Saudi stock market, energy prices and gold prices

Saudi Stock Market, Energy Prices and Gold Prices: An Empirical Study of Their Dynamic Relationship

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ABSTRACT

This study aimed to analyze the relationships among the Saudi stock market, energy prices, and gold prices using daily data for the period from January, 2004, to April, 2015. In this study, the Saudi stock market, oil prices, natural gas prices, and gold prices are analyzed using a Vector Autoregression Model (VAR) and Causality analysis for Saudi Arabia. The results of the VAR suggest that oil and gold prices are significantly affecting the Saudi stock market. Also,oil prices affecting positively and gold prices affecting negatively on Saudi stock market. Therefore, the results of the VAR granger causality suggest that oil and gold prices cause the Saudi stock market . Hence, the results confirm that there is a dynamic relationship between the Saudi stock market, oil prices, and gold prices. These findings may be valuable for investors and policymakers in understanding the dynamic relationship between the Saudi stock market, energy prices, and gold prices.

Key words: dynamic relationship, energy prices, gold prices, Saudi stock market, VAR, Granger causality.

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I would like to extend my thanks and praise to God, who gave me the strength to perform this work. I hope that my work will be in the balance of the Day of Resurrection. "يوم لاينفع مال ولابنون ، إلا من اتى الله بقلب سليم"

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Saudi Arabia is an oil-producing country and the world's largest oil exporter and producer. Saudi Arabia's objective is to be the biggest renewable energy market in the world. Energy is the most important resource in our lives; thus, energy is used to complete work. Saudi Arabia has taken steps to expand its energy sector and support greater investment, especially by foreign companies. Saudi Arabia also continues to invest in the energy sector itself. Energy plays an important role in the growth of the Saudi economy and financial markets; in this context, Saudi Arabia is one of the most important countries on Earth, holding around a quarter of the world's proven oil reserves.

Why is Saudi Arabia the perfect investment opportunity? Saudi Arabia has the 19th largest economy in the world, the biggest economy in the Middle East and North Africa (MENA) region, is one of the fastest-growing countries in the world (as evidenced by 2012 economic growth of 6.8%), holds 25% of the world's oil reserves, and is the largest recipient of foreign direct investment in the Arab world because of the ease with which it allows investors to register property[1].

Oil is the main input in the production of different goods. Thus, when oil prices are changing, this changes expected future cash flows and influences the cost of production. Therefore, stock prices influence oil price changes. Most economists agree that when oil prices change, this leads to changes in the stock market. However, there is no consensus on the trend of this effect. In the event of oil price increases, Saudi Arabia will earn more revenues from oil exports; this must have a positive effect on Saudi stock prices. Moreover, when Saudi Arabia imports products from oil-importing countries, the cost of these imports must increase; this must have a negative influence on Saudi stock prices. Therefore, the relationship between stock prices and oil prices in Saudi Arabia is ambiguous or unclear (Kalyanaraman, 2014). The instability of the Gulf Cooperation Council

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[1] (https://www.sagia.gov.sa/en/Key-sectors1/Energy/).

GCC stock market in relation to changes in oil prices is evidenced by the importance of these countries in the international oil market. These countries represent 47% of the world's oil reserves, produce 20% of all the oil in the world, and represent 36% of the world's oil exports. This shows that there is a powerful relationship between oil price and the Saudi economy (Almohaimeed & Harrathi, 2013).

Changes in oil prices represent one of the most important factors for understanding fluctuations in the Saudi stock market (Alhayki, 2014). Several studies have examined the relationship between oil prices and the stock market of the GCC countries and Saudi Arabia in particular. Some have found that there is a relationship between oil prices and the Saudi Arabian stock market, such that the Saudi stock market is influenced by oil price changes (Arouri et al., 2010, 2011;Zarour, 2006; Hammoudeh & Eleisa, 2004; Kalyanaraman, 2014). Others have found that the Saudi stock market is not affected by oil price changes (Arouri & Fouquau, 2009; Hammoudeh & Choi, 2006).

1.2 Research Question

This research seeks to answer the following question: What is the nature of the relationship between the Saudi stock market, energy prices, and gold prices?

1.3 Objective of the Research

This research focuses on energy prices (i.e., oil and natural gas prices), gold prices, and the Saudi stock market. The purpose of this study is, generally, to examine the relationships between the Saudi stock market, energy prices, and gold prices, and how they mutually react (either positively or negatively).

1.4 Justification of the Research

The increase in oil prices in recent years has increased interest in the relationship between oil prices and the stock market. The recent decline in oil prices has motivated this study to explore the relationships between the Saudi stock market, energy prices, and gold prices in order to assess the impacts of oil, natural gas, and gold prices on the Saudi stock market (and vice versa). This study's results may inform portfolio managers and investors of the relationships between the Saudi stock market, energy prices, and gold prices. Thus, this research may help to serve portfolio managers and investors as a reference for engaging in portfolio diversification and investment strategies.

1.5 Hypotheses of the Research

Hypothesis 1

H_0= The selected variables are non-stationary variables.

H_{1a}= The selected variables are stationary variables.

Hypothesis 2

H_0= There is no causal relationship between the variables.

H_{1a}= There is a significant causal relationship between the variables.

The results of studies examining the relationship between stock prices and oil prices have revealed different results. Hence, this area of study requires more research, particularly in the context of Saudi Arabia, since studies on Saudi Arabia are very few (Kalyanaraman, 2014). The objective of this study is to analyze the relationships between the Saudi stock market, energy prices, and gold prices in order to assess the impacts of oil, natural gas, and gold prices on the Saudi stock market (and vice versa). The remainder of this research is organized as a follows. Section 2 presents the literature review. Section 3 describes the study methodology. Section 4 presents a discussion of the findings. Section 5 concludes the study.

CHAPTER 2: LITERATURE REVIEWS

2.1 Introduction

This study divides its literature review into studies of the relationship between energy prices and the stock market, which include more recent studies on the international market and on emerging and developing countries, and studies on the GCC countries and Saudi Arabia.

2.2 Energy Prices and the Stock Market

2.2.1 Works on International Countries

Early studies explored the impact of oil price changes on economic activity, rather than on the stock market. Thus, studies on the relationship between oil prices and the stock market are few. Hamilton (1983) analyzed the relationship between oil prices and Gross National Product (GNP) for the US economy and found that there is a powerful relationship between oil prices and GNP growth in the US.

The relationship between energy prices and the stock market has been studied for 20 years. Sadorsky (2001) studied the relationship between energy prices and Canadian oil and gas industry stock returns. He used a multifactor market model to identify and explore this relationship and found that crude oil prices, interest rates, and exchange rates all had significant effects on the stock returns of Canadian oil and gas industry.

Basher and Sadorsky (2006) were the first to examine the effect of oil prices on 21 emerging[2] stock market returns, which they observed for the period from December 31, 1992, to October 31, 2005. They found that oil price risk has powerful effects on the returns of emerging stock markets.

Mohammad *et al*. (2009) examined the relationship between macroeconomics variables and the Karachi Stock Exchange (KSE) for the period from 1986 to 2008 using an Auto Regressive Integrated Moving Average (ARIMA) model. They found that foreign exchange reserves and foreign exchange rates significantly impacted the KSE, but that Gross Fixed Capital Formation (GFCF) and the Industrial Production Index (IPI) had insignificant impacts on the KSE. Moreover, the outside factors of the foreign exchange and the money rate or

[2] Including Brazil, Argentina, India, Chile, Indonesia, Colombia, Jordan, Mexico, Israel, Malaysia, Korea, Peru, Pakistan, the Philippines, Sri Lanka, Poland, Thailand, South Africa, Taiwan, Venezuela, and Turkey.

money supply (M2) had a positive impact on stock prices, while the inside factors of capital formation and increased production had an insignificant impact on stock prices.

