization and financial development in East Asia : a panel cointegration and causality analysis. Emerging Markets Finance and Trade, 50 (1), 210-225.

Li, X.-L; Balcilar, M; Gupta, R; Chang, T. (2013). 'The causal relationship between economic policy uncertainty and stock returns in China and India: Evidence from a bootstrap rolling-window approach'. Available at: https://web.up.ac.za/sitefiles/file/40/677/WP_2013_45.pdf.

Lin, C.H. (2012). The comovement between exchange rates and stock prices in the Asian emerging markets. International Review of Economics and Finance, 22, 161-172.

Lin, F. (2011). Tail Dependence between Stock Index Returns and Foreign Exchange Rate Returns- A Copula Approach.

Liu, Ming-L; JI, Qiang ; FAN, Ying. (2013). How does oil market uncertainty interact with other markets? An empirical analysis of implied volatility index. Energy, 55, p.860-868.

Maghyereh, M ; Al-Kandari, A. (2007). Oil prices and stock markets in GCC countries : new evidence from non linear cointegration analysis. Manag. Financ, 33 (7), 449-460.

Malik, F ; Ewing, B.T. (2009). Volatility transmission between oil prices and equity sector returns. International Review of Financial Analysis, 18, 95-100.

Malik, F ; Hammoudeh, S. (2007). Shock and volatility transmission in the oil, US and Gulf equity markets. Int. Rev. Econ. Financ, 16 (3), 357-368.

Masih, A. M. M; Masih, R. (1996). Energy Consumption, Real Income and Temporal Causality: Results from a Multi-Country Study based on Cointegration and Error-Correction Modeling Techniques. Energy Economics, 18, 165-183.

Michelis, L ; Ning, C. (2010). The dependence structure between the Canadian stock market and the USD/CAD exchange rate : a copula approach. Canadian Journal of Economics, 43, 1016-1039.

Miller, J.I ; Ratti, R.A. (2009). Crude oil and stock markets : stability, instability, and bubbles. Energy Econ, 31 (4), 559-568.

Mohanty, S.K ; Nandha, M ; Turkistani, A.Q ; Alaitani, M.Y. (2011). Oil price movements and stock market returns : evidence from Gulf Cooperation Council (GCC) countries. Glob. Financ. J, 22 (1), 42-55.

Narayan, P ; Narayan, S. (2010). Modelling the impact of oil prices on Vietnam's stock prices. Appl. Energy, 87 (1), 356-361.

Nguyen, C ; Bhatti, M.I. (2012). Copula modelling dependency between oil prices and stock markets : evidence from China and Vietnam. J. Int. Financ. Mark. Inst. Money, 22 (4), 758-773.

Nikos, K. (2006). Commodity prices and the influence of the US dollar. World Gold Counc, 1, 1-12.

Ning, C. (2012). Dependence structure between the equity market and the foreign exchange market-a copula approach. Journal of International Money and Finance, 29, 743-759.

Ning, C. (2010). Dependence structure between the equity market and the foreign exchange market–A copula approach. Journal of International Money and Finance. 29, 743. 759.

Pan, M.S ; Fok, R ; Liu, Y. (2007). Dynamic linkages between exchange rates and stock prices : evidence from East Asian markets. International Review of Economics and Finance, 16, 503-520.

Park, J ; Ratti, R.A. (2008). Oil price shocks and stock markets in the US and 13 European countries. Energy Econ, 30, 2587-2608.

Phillips, P.C.B ; Perron, P. (1988). Testing for unit root in time series regression. Biometrica, 5, 335-346.

Phylaktis, K ; Ravazolo, F. (2005). Stock prices and exchange rate dynamics. Journal of International Money and Finance, 24, 1031-1053.

Qinbin, F ; Mohammad, J.P.R. (2012). U.S. industry-level returns and oil prices. Int. Rev. Econ. Financ, 22 (1), 122-128.

Rautava, J. (2004). The role of oil prices and the real exchange rate in Russia's economy- a cointegration approach. J. Comp. Econ, 32 (2), 315-327.

Rogoff, K. (1991). Oil, productivity, government spending and the real yen-dollar exchange rate. FRB of San Francisco. Working Papers, 91-06.

Sevuktekin, M ; Nargelecekenler, M. (2005). Zaman serisi analizi. Izmir : Nobel Yayin Dagitim.

Tarak, N.S ; Kalpataru, B ; Debasish, M. (2014). An empirical study on the dynamic relationship between oil prices and Indian stock market. Manag. Financ, 40 (2), 200-215.

Verbeek, M. (2008). A Guide to Modem Econometrics, 3rd Edition, John Wiley & Sons Ltd ; Netherlands : Erasmus University Rotterdam.

Wang, Y ; Wu, C ; Yang, L. (2013). Oil prices shocks and stock market activities : evidence from oil-importing and oil-exporting countries. J. Comp. Econ, 41, 1220-1239.

Yang, S.Y; Doong, S.C. (2004). Price and volatility spillovers between stock prices and exchange rates : empirical evidence from the G-7 countries. International Journal of Business and Economics, 3, 139-153.

Yoo, S. (2006). "The Causal Relationship between Electricity Consumption and Economic Growth in the ASEAN Countries". Energy Policy, 34, pp. 3573-3582.

Zhang, Y.F ; Fan, Y ; Tsai, H.T ; Wei, Y.M. (2008). Spillover effect of US dollar exchange rate on oil prices. Journal of Policy Modelling, 30, 973-991.