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ANALYZING CAUSATION OF DYNAMIC OIL AND GOLD PRICES IN MALAYSIA

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Abstract: *Gold and oil are among the commodities that are very valuable to the economy and the countries. Both gold and oil prices are such crucial measure because they express the interrelationship between two main commodities. Prices between gold and oil, theoretically depend on each other which both prices will rise and fall simultaneously with one another. This study therefore attempts to examine the cointegration and the causation of both commodities. The monthly data set covering from 2001 to 2016 are utilized using the techniques of cointegration and causation methods. Finding reveals that long run relationship equilibrium exists in the model and shows oil price is highly significant in influencing gold price. While the study on causation reveals that gold price granger causes the oil price but not on the other way around. Therefore, this indicates that there is unidirectional relationship between gold price and oil price in Malaysia.*

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Introduction

Gold and oil are is among the commodities that are very valuable to the economy and the countries. Both commodities are highly demanded and considered to be key commodity to the countries. Gold can be converted to money plays a big role in economic development (Sjaatad, 2008). It has long history of becoming a currency in the economy and unlike any other currencies gold has an intrinsic value and hedge against inflation. Oppenheimer (1968) stated that the current gold's price is indicated in terms of currency and the current currency is affected by the ongoing financial crisis. Hence, the use of gold is still considered as the backup of currency for government and central bank even in this modern day.

On the other hand, crude oil is also undeniable important to the economy. The oil production and consumption are used as one of the most popular economic indicators. The movement of the oil price will affect the economic activities. The higher price of crude oil will benefit the oil producing and exporting economies and affect negatively the countries which import oil for their domestic consumption (Lodha, 2017).

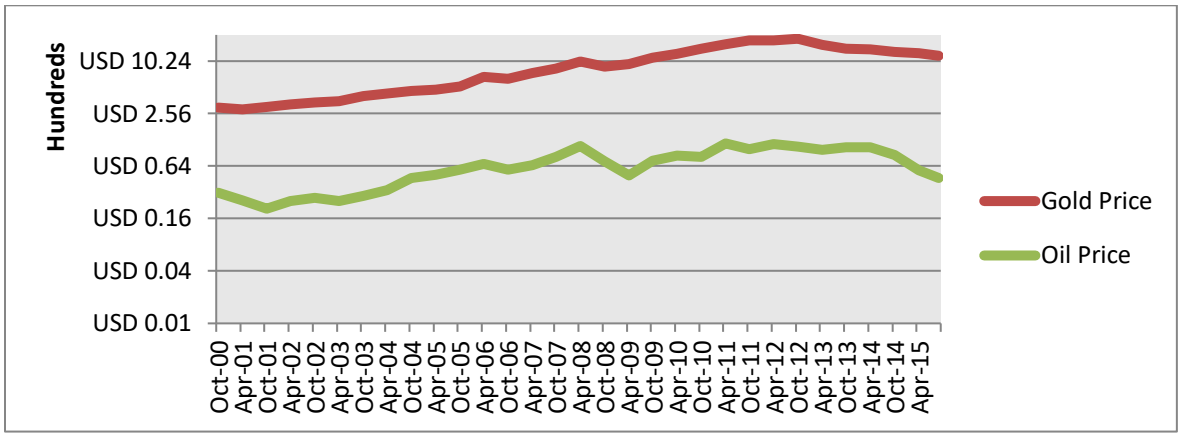

Figure 1: Movement in gold price and oil price from 2000 to 2015.

Both gold and oil prices are such crucial measure because they express the interrelationship between two main commodities. Prices between gold and oil, theoretically depends on each other which are the price will rise and fall simultaneously with one another. For example, Figure 1 shows that the volatility of gold price and the oil price is in parallel. The gold price recorded at USD 889.43 per ounce and oil price USD 131.52 per barrel at Jun 2008. It shoots up to USD 939.77 per ounce and oil price USD 132.55 per barrel. The stable gold price and oil price did not hold longer than that. Since August 2008, the price falls down to USD 829.93 per ounce and USD 114.57 per barrel. The figure shows that there is a consistency movement in gold price and oil price since 2000 to 2015.