Jawadi *et al*. (2010) examined the relationship between stock markets and oil prices in emerging and developed[3] markets and concluded that there was a nonlinear relationship between stock markets and oil prices in emerging and developed markets.

Sujit and Kumar (2011) used daily data for the period from January 2, 1998, to June 5, 2011, along with vector autoregressive and cointegration techniques, to explore the relationships between oil prices, gold prices, exchange rates, and stock market returns. Their study found that exchange rates are heavily influenced by changes in oil and gold prices, but that the exchange rate is less influenced by changes in the stock market.

Broadstock *et al*. (2012) examined asset pricing and dynamic conditional correlation (DCC) models over the period from January 7, 2000, to May 27, 2011, on weekly basis to determine the impact of international oil prices on energy related stock returns in China. They found that there was a strong relationship between these factors during the period of the financial crisis (2008) and that investors in the Chinese stock market and, particularly, in energy related stocks are affected by changes to international oil prices.

Unal and Korman (2012) tested the bivariate extreme value relationship between oil prices and the Turkish stock market from January 1988 to August 2011. They found that, between 1988 and 1999, there was an absence of extreme dependence between stock markets and oil; thus, investors could obtain diversification opportunities, By contrast, from 2000 to 2011, there was greater dependence between stock markets and oil; thus, during this time, investors had to be very careful in seeking diversification opportunities.

Eryigit (2012) examined weekly data for Turkey for the period from January 7, 2005, to October 31, 2008. The study used a VAR model in Turkey to explore the relationships between oil prices, the Istanbul stock exchange market index (ISE-100), exchange rates, and interest rates. It found that there are dynamic relationships between the Istanbul stock exchange market index, oil prices, interest rates, and exchange rates.

[3] Including Mexico and the Philippines.

Ersoy (2013) examined the relationship between energy consumption and the Turkish stock market using cointegration and causality tests for the period from 1995 to 2011. He found a unidirectional causal relationship from the Borsa Istanbul Stock Exchange (BIST) to energy consumption.

Ergun and Ibrahim (2013) studied the impacts of a market index, oil prices and natural gas prices on stock prices for energy companies in Turkey from 2005 to 2011. They found that the market index has a perpetual positive impact on the stock prices of energy companies, but that oil and natural gas may have positive impacts one year and negative impacts the next on the stock prices of energy companies.

Bhunia and Mukhuti (2013) used a Granger causality test to explore the effect of domestic gold prices on Indian stock exchanges from January 2, 1991, to August 10, 2012. They concluded that there was no relationship or causality between gold prices and Indian stock exchanges.

Jawad (2013) analysed the effects of oil demand and supply on oil prices using a GARCH (1, 1) model for the period from 1973 to 2011. He found that oil supply had an insignificant effect on oil prices, but that oil demand had a significant effect on oil prices.

Behname (2013) examined the relationships between market size, inflation, unemployment, and energy using a short-term Granger model for the period from 1980 to 2009. He showed that oil prices are the reason for inflation and economic growth and that there is a bilateral relationship between market size and unemployment. Therefore, countries that import oil must be willing to decrease the effect of oil volatility on economic growth.

Sahu *et al*. (2014) analysed the relationship between oil prices and the Indian stock market from January 2001 to March 2013 and concluded that there was a positive long-run relationship between oil prices and the direction of Indian stock market indices.

2.2.2 Works on GCC Countries

Hammoudeh and Eleisa (2004) explored the relationships between the stock markets of four GCC member countries (Kuwait, the United Arab Emirates, Bahrain, and Saudi Arabia) and oil and found that oil prices were linked only with the stock market of Saudi Arabia.

Hammoudeh and Choi (2006) studied the relationships among GCC countries' weekly equity index returns and oil prices, the U.S. Treasury bill rate, and the Standard and Poor's 500 index. They found that oil prices had no direct impact on equity index returns.

Zarour (2006) identified the impact of oil price changes on GCC countries' stock markets by using a VAR analysis for the period from May, 2001, to May 24, 2005. He found that only the stock markets of Oman and Saudi Arabia responded to high oil prices. Furthermore, the stock market of Saudi Arabia was found to be more responsive to shocks in oil prices.

Maghyereh and Kandari (2007) examined the correlation between stock markets of GCC countries (Saudi Arabia, Oman, Kuwait, and Bahrain) and oil prices. They found that oil prices affect the stock markets of GCC countries in a nonlinear way.

Arouri and Fouquau (2009) studied the short-term relationships between GCC stock markets (the United Arab Emirates, Bahrain, Oman, Kuwait, Qatar, and Saudi Arabia) and oil prices and concluded that Oman, the United Arab Emirates, and Qatar demonstrated significant relationships between stock prices in these markets and oil prices. However, the stock markets of Kuwait, Bahrain and Saudi Arabia were found to not be affected by oil price changes.

Arouri *et al*. (2010) also studied the short-term relationships between GCC stock markets and oil prices using linear and nonlinear models. They concluded a different result from their previous study (2009), despite the two studies having the same purpose and using the same models. The authors found that the stock market returns of Oman, Qatar, the UAE, and Saudi Arabia interacted significantly with oil price variations. However, the stock markets of Kuwait and Bahrain were not affected by oil price variations. Thus, the relationships between the stock markets of GCC countries and oil prices were found to be nonlinear and to shift according to oil price values.

Arouri *et al*. (2011) also examined the return correlations and transmission of volatility between the stock markets of GCC countries and oil prices. They identified a significant spillover of fluctuations from oil prices to the stock markets of GCC countries.

Ghorbel and Boujelbene (2013) analyzed the infectious impact of the US financial crisis and the oil shock on the stock markets of BRIC[4] and GCC countries. They found that the US financial crisis and oil shocks had a significantly strong impact on the stock markets of BRIC and GCC countries.

Alhayki (2014) explored the relationship between stock market returns for GCC countries and oil prices. The study concluded that the stock markets of Saudi Arabia, the United Arab Emirates, and Bahrain had negative relationships with oil prices, while Qatar, Kuwait, and Oman had positive relationships.

Harrathi and Almohaimeed (2015) examined the conditional dependencies between oil prices and GCC stock market and portfolio management strategies in situations of structural breaks. They showed that adding structural breaks minimized the persistence of fluctuations. Thus, they achieved conclusive outcomes concerning the conditional dependencies between GCC stock markets and oil prices, finding that these fluctuations reduce both shocks and fluctuation spillover effects.

[4] Including Brazil, Russia, India, and China.

2.2.3 Works on Saudi Arabia

Almohaimeed and Harrathi (2013) examined the transmission of volatility and the correlations between the stock market, sector indexes,[5] and oil prices using daily data for the period from January 3, 2009, to March 21, 2012, and employing a multivariate GARCH model. They found that oil prices had a negative volatility spillover impact on sector stock returns. In particular, the study found an impact of volatility transmission between sector stock returns and the stock market for all sectors Except the telecom sector.

Kalyanaraman (2014) studied the relationship between stock prices and oil prices with structural breaks and found a significant positive correlation.

