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FACTORS DETERMINING GOLD PRICES IN MALAYSIA

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Abstract: Gold is a valuable asset to a country because of its liquidity. Gold reserve can stabilize the currency in a country. The objective of this paper is to identify the factors contributing to the volatility of gold prices, such as Real Malaysia GDP, inflation rates, crude oil prices and exchange rates. The data was analysed using Autoregressive Distributed Lag (ARDL) approach with time series data, with 30-year coverage from 1987 to 2016. Findings showed that only Real Malaysia GDP and crude oil prices were significantly related to gold prices. As a conclusion, this study can be used as reference by other investors. The author suggests to other researchers to further improve upon this study by adding more variables or diversifying the variables that relate to volatility of gold prices
Keywords: gold price, volatility, time series, ARDL

Introduction

In Islamic history, gold was used as a currency known as the Dinar currency, used in the period of *Jahiliah*. Dinars were gold coins used as an exchange medium by Muslims sometime in the fall of the Ottoman Caliph (Meera, 2002). The Prophet Muhammad set a monetary policy where the use of the gold currency must be in accordance with the price of goods, and any transaction activities should be backed by gold (Yaacob, 2012). This was accepted in Islam because it had a fixed and intrinsic value.

Gold is also a valuable investment tool. The fluctuating prices of this commodity mean that it can be used a hedging tool and can be converted into currency to help offset massive losses suffered by investors (Sukri, Mohd Zain, & Zainal Abidin, 2015). Hedging can also be regarded as a risk reduction in investment against the value of an asset. Besides, gold is an investment initiative that reduces the risk of loss at any time because we cannot expect the economic crisis to happen clearly (Mohd Jamli, 2013). Gold is also an ideal reserve when financial crisis occurs, as gold is an active investment activity over other investments (Kaul & Sapp, 2006). For example, the European and US Zone Crises led to rising gold prices and further boosted demand for gold especially in East Asia, including from China, India, Korea and Japan and ASEAN countries. Therefore, gold is a very valuable investment nowadays due to its rising prices and easy conversion into currency at any time (Ziaei, 2012). Weng (2011) also argues that gold is seen as a commodity that can maintain purchasing power and a hedge against inflation. Based on previous studies, gold prices had a positive correlation to inflation. These expectations could be as reference for investors in coming years. Therefore, the objective of this study is to identify the determining factors of gold prices in short run and long run in Malaysia.

Literature Review

There have been many studies investigating the factors that affected gold prices in various countries. The study conducted by Sjaastad (2008) was about the relationship between the major currencies and the gold prices using the expected error data. As a result, he concluded that since the dissolution of the Bretton Woods financial system, the buoyancy of the major currencies has led to the volatility of world gold prices. The gold price dominated by US Dollar has affected gold prices in other countries. This is influenced by the change in US Dollar currency. This opinion is also supported by the study conducted by Sindhu (2013). He argues that there is a negative relationship between US Dollar and gold prices. This is because of the high interest rates due to the debt burden borne by the United States. Thus, this has shrunk the value of the US dollar leading to increased gold prices in the United States.

Md Hashim et al, (2017) conducted a study on macroeconomic factors against the change in the price of gold. They studied 20 year annual data from 1996 to 2015 of gold-related countries such as India, United States, China, Turkey and Saudi Arabia. They found that there was a positive correlation between oil prices and gold prices but a negative relationship between exchange rates, inflation and interest rates and gold prices. Only the exchange rate did not significantly affect the price of gold. The same study was also conducted by (Zakaria, Abdul Shukur, Affandi, & Wan Mahmood, 2015). They used monthly data of 14 years from 2000 to 2013. The study was about the factors that caused the change in the prices of gold in Malaysia. Based on the results of their study, it was found that the exchange rates, interest rates and inflation rates had a significant relationship with the prices of gold in Malaysia according to the difference in magnitude and direction. Empirical evidence also showed that any changes in the three variables would cause the prices of gold to change.

Sukri, Mohd Zain, and Zainal Abidin (2015) also conducted a study to determine the relationship between macroeconomic factors and the prices of gold *(Emas*

Kijang) in Malaysia. The data used were the data of each macroeconomic factor (inflation rates, crude oil prices, ringgit exchange rates, Real GDP and inflation rates) during the 9th quarter of 2005 to 2014. Multiple Linear Regression Methods were used to get their findings, from which it was discovered that the Ringgit exchange rate showed a negative correlation with the prices of gold *(Emas Kijang)*.

