European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol.8, No.27, 2016

Examining the Dynamics Relationship between Gold, Oil prices and Stock Markets: Experience from Jordan Economy

Izz Eddien N. Ananzeh
Philadelphia University
Jordan

Abdul Nafea Al-Zararee
Philadelphia University
Jordan

Abstract

The volatilities of gold and oil prices have extensive impacts on the financial activities of any country in the world. Consequently, financial markets and these two commodities have seen a period of extreme volatility raise the issue of the transmission the shocks and contagion between these markets through turmoil periods . for that reason this paper came in order to examine the dynamics relationship between the return of Amman Stock Exchange (ASE) and the price of the most important commodities in the world (crude oil , and gold) for the period span from Jan 1993 to Apr 2016 .
The main conclusion refer for a Long-run causality running from gold prices and oil prices to Amman Stock Market Returns. Also for existing co integration among fluctuations in gold price, and oil price on the stock prices of ASE which has remarkable implications for all investors in the region.

Keywords: Gold, Crude Oil, Stock Markets, VAR, Granger Causality Test.

Introduction

Everyone knows that gold and Oil are the most important strategic commodities that are widely traded all around the world, and have raised widespread controversy in the global economic and political circles several times. Due to the features and elements of these two commodities that have led them to the top of the global markets, the oil is extremely important to the economic growth of any country. See (Rafiq, et al (2009); Wang, et al (2010); Arouri, et al (2012)).
Since 1971 gold has been utilized in the global market as commodity,. Gold has a global reputation of being the most precious metals in the world, and individuals crave a feeling of glory in owning it, and using it a secured sanctuary in times of war or crisis to avoid high risk. Therefore, gold and oil are of great interest to specialists in view of the complex economic relations between them and other economic variables. In light of this it is of importance to study the relationship between gold, oil and other economic or financial indicators to determine the effect of each on the other. See (Muhammad et al (2013); Arouri, et al (2012)).

Furthermore, in the financial markets both gold and oil are the most important commodities. Consequently, financial markets and these two commodities have seen a period of extreme volatility raising the issue of the transmission of shocks and contagion between these markets during turmoil periods. The impact of price changes of these commodities on the financial markets is still a relatively new area which motivates researchers to spend more effort in this field.
It is clear through analyzing time series of these two commodities, we can conclude that increasing in gold prices leads to a boom in oil prices for many reasons.
Firstly, Increasing in oil prices will lead to increase in the national revenues of producing countries, and this will lead to a rising in the income level of individuals in those countries. Therefore this leads to a higher standard of living that allows individuals in this case to spend more resources on satisfying their basic needs which may be limited, and this means turning around to satisfy their luxuries needs, such as buying gold which will lead to increasing the price of this commodity.
Secondly, in some cases speculators in global stock markets turn to buying gold which leads to raising the prices in their desire to absorb the increase in the proceeds of oil revenues resulting from higher oil prices.
The price of crude oil in the commodities market is the most volatile, while in the markets of the precious metals gold is considered the leader which has ability of value-preserving.
Researchers for a long period have tried to study variables related to economic and finance of countries by concentrating their effort on developed countries. in recent time the concentration of the researchers has moved to emerging and developing markets rather than developed markets alone.

The market of our country Jordan is still one of the most important emerging markets in the Middle East and North Africa markets, where there is a shortage of studies that test the relationship between oil prices, gold prices and the financial markets in these markets. This study tries to inspect the dynamics relationship between the price of crude oil, gold prices, and Amman Stock Exchange Return for the period span from 1993-2016 through utilizing more advanced methodologies VAR methodology and Granger Causality Test.
We organized the rest of our paper as follows. Literature review is discussed in section two, and Section three represent the methodology. empirical results are reported in Section four, and Section five contains the conclusion.