2.3 Summary of the Existing Literature

Various studies have examined the relationships between oil prices and the stock markets of GCC countries. Hammoudeh and Eleisa (2004) found a link only between oil prices and the stock market of Saudi Arabia, and Zarour(2006) found that only the stock markets of Oman and Saudi Arabia responded to higher oil prices. Furthmore, the stock market of Saudi Arabia has been shown to be more responsive to shocks in oil prices. Arouri *et al*. (2010) found that the stock market returns of Oman, Qatar, the United Arab Emirates, and Saudi Arabia interacted significantly with oil price variations. However, the Kuwait and Bahrain stock markets are not affected by oil price variations, and Arouri *et al*. (2011) found that there is a significant fluctuation spillover from oil prices to the stock markets of GCC countries. Therefore, the results of these studies conclude that, in Saudi Arabia, there is a relationship between oil prices and the stock market; furthermore, the Saudi stock market is influenced by oil price changes. The studies of Hammoudeh and Choi (2006) found that oil prices have no direct impact on equity index returns, and Arouri and Fouquau (2009) concluded that Oman, the United Arab Emirates and Qatar exhibit significant relationships between their stock prices and oil prices. However, the stock markets of Kuwait, Bahrain and Saudi Arabia are not affected by oil price changes. Hence, in sum, these studies found that the Saudi stock market is not affected by oil price changes. In another context, the study of Sahu *et al*. (2014) found a positive long-term relationship between oil prices and the direction of the

[5] Including banking, telecom, industrial and cement.

Indian stock market indices, and Kalyanaraman (2014) found a significant positive correlation between the Saudi stock market and oil prices. Almohaimeed and Harrathi (2013) found that oil prices have negative volatility spillovers on sector stock returns. Finally, Alhayki (2014) concluded that Saudi Arabia, the United Arab Emirates and Bahrain have negative relationships, while Qatar, Kuwait and Oman have positive relationships.

The findings of these studies examining the relationship between stock prices and oil prices differ significantly. Thus, this topic requires more research, particularly in the context of Saudi Arabia, since studies on the Saudi Arabian situation are few (Kalyanaraman, 2014).

CHAPTER 3: METHODOLOGY

3.1 Variables and Data Sources

In this research, the selected variables are oil West Texas Intermediate (WTI) prices, natural gas prices, gold prices, and the Saudi stock market. The data used in this study start in January 2004 and run until April 2015 on a daily basis. All of the data are collected from the Bloomberg database.

3.1.1 Oil

Oil is a very valuable global commodity. Oil indicates growth for any economy, and it can be a country's life line. Thus, oil is a major product for developing and maintaining community and economic growth. Because of this, oil prices fluctuations over time influence all areas of the economy. Voser (2011) suggested that "oil supply and demand is raised dramatically because the energy development and financial growth." Thus, universal demand for refined oil is predicted to stay strong, due to the flexibility and speed of the emerging markets' demand for refined oil. "In fact, refinery utilization rates are forecast to exceed 86% by 2010 with demand at 93 million bpd and set to double by 2030."[6]

3.1.2 Natural Gas

Natural gas is part of our everyday lives. It generates electricity, fuels cars, cooks food, and heats homes. Many households in all countries use natural gas for heating. Thus, natural gas is a significant element of many countries' energy equations. It is also significant for global energy production. The price of natural gas, like the price of oil, has increased significantly in recent years. Moreover, natural gas is a vital energy input for the economic and social growth of any country (Azadeh *et al.*, 2011).

3.1.3 Gold

Gold prices increase when the expectations about financial markets and the economy decline and when uncertainty in the future increases. Thus, gold is a significant asset type that has the features of both a currency and a commodity, and it is considered highly liquid. Gold is different, therefore, from paper assets, such as

[6] https://www.sagia.gov.sa/en/Key-sectors1/Energy/Crude-oil-refining

stocks. Thus, gold is a tangible asset. Furthermore, gold is an investment asset; it is a “secure haven,” which is often considered within commodity portfolios to be a diversifying hedge for risk management. Therefore, Central Banks hold gold reserves because gold provides economical and physical safety. Worldwide confidence in gold is high; thus, central banks’ portfolios can be diversified through the addition of gold, which preserves value against inflation (Sumner, 2010).

3.1.4 Tadawul All-Share Index (TASI) and the Saudi Stock Market

The Saudi stock market comprises the sectors of cement, agriculture, banking, service and industry. The Tadawul All-Share Index (TASI) was introduced in 2001 to hand the execution of the settlement, share trading and clearing of Tadawul. There are no constraints for Saudi citizens to trade shares of Saudi joint stock firms. The GCC countries permit their citizens to invest in specific firms and proportions. The TASI is the biggest stock market in the Islamic world in terms of market capitalization because it represents: 47% of the total market capitalization of the Arab stock exchanges 60% of the total market capitalization of the GCC countries. Furthermore, its market value as a proportion of gross domestic product was 34% in 1966; however, in 2005, this increased to 211%. The volume of share trades increased by 1,675% over the period from 2001 to 2005, the market capitalization rose by more than 300%, the all-share market index rose by 588%, and the value of trade shares rose by 4,850% (Abdulkader & Abdullah, 2009).

3.2 Model and Methodology

This study used a cointegration test, a vector auto-regression (VAR) model, and Granger causality test to examine the relationship or impact of oil prices, natural gas prices, and gold prices on the Saudi stock market (and vice versa). These steps were applied following a study of the descriptive statistics and the unit root test.

3.2.1 Unit Root Test

This test is used to determine whether variables are stationary or not. If variables are non-stationary, they are tested again as unit roots by taking their first differences. A stationary series has no unit root property. However, a non-stationary series faces a regression problem. Therefore, the results of the regression do not reflect the true relationship. Thus, an Augmented Dickey-Fuller (ADF) Unit Root Test was used. Unit root tests determine variables' stationarity properties and the order of integration of the variables. If X and Y are a random walk or non-stationary (i.e., if they have a unit root), the X and Y relationship can be expressed by a simple OLS equation.

$$Y_t = \alpha_0 + \beta X_{t-1} + \varepsilon_t$$

The X_t series is stationary at the level of no differences. A series that is stationary without any differences is integrated of order 0 or designated as I (0).

The $X_t - X_{t-1}$ series is non-stationary, taking the variables' first differences. A series that has stationary first differences is integrated of order one (1) or designated as I (1).

The $X_t - X_{t-2}$ series is non-stationary, taking the variables' second differences. A series that has stationary second differences is integrated of order two (2) or designated as I (2).

3.2.2 Johansen's Cointegration Test

Johansen's cointegration test is used to calculate cointegrating regressions in order to understand the long-run equilibrium relationships between variables. Thus, if two variables have an equilibrium or a long-term relationship, these variables can be considered to be cointegrated.

This test provides useful information on whether energy prices, the Saudi stock market, and gold prices are linked together in the long run or not.

The steps of Johansen's cointegration test are as follows:

1) Determine whether all of the variables are integrated of the same order from the ADF test.

2) Determine the optimal lag length to ensure that the estimated residuals are not autocorrelated.

3) Estimate the maximum Eigenvalue test and the trace test using the VAR model of the cointegration vector. The test for maximum Eigenvalue can be calculated as:

$$LR_{max} \frac{r}{N+1} = -T * \log(1 - \lambda)$$

The null hypothesis (H_o) considers an r cointegrating relationship against the alternative r+1 cointegrating relationship for r = 0,1,2,3.......N-1, where T is the sample size and ƛ is the maximum Eigenvalue.

The trace statistics null hypothesis (H_o) considers an r cointegrating relationship against the alternative N cointegrating relationship, where N is the number of variables for r = 0,1,2,3,..... N-1. The test for trace statistics is calculated as: $LR_{tr}\left(\frac{r}{N}\right) = -T * \sum_{i=r+1}^{n} log\,(1 - \hat{\lambda}_i)$.