Nair et al, (2015) conducted a study on the relationship between gold prices and Indian currency exchange rates against US Dollar in India. The study aimed to examine the impact of the economic downturn in 2008 on the prices of gold and the exchange rates of India currency against US Dollar. The Johansen Co-Integration test method applied to examine the long-term relationship and the Granger Casualty test method to test the lag values between the two variables. They concluded that there was a bidirectional casualty between US Dollar exchange rate and gold prices in India before the economic downturn. However, there was little disruption to the bidirectional relationship and the lag casualty between the two variables during the downturn economy of India.

Mashayeki, Ara, and Jafari (2013) studied the prices of gold and the impact of currency devaluation on economic sanctions in Iran. The purpose of this study was to analyze the price trend of gold within 5 years in Iran. The Regression Auto Model was used to analyze the results of this study and it was found that changes in the value of global currencies and gold prices affected gold prices in Iran. Changes in the price of gold in Iran were also influenced by the major factor, which was the economic sanctions imposed on Iran.

Ling (2011) conducted a study on the relationship between gold prices and the exchange rate of Asean currencies (Ringgit Malaysia, Singapore Dollar, and Thai Bath) against the US Dollar. The methods used to carry out the study were Augmented Dickey-Fuller (ADF) Unit Root Test, Johansen Cointegration Test, Granger Casualty Test with Vector Error Correction Model (VECM) and Ordinary Least Square (OLS) Method. The data used were monthly data from January 1981 to December 2010. From the results of his study, he found that the prices of gold and Ringgit Malaysia had a long-term relationship and a positive relationship. Negative relationships were found between gold prices and Singapore Dollar and Thai Bath.

Ibrahim, Kamaruddin and Hassan (2014) conducted a study to determine the relationship between crude oil prices, inflation rates, exchange rates and gold prices in Malaysia. The data used were 10 know-how periods from 2003 to 2012. The method used to carry out this study was the Multiple Linear Regression Model. They concluded that there was a negative correlation between the inflation rate and the exchange rate against gold prices while a positive correlation between the price of crude oil and gold prices.

Omag (2012) conducted a study on the relationship between gold prices and financial variables (exchange rates and stock prices) in Turkey. Data was taken from January 2002 to December 2011 using the Multiple Linear Regression Model. The results showed that there was a positive correlation between the prices of Turkish gold and the Stock of Istanbul Exchange 100 Index, and the exchange rates between Turkish Lira and Dollar.

Tsen (2014) also argues that there was a negative correlation between the exchange rates and gold prices in Malaysia. He used the Autoregressive Distributed Lag (ARDL) method to show long-term relationships between currency exchange rates and gold prices. He also argued that the rise in gold prices would depreciate the US Dollar.

The uncertain changes in US Dollar currency rates also indirectly affect the price of gold around the world. This opinion is supported by Baber, Baber and Thomas (2013) who conducted a study on gold price fluctuations in India from 2002 to 2012. Their findings showed the inverse relationship between Dollar and gold prices. The rationale was that when the financial crisis in the USA occurred, the dollar rate would be weak and this would indirectly increase the prices of gold.

Gold was used as a hedge against inflation in Malaysia. According to a study conducted by Mohd Jamli (2013), there was a long-term relationship between inflation rates, money supply, interest rates and the stock market against gold prices in Malaysia. The data used was the monthly periodic data of 10 years from 2002 to 2012. The method used was the Johansen cointegration method and the causal test of the Error Correction Vector Model.

Gold prices would rise when inflation occurred. This is evidenced by a study conducted by Khoury (1984) posing a gold price associated with the consumer price index. Worthington and Pahlavani (2007) also argue that gold prices and inflation were positively related over the long term. The study was about the role of gold in protecting inflation, using monthly data from 1945 to 2006.

Material and Methods

The data obtained were the dependent variable data which were the gold prices in Malaysia in terms of US Dollar and independent variable data which were Ringgit exchange rates in US Dollar terms, inflation rates, crude oil prices and real gross domestic product (GDP). These data covered 30-year time period from 1987 to 2017.

In order to meet the objective of this study, a general equation was generated as follows:

$$GP = f (EXC, COP, GDP, INF) \quad [1]$$

Based on the theory and previous studies, a linear equation was formulated to carry out this study as follows:

$$GP_t = \beta_0 + \beta_1 EXC_t + \beta_2 COP_t + \beta_3 GDP_t + \beta_4 INF_t + \varepsilon_i \quad [2]$$

Where:
GP_t = Gold price
β_0 = Y Intercept
$\beta_1 EXC_t$ = Ringgit exchange rate
$\beta_2 COP_t$ = Crude oil price
$\beta_3 RGDP_t$ = GDP is correct
$\beta_4 INF_t$ = Inflation rate
ε_i = Error terms (other factors affecting Y)

Data Collection

Secondary data which was time series data was collected covering 30 year period. Secondary data is the original data collected for its primary use and is taken for purposes of analysis by another party (Hox and Boeije, 2005). Secondary data is also data collected for purposes other than intended use (Jewel, 2001).