2. Literature Review

For a long time, dynamics interaction among various economic indicators has attracted the interest of researchers. However, the interaction or relationship between highly traded commodities (gold and oil) and other economic or financial indicators recently has arisen. Specifically, pertinent literatures create diverse views on the relationship between the prices of the gold, oil prices and other financial indicators.
Many researches conducted in recent years promoted the extraordinary role of the two commodities to enhance any economy through using different methodologies: see (Sadorsky 1999; Rafiq, Salim and Bloch, 2009; Lizardo and Mollick, 2010; Wang et al.2010; Arouri, Jouini and Nguyen, 2012) and others.
The literature highlighted the relationship between oil prices, gold prices and financial markets separately or combined with each other. Jones and Kaul (1996) tested the effect of changes of oil price on the return of stocks that can vary across countries (US, UK, Canada and Japan). This study concluded that the relationship between oil price and stock returns is negative.
Huang et al. (1996) apply VAR methodology to inspect the relationship between the prices of oil and S&P 500 stock prices during the 1980s. They reported no correlation between oil prices and stock markets. Sadorsky (1999) through applying two the methodologies of unrestricted VAR model, and GARCH model examined the relation between stock market of U.S and oil prices, and reported a significant relationship between oil price, and US aggregate stock returns.
Hammoudeh and Eleisa (2004) tested the bidirectional relationship between oil prices and Saudi stock returns and four other countries from GCC countries through employing co integration tests beside a VAR model, whose findings also suggested that the other GCC markets are not directly linked to oil prices and that only the Saudi market in the GCC markets has a bi-directional causal relationship with the changes of prices of oil. Eric et al. (2006) through using co integration techniques concludes that there is a long-term relationship between the price of gold and the US price level. Also the two streams of prices move together with long-run relationship, and reported that the relationship is positive between changes in US inflation and the movement of gold price
Aloui and Jammazi (2009),) reported that increasing in prices of oil and gold determining the volatility of stock returns for the UK, France and Japan markets.
Zang et al. (2010) examined the co integration and causality relationship between crude oil and gold prices. They concluded that there were symmetric trends between gold price and crude oil price with significant positive correlation in the tested period.
Awartani and Maghyereh (2013) applied their study to GCC countries for a Period span from 2004 to 2012 by employing GARCH model. Their results reported for volatility transmissions are bi-directional between stock markets of GCC countries and the prices of crude oil prices. Considering the results of the previous literatures review the contribution of our study came from examining the dynamics relationship between the return of Amman Stock Exchange (ASE) and the price of the most important commodities in the world crude oil price, and gold price. Secondly, we employing the more advanced methodologies, VAR methodology and Granger Causality Test to inspect the dynamics relationship between them, and the stock markets case of Jordan.

3.Data and Methodology

3.1 Data

Firstly Our Sample period of this study spans from Jan 1993 to Apr 2016 including 280 monthly observations. This study use secondary data from different websites primarily from International Financial Statistics of the International Monetary Fund.
The variables of our study includes:

- The rate of return of Weighted Price Index for Amman stock exchange (ASE): as dependent variable calculated through formula:

$$MR_t = Ln(C_t / C_{t-1})$$

Ct: indicate the end-of-month closing price of Weighted Price Index for ASE, and Ct-1 refer to the closing price of previous month .

- Gold prices growth

Calculation the growth in the gold prices is calculated through formula: $GR_t = Ln(GP_t / GP_{t-1})$

GP_t: indicate to the closing prices of month t, and GP_{t-1} indicate to the closing prices of previous month t-1.

- Oil prices growth

Calculation the growth in the crude oil prices is calculated through formula: $OR_t = Ln(OP_t / OP_{t-1})$

OP_t: indicate to the closing prices of month t , and OP_{t-1} indicate to the closing prices of previous month t-1.

3.2 Methodology

Several analytical approaches we employed to inspect the relationship between the variables of our study. So our study came to inspect the dynamics relationship between the prices of crude oil, prices of the gold, and Amman Stock Exchange for the period span from 1993-2016 through employing many advanced methodologies, VAR methodology, and Granger Causality Test.

Firstly, in order to examine the unit root we utilize two tests Augmented Dickey-Fuller (1979), and Phillips-Peron (PP) (1988). Firstly, ADF test estimation depending on the next formula:

$$\Delta X_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 T + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \gamma_t \quad (1)$$

Where γ_t refer to white noise error term, Y_t: indicate to the time series of study, Δ: indicate to the operator of first difference, and t indicate to the time trend.

Secondly, Phillips-Peron (PP).

The test of Phillips and Perron (1988) are similar to ADF (1979) tests but different in the treatment of serial correlation, and the treatment of heteroskedasticity in the errors, also the test give us the same conclusion of the ADF (1979) tests, and both tests employ the time series is not stationary as a null hypotheses.

Time Series Co integration

In The second step we employ Johansen and Juselius (1990) co-integration test to inspect the dynamics correlation or long-run co-integration between gold ounce price , prices of crude oil, and ASE returns.

The approach of co integration for Johansen and Juseliu s based upon two statistics tests: trace and max Eigen value test statistics. The procedures of this test is sequential where the null hypotheses of zero co-integration vector is applied against at most one.

The mathematical form Johansen and Juselius co integration test as follows:

$$\eta_{trac(r)} = -T \sum_{J=r+1}^{N} Ln(1 - \eta_J) \quad (2)$$

$$\eta_{\max(r, r+1)} = -T \ln(1 - \eta_{r+1}) \quad (3)$$

Where η_j refer to the large jth order Eigen value from the Π matrix, and T refer to the number of observations.