3.2.3 Vector Autoregression Model

The VAR model was presented by Sims (1980) as a method to examine the impacts of oil prices, natural gas prices, and gold prices on the Saudi stock market (and vice versa). All VAR models are endogenous variables, and each variable is explained by the lags of it and the other variables. The VAR model is one of the most successful and flexible models for analyzing multivariate time series, and it is useful in describing the dynamic behaviors of economic and financial time series and for forecasting. The VAR model is commonly used to forecast systems of interrelated time series, and it is used in analyzing the impact of random disturbances on the variables. Variables that are are non-cointegrated can use the VAR model. Thus, the basic model applied in this study was:

$$TASI_t = \alpha_0 + \beta_1 TASI_{t-i} + \beta_2 WTI_{t-i} + \beta_3 NAT\_GAS_{t-i} + \beta_4 GOLD_{t-i} + \varepsilon_t$$

$$WTI_t = \alpha_0 + \beta_1 TASI_{t-i} + \beta_2 WTI_{t-i} + \beta_3 NAT\_GAS_{t-i} + \beta_4 GOLD_{t-i} + \varepsilon_t$$

$$NAT\_GAS_t = \alpha_0 + \beta_1 TASI_{t-i} + \beta_2 WTI_{t-i} + \beta_3 NAT\_GAS_{t-i} + \beta_4 GOLD_{t-i} + \varepsilon_t$$

$$GOLD_t = \alpha_0 + \beta_1 TASI_{t-i} + \beta_2 WTI_{t-i} + \beta_3 NAT\_GAS_{t-i} + \beta_4 GOLD_{t-i} + \varepsilon_t$$

3.2.4 Granger Causality Test

According to Granger (1969), the Granger causality test provides an appropriate analysis of non-cointegrated variables. When variables are cointegrated, an error correction model proposed by Engle and Granger (1987) must be used to explore the short- and long-term causal relationships among the variables; this revised model is called the Vector Error Correction Model VECM. Therefore, the Granger causality test is a test for determining whether one time series is useful in forecasting another.

The results of these analyses and test will illustrate the dynamic relationship between the Saudi stock market and energy and gold prices.

CHAPTER 4: THE FINDINGS

4.1 Descriptive Statistics

Descriptive statistics summarize numerical data. The following table provides the descriptive statistics for this study.

Table 1. Results of the Descriptive Statistics

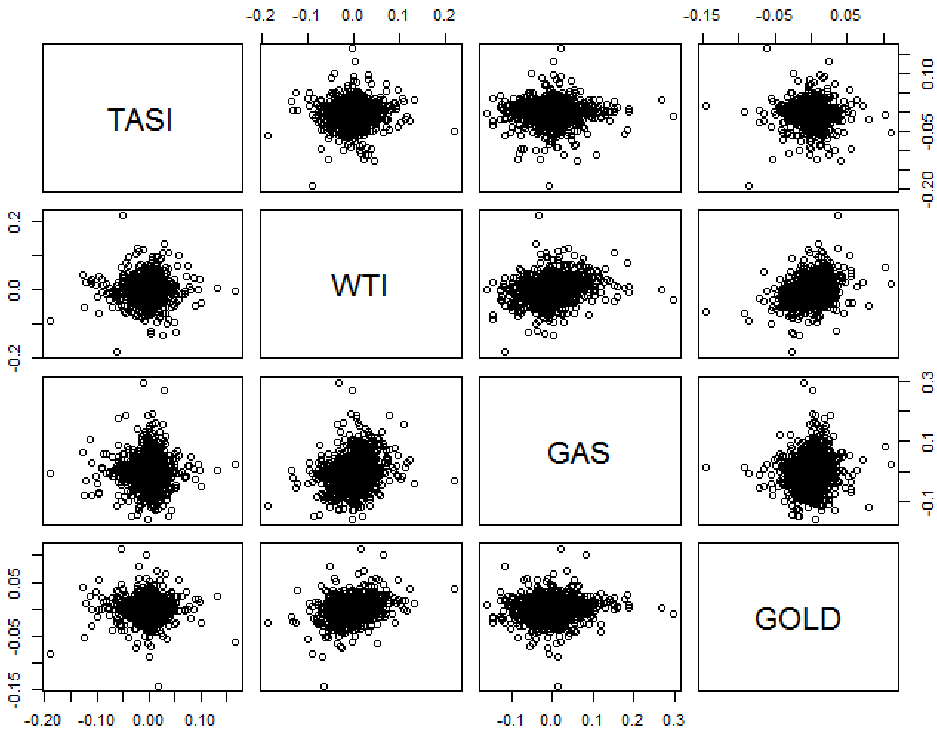
	TASI	WTI	GAS	GOLD
N	1821	1821	1821	1821
Mean	0	0	0	0
SD	0.02	0.03	0.04	0.02
Min	-0.19	-0.19	-0.16	-0.14
Max	0.17	0.22	0.3	0.11
Skew	0.94	0.07	0.6	0.44
Kurtosis	11.57	5.48	4.77	9.21
Jarque-Bera***	10454.18	2288.78	1839.663	6517.6705
Probability	<2e-16	<2e-16	<2e-16	<2e-16

**Notes: *****Significant at the 1% level

Table (1) shows that the descriptive statistics, including the max and min values for the TASI, WTI, Gas, and Gold variables, are not stable during the period of this study. The maximum value of Gas is 30%, and the minimum value is -16%; this indicates instability. Skewness measures whether variables are distributed symmetrically or not; the variables here are distributed symmetrically because all of the variables are skewed positively and to the right. Kurtosis measures whether the distribution of variables is flat or peaked. The variables here have a relatively peaked distribution; thus, they follow a platykurtic distribution. The Jarque-Bera test shows that the data follow a normal distribution; therefore, the null hypothesis (H_0) is rejected at the 1% level of significance.

4.2 Univariate Analysis

Figure 1 . Correlations among Variables



In figure (1) and table (2), the R correlation coefficient measures the direction and strength of the relationship between two variables in a scatterplot. This R ranges from -1 to +1. If (R) is -1, this indicates a negative perfect relationship. If R is +1, this indicates a positive perfect relationship. Finally, if R is 0, there is no relationship.

In this study, the relationship between TASI and WTI and WTI with TASI is equal to (2.9%), indicating that there is a positive relationship. Furthermore, the relationships between TASI and Gas and Gas with TASI is equal to (- 0.17%) indicating that there is a negative relationship and TASI with Gold and Gold With TASI is equal to (-1.41%) hence, there is a negative perfect relationship. However, WTI has a positive and weak relationship with Gas and Gas with WTI is equal to (0.24%) and a positive and weak relationship with Gold is equal to (0.30%) Also, Gold with WTI have a positive and weak relationship. Gas and Gold and Gold with Gas have a positive relationship is equal to (6.9%). Hence, the correlations among the variables include there is positive and weak and perfect negative relationships.

Table 2 . Correlations among the Variables

	TASI	WTI	GAS	GOLD
TASI	1	0.029755	-0.00178	-0.01416
WTI	0.029755	1	0.244777	0.306975
GAS	-0.00178	0.244777	1	0.069595
GOLD	-0.01416	0.306975	0.069595	1

4.3 Test of Stationary Augmented Dicky-Fuller (ADF) Unit Root Test

The ADF test is used to determine whether variables are stationary or not. If variables are non-stationary, they are tested again for unit roots by taking their first differences. A stationary series has no unit root property.