According to Amin (1988), time series data means the data describing the values of the variables from time to time. For example, this study explained the value of dependent variables such as gold prices and independent variables namely Ringgit exchange rates, crude oil prices, inflation rates and real GDP from 1987 to 2016.

Secondary data was selected to carry out this study to indicate the trend in short and long term of the relationship between the variables. The study was also conducted based on past studies that mostly used secondary data. This was also a factor justifying the use of secondary data in this study.

Unit Root Test

This method is a popular and formal method employed by researchers to estimate the accuracy of the data. This test is based on the Augmented Dickey Fuller (ADF) standard introduced by Dickey and Fuller (1979, 1981). According to Mohd Jamli (2013), the ADF test is also very important in time series data because it can remove spurious correlation or non-stationary which means false correlation between variables leading to inaccurate results. The optimum lag length is determined by the Akaike Information Criterion (AIC) method. The estimation model (ADF) is as follows:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \Sigma_{i=1}^{L} \delta_i \ \Delta Y_{t-1} + u_t \quad [3]$$

where ΔY_t: First Difference Time Series Y_t (Y_t - Y_{t-1})

β_0 : Intercept
t : Time Flow
L : Lag Length
u_t: Error Term

When the value t is greater than the critical value, then H_0 is rejected. Then, the data is stationary. In addition, data accuracy can also be seen through the critical value of Mckinnon at the level of 1%, 5% and 10%. This is evaluated when ADF t-stat value exceeds the critical value of Mckinnon so the data is stationary. The null hypotheses and alternative hypotheses are written as follows:

H_0 = δ=0 The unit root exists so the data is not stationary; then it is necessary to make the first difference to make the data stationary.

H_1 = δ<0 The unit root does not exist; then the data is stationary.

In addition, the standards of Phillips and Perron (1988) are also applied. This method is used only to reduce the inclusion of error pronouncements made through the ADF test. Besides, it also yields approximately the same t-statistical computed value as estimated by the ADF test.

Cointegration Test

The first approach in the ARDL method is the Bound Test which is to indicate cointegration between the variables used as a result of the non-stationary variable at the level. Moreover, it observes the long run relationship between the variables even though the variable is not stationary. Bound Test is the best method to examine the long run relationship between variables (Pesaran et al, 1999, Norhayati et al, 2012). The null hypotheses and alternative hypotheses were been written as follows:

H_0 = δ=0 no cointegration

H_1 = δ<0 cointegration exist

To confirm the existence of cointegration between variables, the remaining data should be regressed. If the t-stats value is less than zero at the level, then the data is stationary. This means the cointegration between the variables is valid (Bhaumik, 2015).

When there is a cointegration, the next step is to proceed with the Error Correction Model (ECM) test. ECM is used to produce a comprehensive model that combines the dynamics between short run and long run variables. In other words, this model aims to make adjustments to variables dynamically in the short run. This is because according to Bhaumik (2016), there are possible variables that are not stationary but have cointegration with each other. ECM equation was written as follows:

$$\Delta GP_t = \alpha_2 + \sum_{i-1}^{P} \varphi_{2i}\, \Delta GP_{t-i} + \sum_{i=0}^{P} \varpi \Delta_{2i}\, \Delta EXC_{t-0} + \sum_{i=0}^{P} \phi \Delta_{2i}\, RGDP_{t-i} + \sum_{i=0}^{P} \lambda_{2i}\, \Delta INF_{t-i} + \sum_{i=0}^{P} \gamma_{2i}\, \Delta COP_{t-i} + \psi ecm_{t-1} + \varepsilon_t$$

Where:

$\varphi, \varpi, \phi, \lambda, \gamma$ = Dynamic coefficient of short run and long run

ψ = Speed of adjusment towards a long run equilibrium

=*Stability Test*

This test is aimed to look at the stability between variables in the short and long term through the evaluation of the value of the coefficient of variables. This test is done by removing the Cumulative Sum of Squares of Residuals Recursive diagram (CUSUMSQ) and Cumulative Sum of Residuals Recursive (CUSUM). If the straight line (CUSUMSQ) or (CUSUM) does not touch a significant line then the model is stable.

Diagnostic Test

This test is conducted to observe some of the error levels of a model. This test covers LM Series Testing, Ramsey RESET Test and Heteroscadiscity. The LM Series test is to estimates the existence of a series of correlations between the variables while the Ramsey RESET Test is to recognize the linear level of a model and the Heteroscadiscity test to see the existence of a disturbing term in a model.