Null hypothesis in the λ_{trace} is the number of vectors of co-integrating is less than or equal to (j) against to the number of co-integration relations (j).

Johansen and Juselius co integration test present critical values for two statistics, and the test statistics distribution is non-standard. From Johansen's tables if the test statistic is greater than critical value we will reject the null hypothesis this means we have j co integrating vectors.

Finally We employ granger causality test to inspect the causal relationship between gold ounce price ,crude oil price and ASE returns, we applied Granger Causality test (Granger, 1986):

$$MR_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1t} MR_{t-1} + \sum_{i=1}^{n} \alpha_{2t} GR_{t-1} + \sum_{i=1}^{n} \alpha_{3t} ORA_{t-1} + \gamma_{1t}$$

$$GR_t = \beta_0 + \sum_{i=1}^{n} \beta_{1t} GR_{t-1} + \sum_{i=1}^{n} \beta_{2t} MR_{t-1} + \sum_{i=1}^{n} \beta_{3t} OR_{t-1} + \gamma_{2t}$$

$$OR_t = \chi_0 + \sum_{i=1}^{n} \chi_{1t} OR_{t-1} + \sum_{i=1}^{n} \chi_{2t} GR_{t-1} + \sum_{i=1}^{n} \chi_{3t} MR_{t-1} + \gamma_{3t}$$

$(\alpha_{1t,\ldots,3t}, \beta_{1t,\ldots,3t}, \chi_{1t,\ldots,3t})$ refer to the parameters.

4. Empirical Results

In order to avoid the spurious regressions our work by testing the stationarity for all the time series through employing two of unit root tests ; Augmented Dickey Fuller (ADF) , and Phillips Perron (PP) .

Our results in table,1 point out for rejection of null hypothesis of a unit root at 1% level for all time series in level 0, therefore our conclusion that the all variables under study are stationary and integrated in the same level of order zero, I(0) .

Table 1: Unit Root tests results

Study Variables	ADF Test Level	PP Test Level	Inference
MR	-4.624982*	-16.54345*	I(0)
GR	-1.840360*	-6.647585*	I(0)
OR	-2.846465*	-11.57543*	I(0)

- *,** denotes significant at 1% , and 5%.

after confirming that the variables of our are stationary and integrated with the same order I(0). The next procedure we will proceed to investigate whether the stationary variables are co-integrated or not, to achieve this we employed Johansen Multivariate Co integration test. The null hypothesis depending on the Johansen test declares that there are no co integration vectors through variables under study. First of all we will go to select Optimal lag, and to achieve this we employ five criteria in the process of selection:

1. (LR): sequential modified LR test statistic
2. (FPE): Final prediction error
3. (AIC): Akaike information criterion
4. (SC): Schwarz information criterion
5. (HQ): Hannan-Quinn information criterion

Depending upon the results of five criteria which presented in table 2, the optimal lagged term is lag two which is the most appropriate one.

Table (2): Represent Lag-Length Selection by Different Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-699.9234	NA	0.032117	5.075259	5.114509	5.091008
1	944.8402	3242.025	2.38E-07	-6.73308	-6.57311*	-6.67215*
2	956.557	22.8436*	2.34e-07*	-6.7544*	-6.480179	-6.644686
3	961.795	10.0979	2.40E-07	-6.72762	-6.335269	-6.570279

* indicates lag order selected by the criterion

Table number 3 reported the co integration test results. The result of trace test confirming at least there are three co integrating equations at level of significance of 5%, and the results of maximum Eigen value test confirm this result. We can conclude that the three study variables have a equilibrium or a long-run relationship between each other.

This means that the gold and crude oil are tied together with index return of ASE in the long run, and their variation from the long-run equilibrium path will be corrected. So that our results in this section propose the presence of dynamics correlation between gold ,crude oil and index return of ASE. As a result we can see the importance of using Vector Error Correction Model (VECM) which incorporate the information's about the short-run dynamics.

Table 3: Represent the results of Johansen Co integration Tests

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.259328	191.7921	29.6707	0.0001
At most 1 *	0.229016	108.6374	15.8741	0.0001
At most 2 *	0.123751	36.59297	3.941466	0

* denotes rejection of the hypothesis at the 0.05 level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.259328	83.15465	21.5462	0
At most 1 *	0.229016	72.04445	15.2646	0
At most 2 *	0.123751	36.59297	3.851466	0

Vector Error Correction Model (VECM)

To distinguish between the short run and long run causality we apply Vector Error correction models (VECM). Table No 4 report the result of VECM. The result confirm for a Long run causality running from gold prices and oil prices to Amman Stock Market Returns because the coefficient of ECT is negative and significant.