Figure 2. Daily Prices of TASI, WTI, NAT-GAS, and GOLD (in Level)

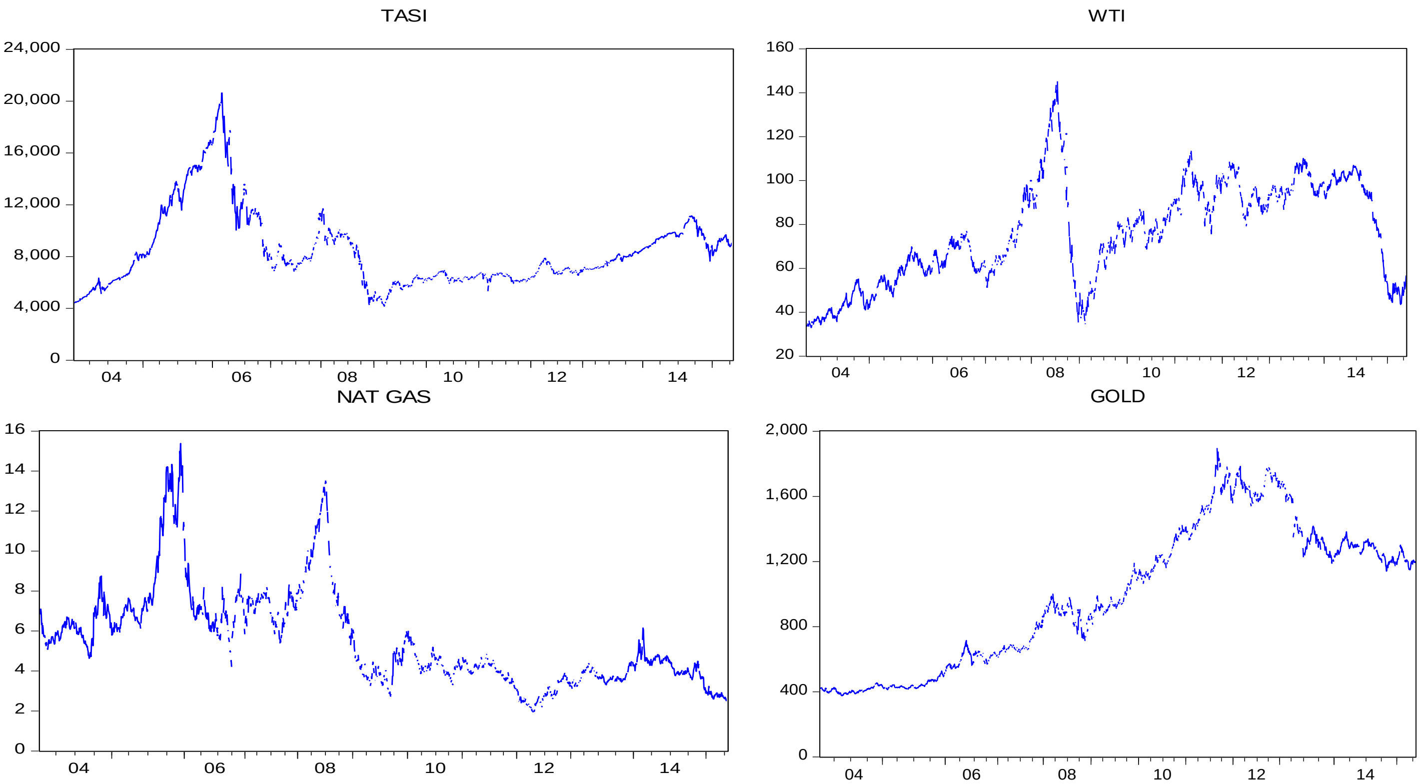


Table 3. Results of the Augmented Dicky-Fuller (ADF) Unit Root Test (in Level)

Variables	Trend	Trend and intercept
TASI	[0.3210] -1.924805 (1)	[0.5633] -2.067089 (1)
WTI	[0.1796] -2.277183 (0)	[0.6359] -1.934328 (0)
NAT_GAS	[0.5633] -2.067089 (1)	[0.1610] -2905064 (0)
Gold	[0.6307] -1.302157 (0)	[0.9295] -1.087348 (0)

Notes: [ ] MacKinnon (1996) p-values, ( ) lag lengths for ADF

Hypothesis 1

H_0= The selected variables are non-stationary variables.

H_{1a}= The selected variables are stationary variables.

Figure (2) and table (3) show that cannot reject the null hypotheses (H_0). Hence, the series includes a unit root. Thus, all variables are non-stationary in the two models (intercept and trend and intercept) because all the variables have p-values greater than 5%. The TASI, WTI, NAT _GAS, and GOLD series are all non-stationary at level, taking the variables into first differences.

Figure 3. Daily Prices of TASI, WTI, NAT-G AS, and GOLD (in First Difference)

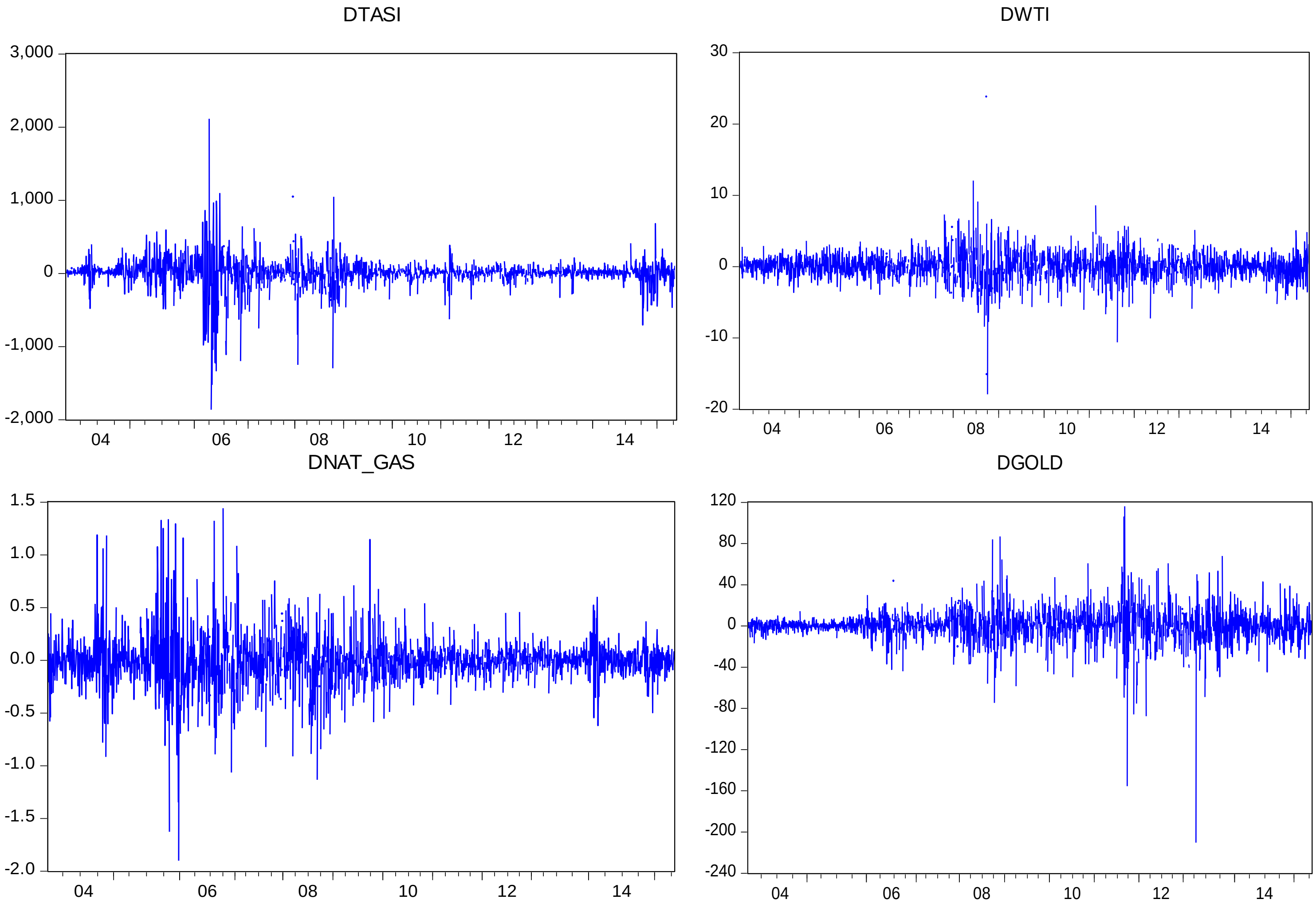


Table 4. Results of ADF Unit Root Test (in First Difference)