According to Vivian and Wohar (2012) and Chikli et al. (2014) the presence of financialization process has led the commodity market such as gold and oil prices to share similar statistical properties with other common characteristics. Thus, with this similarity of the properties it can lead to substantial implications when there are price movements in both commodities. This study therefore attempts to examine the cointegration and the causation of both commodities.

Literature Review

Considerable amount of researches have focused on the relationship between oil or gold factors, such as inflation, interest rate, and U.S. dollar exchange rate. These include studies by Park and Ratti (2008), Killian and Park (2009) and Narayan and Narayan (2010) who highlight the causal links between macroeconomics variables and oil prices. Furthermore, some studies such as Hunt (2006) and Hooker (2002) confirmed that the oil price is a leading indicator of inflation. In other countries, studies such as in Singapore (Thai Ha & Youngho, 2011), India (Varsha et. al, 2016; Lodha, 2017) have investigated on the issue of gold and oil price causation. Nonetheless, based on the previous studies highlighted there is still lack of studies in Malaysia regarding the causality and relationship between gold and oil price.

Numerous studies concern on the relationship between gold and oil price. Juan et. al (2009) for example have tested a theory by using Value at Risk (VaR) with the data from 2007-2009 during the financial crisis. They found the gold price does not influence the volatility of oil price. Based

on the finding it shows a negative relationship between gold price and oil price. In similar year, Mu Lan (2010), Fattouth (2010) and Sari (2010) also investigate the relationship between gold price and price. Mu Lan (2010), for example explores the impacts of fluctuations in crude oil price, gold price and exchange rates of the US dollar against various currencies. Using daily data and time series method, the result reveals that cointegration exists among oil price, and gold price. A positive long term relationship is found between gold price and oil price. While, Fattouth (2010) uses Caner and Hansen's (2001) method. The test uses the application of the asymmetry in the spread adjustment process for oil and metal commodities using two-regime threshold autoregressive (TAR). The study attempts to test whether oil price is related with the volatility of gold price and reveals a negative relationship between gold price and oil price. It indicates whenever gold price increases the oil price will react negatively. Nonetheless, the finding reveals there is no co-integration among oil price and gold. Sari (2010) on the other hand, explores a directional relationship between spot oil price and four precious metals which are gold price, silver price, platinum, and palladium. A weak and asymmetric relationship between the price returns of oil and gold is found.

Malliaris and Malliaris (2012) investigate inter-relationship among the price behavior of oil and gold during 2000-2007 in Euro. The study applies the time series and neural network methodologies. A negative relationship is found between gold price and oil price. The rising gold prices may signal inflationary expectations and cause oil-exporting countries to seek increasing oil prices. Sindhu (2013) however found and contradictory result from Malliaris and Malliaris (2012) as the finding reveals a positive relationship between oil price and gold price. Sindhu (2013) uses the major data sources from WGC (World Gold Council), Gem and Jewelry Export Promotion Council (GJEPC), MMTC Ltd, State Trading Corporation spanning from November 2006 to December 2011.

In the study of causation between gold price and oil price Zhang (2010) has highlighted there is empirical evidence on consistency trends between oil price and gold price in the period of January of 2000 to March of 2008. The finding also reveals that the long run equilibrium can be between the two markets. In terms of causation there is a significant nonlinear Granger causality, which overall suggests their fairly direct interactive mechanism. Wang (2010) on the other hand examines the fluctuations in crude oil and gold prices, and the exchange rates of the US dollar against various currencies on the stock price indices of the United States, Germany, Japan, Taiwan and China respectively. In the case of Singapore Thai-Ha and Youngho (2011) study relationship between gold price and oil price using co-integration, stationary and Granger causality. They found out that the oil price and gold price are correlated and have causation. The result reveals that there is a positive relationship between oil price and gold price is long-run. The increase in oil price is due to high demand for gold will push up the price of gold. In the case of Malaysia, Yahya et al. (2013) test the relationship between strategic commodities oil and gold. Using an estimation of the Vector Auto Regression (VAR) method on data covering the period from January 2007 to December 2011 the finding shows that gold price does affect the oil price.