Also our results reported for no short run causality from oil prices to Amman Stock Market Returns, but also reported for a short run causality from gold prices to the Amman Stock Market Returns, but reported for no short run causality from oil prices to Amman Stock Market Returns .

Table (4): Represent Vector Error Correction Model

Co integrating Equation:	CointEq1
MR(-1)	1
GR(-1)	-0.265144 -1.67827 [-0.15799]
OR(-1)	-2.174038 -0.67587 [-3.21666]

C	-0.024021		
Error Correction:	D(M)	D(G)	D(O)
CointEq1	-0.920328	0.00863	0.047794
	-0.10261	-0.01279	-0.01944
	[-8.96899]*	[0.67483]	[2.45898]
D(MR(-1))	-0.047382	-0.00759	-0.03392
	-0.08536	-0.01064	-0.01617
	[-0.55510]	[-0.71345]	[-2.09769]
D(MR(-2))	-0.011778	-0.002608	-0.00851
	-0.06133	-0.00764	-0.01162
	[-0.19204]	[-0.34122]	[-0.73221]
D(GR(-1))	0.6896	-0.418024	0.355818
	-0.81042	-0.10101	-0.15351
	[0.85091]	[-4.13863]	[2.31791]
D(GR(-2))	0.755103	-0.249081	0.146045
	-0.81318	-0.10135	-0.15403
	[0.92858]	[-2.45766]	[0.94816]
D(OR(-1))	-1.268997	0.052864	-0.46964
	-0.39038	-0.04865	-0.07394
	[-3.25066]*	[1.08651]	[-6.35119]
D(OR(-2))	-1.180958	-0.042084	-0.3402
	-0.37317	-0.04651	-0.07068
	[-3.16470]*	[-0.90487]	[-4.81300]
C	-0.002997	-0.003713	-0.00336
	-0.03637	-0.00453	-0.00689
	[-0.08241]	[-0.81908]	[-0.48719]
R-squared	0.490176	0.077502	0.217514
Adj. R-squared	0.476909	0.053497	0.197151
Sum sq. resids	98.55905	1.530956	3.536185
S.E. equation	0.605302	0.075441	0.114655
F-statistic	36.94757	3.228509	10.68227
Log likelihood	-249.9254	326.8944	210.9482
Akaike AIC	1.862277	-2.302487	-1.46533
Schwarz SC	1.966942	-2.197822	-1.36067
Mean dependent	-0.003681	-0.003742	-0.00359
S.D. dependent	0.836919	0.077543	0.12796

- *,** denotes significant at 1% , and 5%.

Finally we employ Granger Causality Test to detect the causality direction between possible relationship among the study variables..

Our results as reported in Table No. 5 confirm for single causality running from Amman Stock Market Returns to gold prices, from Amman Stock Market Returns to oil prices , and from gold prices to oil prices. No bidirectional causality observed.

This means there is a short-run impact of changes in the crude oil price, and gold prices on the Amman Stock Market Returns.

Table (5): Represent Granger Causality Test

Null Hypoth:	Obs	F-Stat	Prob.
GR doesn't Granger Cause MR	278	0.88071	0.4157
MR doesn't Granger Cause GR		3.82944	0.0229
OR doesn't Granger Cause MR	278	0.46737	0.6271
MR doesn't Granger Cause OR		3.34224	0.0368
OR doesn't Granger Cause GR	278	1.14963	0.3183
GR doesn't Granger Cause OR		2.88737	0.0574

5.Conclusions

The volatilities of gold and oil prices have extensive impacts on the financial activities of any country. So that our study came to inspect the dynamics relationship between price of crude oil price, gold price, and Amman Stock Exchange (ASE) .

Our results report that gold and crude oil are tied together with index return of ASE in the long run, and their variation from the long-run equilibrium path will be corrected. Our results propose the presence of dynamics correlation between gold ,crude oil and index return of ASE.

Also our results confirm for a Long run causality running from gold prices and oil prices to Amman Stock Market Returns ,and reported short run causality from gold prices to the Amman Stock Market Returns.

Our results finally confirm single causality running from Amman Stock Market Returns to gold prices, from Amman Stock Market Returns to oil prices , and no bidirectional causality is observed.

The main conclusion refers to existing co integration among fluctuations in gold price, and oil price on the stock prices of ASE which has remarkable implications for the investors in our country.