Variables	Trend	Trend and intercept
TASI	[0.0000] -38.79308 (0)	[0.0000] -38.78983 (0)
WTI	[0.0000] -43.24066 (0)	[0.0000] -32.36834 (1)
NAT_GAS	[0.0000] -42.66900 (0)	[0.0000] -42.65844 (0)
Gold	[0.0001] -45.49682 (0)	[0.0000] -45.50527 (0)

Notes: [ ] MacKinnon (1996) p-values, ( ) lag lengths for ADF.

Hypothesis 1

H_0= The selected variables are non-stationary variables.

H_{1a}= The selected variables are stationary variables.

The results of figure (3) and table (4) show that all variables are stationary in their first differences (i.e., the series is stationary at first differences). The variables are integrated of order one (1) or designated as I (1). Hence, the null hypotheses (H_0) can be rejected, since all variables have p-values less than 5%. In sum, all variables from the ADF test are stationary at first differences.

4.4 Selecting the Optimum Lag Length

This study determines the most suitable lag length for conducting the Johansen cointegration test. It also determines the optimum lag length through the Akaike information criteria (AIC), the Hannan-Quinn information criteria (HQC), the Schwarz information criteria (SIC), and the Final Prediction Error (FPE).

Table 5 . Selecting the Optimum Lag Length for TASI

Lag length	AIC	HQC	SIC	FPE
1	-7.66829	-7.66605*	-7.66221*	0.000467
2	-7.6672	-7.66383	-7.65808	0.000468
3	-7.66628	-7.66179	-7.65413	0.000468
4	-7.66639	-7.66079	-7.6512	0.000468
5	-7.66573	-7.65901	-7.64751	0.000469
6	-7.66504	-7.65719	-7.64378	0.000469
7	-7.66988*	-7.66091	-7.64557	0.000467*
8	-7.66915	-7.65906	-7.64181	0.000467
9	-7.66943	-7.65822	-7.63905	0.000467
10	-7.66849	-7.65615	-7.63507	0.000467

Notes: *Optimum lag order selected by the AIC, SIC, HQC, and FPE.

Table (5) shows that the AIC criteria and FPE provide higher lag lengths of 7, while the SIC and HQC provide lower lag lengths of 1. Hence, the appropriate selection lag for TASI is (1) for SIC and HQC, since cannot risk under-parameterization or over-parameterization with higher lags.

Table 6. Selecting the Optimum Lag Length for WTI

Lag length	AIC	HQC	SIC	FPE
1	-7.16724	-7.165*	-7.16116*	0.000771
2	-7.16734*	-7.16398	-7.15823	0.000771*
3	-7.1663	-7.16182	-7.15415	0.000772
4	-7.16527	-7.15967	-7.15008	0.000773
5	-7.16441	-7.15769	-7.14619	0.000774
6	-7.16526	-7.15741	-7.14399	0.000773
7	-7.16707	-7.1581	-7.14277	0.000772
8	-7.16703	-7.15694	-7.13969	0.000772

9	-7.16634	-7.15513	-7.13596	0.000772
10	-7.16554	-7.1532	-7.13212	0.000773

**Notes: ***Optimum lag order selected by the AIC, SIC, HQC, and FPE.

Table (6) shows that the AIC criteria and the FPE provide higher lag lengths of 2; however, the SIC and HQC provide lower lag lengths of 1. Hence, the appropriate lag for WTI is (1) for SIC and HQC, since cannot take the risk of under-parameterization or over-parameterization with higher lags.

Table 7. Selecting the Optimum Lag Length for NAT_GAS

Lag length	AIC	HQC	SIC	FPE
1	-6.42871*	-6.42647*	-6.42263*	0.001615*
2	-6.42779	-6.42442	-6.41867	0.001616
3	-6.42677	-6.42229	-6.41462	0.001618
4	-6.42587	-6.42026	-6.41068	0.001619
5	-6.4249472	-6.4182208	-6.40671976	0.00162062
6	-6.42397	-6.41612	-6.4027	0.001622
7	-6.42449	-6.41552	-6.40019	0.001621
8	-6.42355	-6.41346	-6.39621	0.001623
9	-6.42293	-6.41172	-6.39255	0.001624
10	-6.4219914	-6.4096597	-6.38857447	0.00162542

Notes: * Optimum lag order selected by the AIC, SIC, HQC, and FPE.

Table (7) shows that the criteria for the AIC, HQC, SIC and FPE for NAT_ GAS indicate a lower lag length of 1.

Table 8. Selecting the Optimum Lag Length for Gold.

Lag length	AIC	HQC	SIC	FPE
1	-8.30598*	-8.30374*	-8.29991*	0.000247*
2	-8.30493	-8.30157	-8.29582	0.000247
3	-8.30422	-8.29974	-8.29207	0.000247
4	-8.30323	-8.29762	-8.28804	0.000248
5	-8.30262	-8.2959	-8.28439	0.000248
6	-8.30152	-8.29367	-8.28025	0.000248
7	-8.30043	-8.29147	-8.27613	0.000248
8	-8.30197	-8.29188	-8.27463	0.000248
9	-8.30107	-8.28986	-8.27069	0.000248
10	-8.30001	-8.28768	-8.26659	0.000249

Notes: * Optimum lag order selected by the AIC, SIC, HQC, and FPE.

The criteria for the AIC, HQC, SIC and FPE of Gold indicate a lower lag length of 1. After studying the lag lengths for all variables, this study chose the optimum lag length indicated for HQC and SIC because their optimum lag length is (1) the minimum value.

4.5 Multivariate Analysis Test of Cointegration

This test provides useful information on whether energy prices, the Saudi stock market and gold prices are linked in the long run. If two variables have an equilibrium or a long-term relationship, can infer that they are cointegrated. If the variables are cointegrated, a VECM is run; however, if the variables are non-cointegrated, a VAR is run.

Table 9. Results of Cointegration Test (Trace Statistics)

Hypothesized No. of Equation	Trace Statistics	0.05 Critical Values	Probe [ ]
Non	31.66958	47.85613	0.6303
At most 1	11.14066	29.79707	0.9577
At most 2	4.849884	15.49471	0.8246
At most 3	1.026832	3.841466	0.3109

Notes: The trace rest indicates no cointegration at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level.
[ ] Mackinnon-Haug-Michelis (1999) p-values.

Table 10. Results of Cointegration Test (Maximum Eigen Statistics)

Hypothesized No. of Equation	Max Eigen Statistic	0.05 Critical Values	Probe [ ]
None	20.52892	27.58434	0.3057
At most 1	6.290777	21.13162	0.9764
At most 2	3.823052	14.26460	0.8775
At most 3	1.026832	3.841466	0.3109

Notes: The max Eigen statistic **test** indicates no cointegration at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level.
[ ] Mackinnon-Haug-Michelis (1999) p-values.

Tables (9) and (10) show whether these variables are cointegrated or not and whether the four variables have a long-term association.