Unfortunately no causation is found between these two commodities. In more recent years, Varsha et. al (2016), Arfoui and Rejeb (2016) and Lodha (2017) have investigated on the relationship on gold and oil price. Mixed results are found on the causality directions between gold and oil price. Arfoui and Rejeb (2016) confirm the interdependencies between the variable using simultaneous

equation system. While Varsha et. al (2016) and Lodha (2017) indicates the existence of unidirectional relationship between the two commodities.

Methodology

Series of monthly data from 2001 to 2015 (n=180) is applied in this study. The sample is restricted to this time span in order to get uniformness of the data set and considering the availability of the data. Data is obtained from Index Mundi and BNM Monthly Statistical Bulletin of Bank Negara Malaysia.

Following Zuriyati and Norazamina (2016) this study will also applied a technique of conintegration and causation. Thus, before proceeding to the cointegration test it is compulsory to examine the stationary level of the time series properties using the Augmented Dickey Fuller (ADF). This is the one of the most popular testing on the presence of unit root. This test is necessary to confirm that all the order of integration will be stationary at first difference. The ADF unit root test can is performed by estimating the regression;

$$Y_t = \rho y_{t-1} + \alpha_1 \Delta y_{t-1} + \ldots + \alpha_{\rho-1} \Delta y_{t-\rho+1} + \varepsilon_t$$

While, Johansen cointegration test (Johansen, 1988 and Johansen and Juselius, 1990) is used for testing cointegration. Johansen cointegration test can be also applied to check whether the long run equilibrium exists between the variables.

Proceeding to the next level Granger causality test is used to test if lag of one variable enter into the equation of another variable Granger. The Granger causality test is a statistical proposition test for determining whether one-time series is helpful in forecasting another (Varsha et al., 2017). For example the granger causality can br measured on whether the current and past value of "Y" can help to forecast future value of "Z".

Findings

Table 1: Descriptive statistics

Stat	Mean	Median	Max	Min	Std. Dev	Skewness	Kurtosis
GP	2848.684	2692.505	5474.760	989.8200	1413.461	0.254197	1.667705
OP	225.3783	234.4200	430.7800	70.38000	91.63721	-0.054800	1.833169
ER	3.489751	3.513750	3.800000	2.955500	0.289734	-0.263642	1.521887
GDP	72191.58	62457.00	283244.0	49966.00	36930.42	3.406728	15.45159
IR	2.862943	2.872000	3.562000	1.823000	0.408917	-0.579029	3.149861

Table 1 shows the summary statistics of all variables. The statistics are based on the 174-months observation. In order to avoid the spurious problem using the OLS, the study tests for the properties of the time series data to determine if variables are stationary or non-stationary. In a stationary test or unit root test augmented Dicky Fuller (ADF) must be higher than t-critical. Result in Table 2 shows that dependent variable of gold price inflows other variables such as oil price, exchange rate; gross domestic product and interest rate are stationary. The data transform to full-log gold price, oil price, and gross domestic product. The following table shows the result obtained from unit root test;

Table 2: Result of Stationary Test (Unit root test)

VARIABLE	T CRITICAL	LEVEL	1^{ST} DIFERENTATION
LGP	3.466786	1.149389	12.61946
LOP	3.466994	1.784850	10.08608
ER	3.466994	0.267891	10.58867
LGDP	3.468521	1.961046	14.40822
IR	3.467418	2.960683	5.828315

The result shows that using 5% significant level, all variables fail to reject the null hypothesis of non-stationary at the level from. Conversely, all variables are stationary in their first difference. In addition, given that the studies have confirmed the stationary of the series at first difference, the unit root test results strongly suggest that all the variables are in the integration of order one. Since all the variables are in same order of integration this study proceeds to apply the cointegration technique.

Cointegration requires data to be stationary at same level and it is used to identify the long run relationship among different variables. The variables can be cointegrated among different series when series have lead-lag relationships. The following Table 3 shows the result obtained from cointegration test.