Our findings agree with many prior researches like Huang, Masulis and Stoll (1996), Sadorsky (2001) Miller and Ratti's (2009), Mishra et al.(2010), Wang et al.(2010), Bhunia and Das (2012), and others.

Due to the scarcity in financial literature regarding for Middle East and North Africa (MENA) countries we recommend for further studies in the future to examine the relationship between oil, gold and the stock markets or any other macroeconomic variables.

References

Aloui, C., & Jammazi, R. (2009)." The effects of crude oil shocks on stock market shifts behavior". a regime switching approach. Energy Economics 31, 789–799.

Arouri, M.E.H., Jouini, J., & Nguyen, D. (2012). "On the impacts of oil price fluctuations on European equity markets: Volatility spillover and

hedging effectiveness". Energy Economics. 34, 611–617.

Awartani, B., & Maghyereh, A.I. (2013). "Dynamic spillovers between oil and stock markets in the Gulf Cooperation Council Countries". Energy

Eco Basher, Syed A., Haug, Alfred A., & Sadorsky". Energy Economics 34, 227–240.nomics 36, 28-42.

Bhunia, D. A. & Das, M. A. (2012). "Association between Gold Prices and Stock Market Returns: Empirical Evidence from NSE". Journal of Exclusive Management Science, Vol 1, Issue 2, pp. 1-7.

Dickey, D. A. & Fuller, W.A. (1979). "Distribution of the estimators for autoregressive time series with a unit root", Journal of the American Statistical Association, vol. 74, no. 366, pp. 427-431.

Eric J. Levin & Robert E. Wright, (2006). "Short Run and Lon Run Determinants of the Price of Gold". World Gold Council Research Study No. 32.

Hammoudeh, S., Dibooglu, S., & Aleisa, E. (2004). "Relationships among US oil prices and oil industry equity indices". International Review of Economics and Finance 13, 427–453.

Haung, R. D, R. W. Masulis, & H. R. Stoll (1996). "Energy Shocks and Financial Markets". Journal of Futures Markets Vol. 16, pp. 1-27.

Gujarati, D. N. (2003). "Basic econometrics" . 4th ed., McGraw-Hill, Boston, viewed 28.May 2011.

Huang, R.D., Masulis, R.W., & Stoll, H.R. (1996). "Energy shocks and financial markets". Journal of Futures Markets 16, 1–27.

Johansen, S. & Juselius, K. (1990). "Maximum likelihood estimation and inference on cointegration – with applications to the demand for money". Oxford Bulletin of Economics and statistics, vol. 55, no. 2, pp. 169-210.

Jones, C. M. & G. Kaul. (1996). "Oil and the Stock Markets". Journal of Lizardo, R.A., & Mollick, A.V. (2010). "Oil Price Fluctuations and U.S. Dollar Exchange Rates". Energy Economics, 32, 399-408.Finance, 51, 463-491.

Miller, J. I. & Ratti, R. A. (2009). "Crude oil and stock markets: Stability, instability and bubbles". Energy Economics, Vol.31 No. 4, pp. 559-568.

Mishra P.K., Das J.R., & Mishra S.K. (2010). "Gold Price Volatility and Stock Market Returns In India". American Journal of Scientific Research, No. 9, pp. 47-55.

Muhammad M. B, M. S, M.I. (2013). Relationship between Gold and Oil Prices and Stock Market Returns. Acta Universitatis Danubius , 28-39.

Phillips, P.C.B. & P. Perron (1988). "Testing for Unit Roots in Time Series Regression". Biometrika, 75, 335-346.

Rafiq, S., Salim. R., & Bloch, H. (2009). "Impact of crude oil volatility on economic activities: an empirical investigation in the Thai economy".

Resources Policy, 34, 212-132.

Sadorsky, P. (1999). "Oil price shocks and stock market activity". Energy Economics, vol.21, no. 5, pp. 449-469.

Sadorsky, P. (2001). "Risk Factors in Stock Returns of Canadian Oil and GasCompanies". Energy Economics Vol. 23, pp. 17-28.

Sadorsky, P (2012). "Correlations and Volatility Spillovers between Oil Prices and the Stock Prices of Clean Energy and Technology Companies". Energy Economics 34, 248-255.

Wang Mu-Lan, Wang Ching-Ping, & Huang Tzu-Ying (2010). "Relationships among Oil Price, Gold Price, Exchange Rate and International Stock Markets". International Research Journal of Finance and Economics, No. 47, pp. 80-89.

Zhang, Y.J. & Wei, Y.M. (2010). "The crude oil market and the gold market: Evidence for co integration, causality and price discovery". Resources Policy, 35, 168-177.