The trace statistics and max Eigen statistics tests show that the four variables are not cointegrated, since the [ ] p-values for both tests are greater than 0.05%. For example, for the first model in the trace statistics test, the P-value was 0.6303 (63.03%, which is more than 0.05%). Further, the trace statistics were equal to 31.66958, which is less than the critical value of 47.85613. Furthermore, the first model in the max Eigen statistics test had a p-value of 0.3057 (30.57%, which is greater than 0.05%]. Further, the max Eigen statistics were equal to 20.52892, which is less than the critical value of 27.58434.

This study concludes that there is no long-term association among the variables. Thus, VECM cannot be run because not all of the variables are cointegrated. Hence, the unrestricted VAR model will be run.

4.6 VAR Analysis

The VAR analysis examines the impact of oil prices, natural gas prices, and gold prices on the Saudi stock market (and vice versa). VAR analysis is one of the most successful and flexible models for analyzing a multivariate time series, and it is useful for describing the dynamic behaviors of economic and financial time series and for forecasting. The VAR is commonly used for forecasting systems of interrelated time series and is used in analyzing the impact of random disturbances on the variables.

Table 11. Results of VAR Estimates

	DTASI	**DWTI**	**DNAT-GAS**	**DGOLD**
DTASI (-1)	0.092525	-0.00019	1.33E-05	-0.002464
	(-0.02333)	(0.00023)	(-2.80E-05)	(-0.00192)
	[3.96599]	[-0.81363]	[0.47320]	[-1.28630]
DWTI (-1)	6.08093	-0.039769	-0.001791	-0.370283
	(-2.53538)	(-0.02531)	(-0.00306)	(-0.20817)
	[2.39843]	[-1.57109]	[-0.58442]	[-1.77874]
DNAT-GAS (-1)	-16.54008	0.339324	0.002461	1.177947
	(20.0294)	(-0.19997)	(-0.0242)	(-1.64455)
	[-0.82579]	[1.69687]	[0.010169]	[0.71627]
DGOLD (-1)	-0.62717	0.006427	0.000234	-0.052291
	(-0.29904)	(-0.00299)	(-0.00036)	(-0.02455)
	[-2.09731]	[2.15272]	[0.64695]	[-2.12974]
C	2.562691	0.011685	-0.002523	0.46143
	(-4.86432)	(-0.04856)	(-0.00588)	(-0.39939)
	[0.52683]	[0.24060]	[-0.42916]	[1.15533]

Notes: Standard errors in ( ) and T-statistics in [ ]

Table (11) shows the results of the VAR estimates, which provide four regression models that are the independent of DTASI (-1) (i.e., the independent variable of the first difference of TASI lag one and the dependent variables of TASI, WTI, NAT_GAS, and Gold, as well as the same for the other variables of WTI, NAT_GAS, and Gold). Each regression model has five coefficients; however, it is important to know the p-values, which must be estimated in table (12).

Table 12. Results of Estimate Least Squares

	Coefficient	**Std. Error**	**T-Statistics**	**Prob**
C (1)	0.09252	0.02333	3.965993	0.0001
C (2)	6.08093	2.535383	2.398427	0.0165
C (3)	-16.54008	20.02942	-0.825789	0.409
C (4)	-0.62717	0.299036	-2.097308	0.036
C (5)	2.562691	4.864316	0.526835	0.5983
C (6)	-0.00019	0.000233	-0.813627	0.4159
C (7)	-0.039769	0.025313	-1.571091	0.1162
C (8)	0.339324	0.199971	1.69687	0.0898
C (9)	0.006427	0.002986	2.152717	0.0314
C (10)	0.011685	0.048565	0.2406	0.8099
C (11)	1.33E-05	2.82E-05	0.473204	0.6361
C (12)	-0.001791	0.003064	-0.584421	0.559
C (13)	0.002461	0.024204	0.101694	0.919
C (14)	0.000234	0.000361	0.646954	0.5177
C (15)	-0.002523	0.005878	-0.429161	0.6678
C (16)	-0.002464	0.001916	-1.2863	0.1984
C (17)	-0.370283	0.208172	-1.778739	0.0753
C (18)	1.177947	1.644548	0.716274	0.4738
C (19)	-0.052291	0.024553	-2.129735	0.0332
C (20)	0.46143	0.399393	1.15533	0.248

Notes: Prob = p-values

The results of table (12) show that, in Equation (1):

DTASI = C(1)*DTASI(-1) + C(2)*DWTI(-1) + C(3)*DNAT_GAS(-1) + C(4)*DGOLD(- 1) + C(5)C(2).

Oil prices are 0.0165 (1.65%, which is less than 5%); thus, this is significant and influences the Saudi stock market. C(3) shows that NAT_GAS is 0.409 (40.9%, which is more than 5%). Thus, NAT_GAS is not significant and is not influenced by Saudi stock market. C(4) shows that GOLD is 0.036 (3.6%, which is less than 5%). Thus, gold is has a significant influence on the Saudi stock market. Hence, from this equation (1), it is found that the Saudi stock market TASI, as the dependent variable is influenced by oil prices and gold prices. The TASI equals 0.092525%, the WTI equals 6.08093%, , and Gold equals -0.62717 (i.e. the WTI has a greater effect on the TASI when WTI prices go up by 6.08093%. Then, the TASI increases by 0.092525%. Furthermore, when gold prices increase by -0.62717%, the TASI decreases by 0.092525% (and vice versa). Thus, the Saudi stock market is affected by changes to oil prices and gold prices.

In Equation (2):

DWTI = C(6)*DTASI(-1) + C(7)*DWTI(-1) + C(8)*DNAT_GAS(-1) + C(9)*DGOLD(-1) + C(10).

The variables here (TASI and NAT GAS) are not affecting to oil prices because all p-values are more than 5%. Only GOLD is affecting to oil prices, since its p-value is less than 5%.

In Equation (3):

DNAT_GAS = C(11)*DTASI(-1) + C(12)*DWTI(-1) + C(13) *DNAT_GAS(-1) + C(14)*DGOLD(-1) + C(15).

Here, none of the variables (i.e., TASI, WTI, or Gold) is affecting to NAT_GAS because all of the p-values are greater than 5%.

In Equation (4):

DGOLD = C(16)*DTASI(-1) + C(17)*DWTI(-1) + C(18)*DNAT_GAS(-1) + C(19)*DGOLD(-1) + C(20).

None of the variables (i.e., TASI, WTI, or NAT_GAS) is affecting to Gold because all of the p-values are greater than 5%.

Moreover, this study concludes that the VAR results indicate that oil and gold prices significantly affect the Saudi stock market and that gold prices affect oil prices.

4.7 Causality Analysis

The Granger test provides an appropriate analysis when variables are non-cointegrated. Therefore, the Granger causality test determines whether one time series is useful in forecasting another.

Table 13. Results of the VAR Granger Causality/Block Exogeneity Wald Test

Model	Dependent variables	Independent variables	Chi-sq	Probability values	Implication
1	TASI	WTI	5.752452	0.0165	Causality
		NAT-GAS	0.681927	0.4089	NO Causality
		GOLD	4.398699	0.036	Causality
2	WTI	TASI	0.66199	0.4159	NO Causality
		NAT_GAS	2.879366	0.0897	NO Causality
		GOLD	4.634189	0.0313	Causality
3	NAT_GAS	TASI	0.223922	0.6361	NO Causality
		WTI	0.341548	0.5589	NO Causality
		GOLD	0.418549	0.5177	NO Causality
4	GOLD	TASI	1.654568	0.1983	NO Causality
		WTI	3.163911	0.0753	NO Causality

		NAT_GAS	0.513048	0.4738	NO Causality

Hypothesis 2

H_0= There is no causal relationship between the variables.