Results and Discussion

This section will discuss the answers to the questions mentioned in relation to macroeconomic factors against the change in the price of gold in Malaysia. The dependent variable used was the prices of gold and the independent variable were the Ringgit exchange rates, Real Gross Domestic Product (GDP), the prices of crude oil and inflation rates. To meet all of the objectives of the study, several methods were used, namely stationary tests, cointegration tests, stability tests and diagnostic tests. This method was also used as the last researcher was very well acquainted with its use.

Unit Root Test Result

As previously stated, this method was used to test the accuracy of the data as it presented the results of the test by ADF and Phillips Perron tests. Table 2 shows the result of the test using latitude length 1 to 10. For ADF test, the number of lag was determined by Shwarz Info Criterion while Phillips Perron test was determined by Newest Bandwith. The value of p was a measure of the magnitude of all the variables used. ADF test result

showed that only inflation rate was stationary either with a trend or without a trend. This shows that inflation rates indicated short run and long run relationships. The p value was smaller than 0.01 compared to other non-stationary variables. In order to get a stuttering, the variables were tested at first difference and it was found that all the variables were stationary either with trends or without trends. The p value was all smaller than 0.01 or at 1% level of significance. In addition, the test results from Phillips Perron also gave a fairly similar result. However, Phillips Perron test results were more accurate than ADF. As mentioned earlier, the Phillips Perron test was able to change the values of the results from the ADF test to smaller and more significant ones (Weng, 2011). Overall, all variables were stationary in the first differential and had a stochastic trend simultaneously (Mohd Jamli, 2013).

Table 1: Unit Root Test Results

Variables	Augmented Dickey Fuller				Phillips Perron			
	At Level		First Difference		At Level		First Difference	
	Trend	Without Trend	Trend	Without trend	Trend	Without Trend	Trend	Without Trend
Gold Price	0.5787	0.9904	0.0013	0.0008	0.5786	0.9898	0.0013	0.0008
Exchange Rate	0.5560	0.4744	0.0011	0.0002	0.5560	0.4647	0.0011	0.0001
Real GDP	0.6647	0.5919	0.0055	0.0013	0.5747	0.5919	0.0055	0.0013
Inflation Rate	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000
Crude Oil Price	0.8976	0.7362	0.0046	0.0010	0.8395	0.7280	0.0045	0.0010

Cointegration Test Results

Table 2: Boundary Test Result-ARDL

Test Statistic	Value Statistic	Lag	Significance Level	Case 3: Constant without boundaries and no trend	
				I(0)	I(1)
F-statistic	4.406890	3	10%	2.45	3.52
			5%	2.86	4.01
			1%	3.74	5.06

Table 3: Error Correction Model Test Result

Lag (2,3,3,0,3,)	ARDL:				
Dependent Variable	Independent Variable				
	C	DLEXC	LCP	LGDP	ECM(-1)
DLGP	0.522315	0.528180***	0.160059***	0.386164**	0.015044***
	(5.577767)	(-5.057164)	(-4.120902)	(2.826059)	(-5.481512)

Note: 1. *** Significant at 1% significance level, ** Significant at 5% significance level.

The method used to test the existence of long-term relationships between the variables was the Boundry Test approach in the ARDL approach. Referring to the F-statistic value in Table 3, it was found that the value was at the upper boundary level which was significant at a significance level of 5%. Based on the CointEq(-1) value that represented ECT, it can also be concluded that there was a long-term cointegration relationship between inflation rates, real GDP, crude oil prices and exchange rates against gold prices in Malaysia.

With the cointegration relationship in the variable, the long-term and short-term correction errors model was done and is shown in Table 4. This is supported by a study conducted by Bhaumik (2015). As shown in table 4.4.2, it was found that the increase in the Ringgit exchange rate would cause a decrease in the gold price of RM267 in the short and long term by looking at significant values at a significance level of 1% at lag 1, while oil prices were significant at a 1% significance level at lag 2, which was an increase of RM1 in crude oil prices would cause a reduction in the gold price of RM66 in the short and long term. For real GDP, the p value was significant at a 5% significance level and that RM1 increase in real GDP would result in a rise in gold price of RM109 in the short and long term. The adjustment value of this model was -0.08 which showed that the variation of the correction of this model was 8%. This is because the p value was significant at a significance level of 1% (Hossain, 2018).