Table 3: Result of Johansen's Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.259181	88.54388	69.81889	0.0008
At most 1	0.119439	39.94405	47.85613	0.2245
At most 2	0.082064	19.33835	29.79707	0.4688
At most 3	0.020150	5.466735	15.49471	0.7574
At most 4	0.013300	2.169098	3.841466	0.1408

Trace test indicates 1 cointegrating equation(s) at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.259181	48.59982	33.87687	0.0005
At most 1	0.119439	20.60571	27.58434	0.3007
At most 2	0.082064	13.87161	21.13162	0.3757
At most 3	0.020150	3.297637	14.26460	0.9250
At most 4	0.013300	2.169098	3.841466	0.1408

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level

Due to the all variables are stationary, for a reason, multivariate cointegration method in Johansen approach can be applied to identify the cointegration between the variable in the long run equilibrium. Simultaneously, this method can be determined the cointegration vectors. Since the study makes out two likelihood ratios, specifically, the Trace Test and the Maximum Eigen Value tests can decide the cointegration vectors. At the time of testing, the present study accepts linear deterministic trend unrestricted with intercepts without trends on account of using a lag of 1 to 10 at 1st differences derived from Swartz Information Criterion (SIC) for the selected indicators under the study.

The equation below shows the multivariate cointegration test results in the course of Johansen approach that offers surety regarding a connection between all variables in the long period as trace statistics is more than the critical value in case of both the likelihood ratio test, to be exact, the trace test and the maximum eigenvalue test. Consequently, the results of the multivariate cointegration test reject the null hypothesis. The long run equilibrium is obtained as below;

$$\mathbf{GP = - 0.422559LOP^{***} + 0.884819ER^{***} - 1.306610LGDP^{***} + 0.266996IR^{***}}$$

$$\mathbf{(0.11928) \quad (0.18193) \quad (0.21307) \quad (0.08682)}$$

*** 1% probability of the significant level coefficient
** 5% probability of the significant level coefficient
(In the parenthesis are std errors of coefficient)

Based on the long run equilibrium that all the factors used in this study such as oil price, exchange rate, gross domestic product and interest rate are highly significant in the long run. As the main focus of the study is on the relationship between oil price and gold price, it is found that these variables are significant at 1 percent probability of the significant level or 99 percent level of significance. The oil price also influences positively the gold price in the long-run relationship. This finding is consistent with previous studies Mu Lan (2010), Narayan and Narayan (2010), Sindhu (2103), and who found there is a positive relationship between gold price and oil price. Nevertheless, Malliaris and Malliaris (2012), Juan et al (2008), Nandra and Fatt (2008) and Sari (2010) found unpredictable result with this study. Using similar method, they found a negative relationship between gold price and oil price.

Table 4: Result of Granger Causality Test

Null Hypothesis	Obs	F-statistics	Probability
LOP does not Granger Cause LGP	179	0.02516	0.97515
LGP does not Granger Cause LOP		3.16838	0.04451

Notes: The summary statistics are based on the 174-month observation.

The pairwise Granger causality test has been performed in the present study in search of the direction of causation among the selected variables. Result of Granger causality test reveals that gold price granger causes the oil price as the probability of the result is less than 0.05. Nonetheless, the alternative hypothesis is rejected as the oil price does not granger cause the gold price. Hence, this indicates there is only a unidirectional relationship between gold price and oil price. The causation is found from the gold price to the oil price and not another way round.

The unidirectional causality is found from gold price to oil price but not from the oil price to gold price. The finding obtained in Malaysia is inconsistent in the case of India studied by Varsha et. al (2016) and Lodha (2017). They found the existence of unidirectional causation between the two commodities. However the direction of causation is found from oil price to gold price. This finding is parallel to previous findings in Singapore and China such as Thai-Ha and Youngho (2011) and Zhang (2013). It is also contradicting with the previous finding Yahya et. al (2013). Using a different method they found there is no causation between these two commodities. Thus, unidirectional causation is observed from the gold price to oil price implies that the changes in oil price may be monitored by observing in the gold price.

Conclusion

This study attempts to examine the cointegration and the causation on oil price and gold price. It is found that the long run cointegration exists and oil price has a high significant influence on gold price. Thus, the government needs to watch closely the oil price since it gives high impact on the movement of gold price. While, result of Granger causality test reveals that gold price granger causes the oil price. Nonetheless, the oil price does not granger cause the gold price. Hence, this indicates there is only a unidirectional relationship between gold price and oil price which suggested in the near future study should be done on the way round whether the gold price can predict the changes in the oil price.

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