H_{1a}= There is a significant causal relationship between the variables.

Table 14. Hypotheses for Granger Causality

Model	Null hypothesis (H_0)	Alternative hypothesis (H_1)
1	WTI cannot cause TASI NAT_GAS cannot cause TASI GOLD cannot cause TASI	WTI can cause TASI NAT_GAS can cause TASI GOLD can cause TASI
2	TASI cannot cause WTI NAT_GAS cannot cause WTI GOLD cannot cause WTI	TASI can cause WTI NAT_GAS can cause WTI GOLD can cause WTI
3	TASI cannot cause NAT_GAS WTI cannot cause NAT_GAS GOLD cannot cause NAT_GAS	TASI can cause NAT_GAS WTI can cause NAT_GAS GOLD can cause NAT_GAS
4	TASI cannot cause GOLD WTI cannot cause Gold NAT_GAS cannot cause GOLD	TASI can cause GOLD WTI can cause Gold NAT_GAS can cause GOLD

In the first model, when the TASI is the dependent variable and WTI, NAT_GAS and GOLD are independent variables, only two variables can cause TASI: WTI and GOLD. Hence, can reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1), since the probability values are less than 5% (1.65%, 3.6%, respectively). However, NAT_GAS cannot cause TASI; thus, cannot reject the null hypothesis (H_0) because the probability is more than 5% (40.89%).

In the second model, when the WTI is the dependent variable and TASI, NAT_GAS and GOLD are independent variables, only one variable (GOLD) can cause WTI; hence, can reject mull hypothesis (H_0) and accept the alternative hypothesis (H_1) because the probability is less than 5% (3.31%). However, TASI and NAT_GAS cannot cause WTI; hence, cannot reject the null hypothesis (H_0) because the probability is more than 5% (41.59% and 8.97%, respectively).

In the third model, when NAT_GAS is the dependent variable and TASI, WTI and GOLD are independent variables, the results show that these variables cannot cause NAT_GAS. Thus, cannot reject the null hypothesis (H_0) because the probability is greater than 5% (63.61%, 55.89%, and 51.77%, respectively).

In the fourth model, when GOLD is the dependent variable and TASI, WTI and NAT_GAS are independent variables, the results show that these variables cannot cause GOLD; thus, cannot reject Null hypothesis (H_0) because the probability is greater than 5% (19.83%, 7.53%, and 47.83%, respectively).

This study concludes that oil and gold prices can cause the Saudi stock market. Furthermore, Gold can cause oil prices. However, natural gas cannot cause the Saudi stock market, oil and gold prices.

4.8 Summary of the Results

The earlier findings of Sadorsky (2001), Hammoudah and Eleisa (2004), Basher and Sadorsky (2006), Zarour(2006), Arouri et al. (2010, 2011), Broadstock et al. (2012), Eryigit (2012), Ersoy (2013), Ghorbel and Boujelbene (2013), Sahu (2014) and Kalyanaraman (2014) found a significant impact of oil prices on the stock market across international and emerging markets, including Saudi Arabia and GCC countries. The results of this study, which were based on Johansen's cointegration test, enhance and confirm that the Saudi stock market, energy prices, and gold prices are not cointegrated. By contrast, the VAR results indicate that oil and gold prices significantly affect the Saudi stock market. Also,oil prices affecting positively and gold prices affecting negatively on Saudi stock market. Furthermore, the results of the VAR Granger causality confirm that oil and gold prices can cause the Saudi stock market and that gold can cause oil prices. Here, in this study, oil prices positively affect the Saudi stock market, such that if oil prices are high, Saudi Arabia gains revenues (since it exports oil). This indicate a higher production of services and goods; hence, company performance is good, ultimately increasing the demand for oil and furthering the country's economic development. Furthermore, when oil prices increase income, investments and expenses increase. This also leads to lower unemployment, decreased gold prices and increased inflation.

On the opposite side, if oil prices are low, indicating a lower production of services and goods, company performance will be poor, ultimately decreasing the demand for oil and affecting the country's economic development. Further, when energy prices decrease, income and net growth in investments and expenses decrease, leading to increased unemployment, increased gold prices, and decreased inflation. Hence, the results show that gold react negatively to the Saudi stock market, such that, when gold prices are high, the Saudi stock market decreases. Thus, gold can be used as a hedge against inflation because gold offers liquidity. Energy and gold prices are affected by the following factors: inflation, the country's political and economic condition, and government policies.

During the study period, oil prices were declining; thus, gold prices were increasing. As a result, gold prices negatively reacted with the Saudi stock market, such that, as the gold prices increased, the Saudi stock market decreased. This is a good indicator for investors and portfolio managers to include energy prices, stock market prices and gold prices in their portfolios to reduce risks.

Furthermore, during the study period, various sector shares in Saudi Arabia decreased due to lower oil prices. Specifically, a loss of $290 billion in oil revenues was expected due to lower prices, representing 21% of the gross domestic product for the Gulf States. Therefore, in the year 2015, the Gulf States have agreed to enforce a tax ranging from 3 to 5%.

CHAPTER 5: CONCLUSION

Conclusion and Recommendation

This study used VAR analysis and Causality analysis to examine the dynamic relationships between energy prices, gold prices and the Saudi stock market. The evidence of this research provides a comprehensive understanding of the dynamic relationships between the Saudi stock market, energy prices, and gold prices in Saudi Arabia. Since Saudi Arabia is a major world energy market player, its stock market is likely to be sensitive to changes in energy and gold prices. The VAR results indicate that oil and gold prices significantly affect the Saudi stock market. Also,oil prices affecting positively and gold prices affecting negatively on Saudi stock market. Therefore, the results of the VAR granger causality suggest that oil and gold prices cause the Saudi stock market. These results confirm that there is a dynamic relationship between the Saudi stock market, oil prices, and gold prices.

During the study period, oil prices were declining; thus, gold prices increasing. As a result, gold prices reacted negatively with the Saudi stock market (such that, as the gold prices increased, the Saudi stock market decreased). This is a good indicator for investors and portfolio managers to include energy prices, stock market prices and gold prices in their portfolios to reduce risks.

The results of this study could be useful for market participants, researchers, regulators, portfolio managers, and shareholders seeking a greater understanding of their portfolios. They may also help foreign investors seeking to contribute to the Saudi stock market in understanding the relationships between energy prices, the Saudi stock market, and gold prices. The policy makers and investors in Saudi Arabia should examine the effects of changes to energy prices and gold prices on their own stock markets and economies.

The results of this study also suggest different methods for future research. First, the methodology used in this study could be useful in testing the impacts of other energy products, such as petroleum, energy consumption and electricity, on the stock market. Second, this study can be used to assess the contributions of energy assets and gold to portfolio risk management. Third, estimate the contributions of energy assets and gold as safety assets in reducing financial risk. Fourth, further research could empirically examine the relationships between energy products and the stock markets in Saudi Arabia, the GCC and other oil-exporting countries.

Finally, due the Kingdom of Saudi Arabia is home to a number of Islamic banks also, the Islamic operations is offered from conventional banks. Furthermore, due the oil prices decline that has affected the performance of the Islamic banking. Hence, for future research could be useful to analyze the dynamic effects of energy price and gold price changes on the total Islamic bank financing in Saudi Arabia , and how they mutually react (either positively or negatively). I.e. How the islamic banks in Saudi arabia react with changes of energy and gold prices. Which may be help the investors and policymakers in understanding the dynamic relationship between the energy prices, gold prices and the total Islamic bank financing in Saudi Arabia.

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