Stability Test

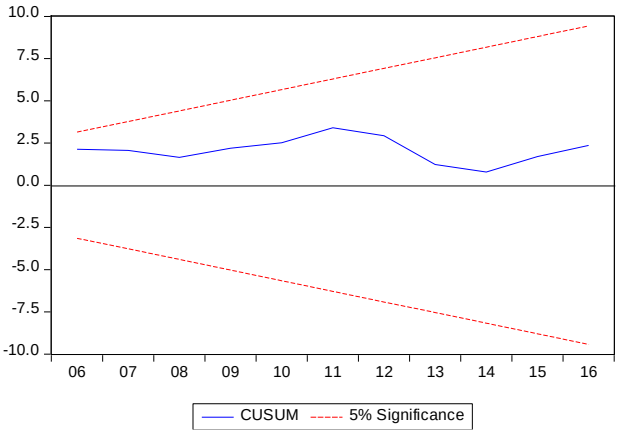

Figure 1: Cumulative Sum Of Residual Recursive

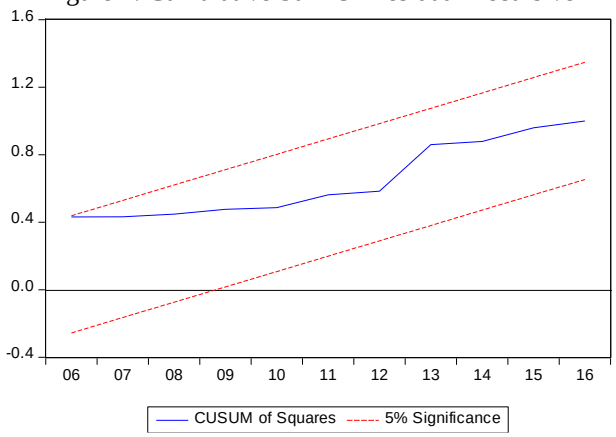

Figure 2: Cumulative Of Sum Of Residual Recursive

This test was also a requirement for the use of the ARDL method. To determine the stability of long-term and short-term coefficients, Cumulative Sum of Residual Recursive (CUSUM) and Cumulative Sum of Square of Residual Recursive (CUSUMQ) tests were conducted. Figure 1 and Figure 2 show the stability of the coefficient for short and long term. As long as the line (CUSUM) and the line (CUSUMSQ) do not touch a significant line of 5%, then the coefficient is still stable (Sapuan & Sanusi, 2013).

Diagnostic Test

Table 4: Diagnostic Test Result

Diagnostic Test	Probability
LM Series Test	0.0003
RAMSEY RESET Test	0.3014
Breush Pagan Godfrey Heteroskadiscity	0.9288

The table above shows the results of a diagnostic test. Among the tests performed were the LM Series Test to see the correlation between the variables used (Bhaumik, 2015). In addition, the RAMSEY RESET test was to identify the extent of the specification error in the model. Finally, the Heteroscadicity test was to see the existence of a variety of thermal disturbances in the model (Bhaumik, 2015).

It was found that the LM Series Test showed a significant value at a significance level of 1%. This means we rejected the null hypothesis (no autocorrelation). For the RAMSEY RESET test, the probability value was 0.3014. This value showed that we received the Hypothesis Zero (no omitted variable). So, this model is robust. The Heteroscadicity test showed the probability value of 0.9288. This value indicated that we accepted the Null Hypothesis (No Heteroskadiscity). This indicated that all variables were not affected by the term interference.

Conclusion

This paper explores the relationship between gold prices and inflation rates, real GDP, exchange rates and crude oil prices using data in Malaysia over the period from 1987 to 2016. In doing so, ARDL was applied to examine the short run and long run relationship between the variables.

In order to investigate the factors of volatility of gold prices in 30 years, all variables were stationary based on ADF and Phillip Perron test in first difference in the long run. The second step was cointegration test approach. ECT value which was significant at 5% level found that there were cointegration relationship between variables in the long run. Third was the stability test. Based on figure (CUSUM) and (CUSUMSQ), as line (CUSUM) and line (CUSUMSQ) did not touch, the significant line was stable as the coefficient of variables.

This paper suggests to other researchers to further improve upon this study by adding more variables or diversifying the variables that relate to volatility of gold prices. For example, researchers may use stock prices and interest rates as factors affecting volatility of gold prices in Malaysia. Moreover, researchers may extend the scope of study to ASEAN countries so that differences between these countries can be shown. Besides, in the government sector, the author suggests on saving more gold reserve as this commodity can gain more GDP. For example, the higher gold price then the higher the GDP in long run. Higher gold reserve also helps to control the inflation in the long run. Investors also can involve in gold investment as they can increase their savings in the following year because gold commodity has higher liquidity than other assets.

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