# Gold, Uncertainty, Macroeconomy, Inflation Hedging and Safe Haven in Indonesia

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| Article Info | Abstract |
|---|---|
| | This study examines the impacts of monetary policy uncertainty and macroeconomic variables on gold price dynamics in Indonesia. Monthly time series data was used for the period of January 2009 till December 2018. Indonesia has the second place after Thailand as a country with the highest gold demand in Southeast Asia. but, there are less studies about role of gold as safe haven in Indonesia and this study is the first one that specifically included the uncertainty variable of US monetary policy in the model using ARDL-ECM approach. The ARDL-ECM approach is applied to find out are the gold price dynamics in Indonesia influenced by macroeconomic shocks or by the movements of gold price itself in the previous period. The empirical results of this study indicate that gold plays an important role as inflation hedging and safe haven in Indonesia. This study proved that in the short-term and long-term, gold price in the previous period, exchange rate, and IHSG have a negative and significant relationship on gold prices dynamics in Indonesia, while the London gold price and inflation have a positive and significant relationship on gold price movement in Indonesia. The high level of US monetary policy uncertainty and uncertainty in global economic conditions has led to an increase in gold prices in Indonesia. |

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## INTRODUCTION

Gold is a good strategic investment instrument than other types of precious metals, because it has a stable value, even tends to increase over time. Gold prices reveal the true state of economic health. When gold prices are higher, the economy tends to be relatively unhealthy. When gold prices are lower, the economy is relatively more healthy, making stocks and bonds more profitable instruments. Hence, price of gold shows expected inflation rate that finally reflects the health of the economy. In addition, gold functions are for exchange tool, payment instrument, and investment tool that is free of risk (safe haven), as well as a hedging tool. For central banks, like Bank Indonesia, gold were used to maintain the value of the currency and to keep the stability of the economy. Nevertheless, Zhu, et al. (2018), argues that the role of gold as a safe haven or as a hedge is begun to diminish. In their research, they show that the function of gold as an inflation hedge in the UK has been missing since May 1997, whereas in America it has been gone since 2003. In addition, they are also proved that gold functions as an inflation hedge only when inflation conditions and expectations of inflation are high, or in other words when the economy experiences a high level of uncertainty. In contrary, when economic conditions get better with a low level of uncertainty, investors will redirect their investment into other investment instruments, such as stocks, bonds, and housing (real estate). Several previous studies (Beckman et al., 2015; Balcilar et al., 2016; Bilgin, 2018; and Bouoiyour et al., 2018), shows that gold has long been seen as a hedge and safe haven on several variables with highly volatile, such as stock prices, oil prices, exchange rates, and inflation rate. Highly intensity of volatility indicate the higher uncertainties in macroeconomic variables. Hence, the relationships between the prices of gold, uncertainty, and macroeconomic dynamics remains uncertain.

Indonesia is one of the countries with the highest gold demand in the world, especially in Southeast Asia, Indonesia has the second place after Thailand. Contrast to developed country such as Singapore which is the demand for gold is relatively low. So it can be assume that the function of gold as an hedging or safe haven in investment begins to decrease or even disappear when the economic conditions are good, so that the demand for gold for investment is also small. Contrarily, gold was used as a safe haven or hedging when economic conditions are in a high degree of uncertainty, such as prolonged inflation, currency depreciation, or the occurrence of crises and other problems that are often faced by developing countries. This study aims to analyze the impact of US monetary policy uncertainty and changes in London gold prices, inflation rate, exchange rate, and stock prices on Indonesian gold prices dynamics.

This study contributes to the existing literature in several ways. there have been many studies about the role of gold as a hedging or safe haven, but mostly using case studies in the developed countries like United States. less studies have done an analysis in developing countries, especially for cases in Indonesia. First, this is the first study that specifically included the uncertainty variable of US monetary policy in the model to analyze the movement of gold prices in Indonesia. Based on the data from World Gold Council (2019), Indonesia is one of the countries with highest gold demand in the world, especially in Southeast Asia become one of our motivation research. Second, this study also investigates the impact of the past dependent and past independent variables on present dependent variable using an Autoregressive Distributed Lag (ARDL) model. Third, this research contributes to the development of investment theory literature and empirical studies that can be taken into consideration in the formulation of monetary policy and investment decision making for investors in protecting their financial assets. This study aims to analyze the impact of US monetary policy uncertainty and changes in London gold prices, inflation rate, exchange rate, and stock prices on gold prices dynamics in Indonesia using quantitative analysis of monthly time series data during the period January 2009 till December 2018.

The rest of the paper is structured as follows. In Section 1, we present our research background and motivation of this study. Section 2, we present our literature review and we describe our dataset as well as our econometric framework. Section 3, we present the estimation result and our findings. Section 4, we conclude, discuss the implications and limitations, and suggest future research directions.

**RESEARCH METHODS**

In this study, the cointegration test used was Bound test with a long-term estimation using the F-test to overcome differences in the level of integration between variables (Pesaran et al, 2001). The hypothesis used for the Bound test is as follows.

$H_0 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = 0$ (No cointegration).

$H_1 = \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq 0$ (There is Cointegration).

If it fails to reject the null hypothesis which indicates that there is no cointegration between variables, the research model used is the ARDL model to find out the long-term relationship between variables, as shown by equation (1) as follows.

$$\Delta lnGOLDID_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta lnGOLDID_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta lnMPU_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta lnGOLDL_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta lnIHK_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta lnREER_{t-i} + \sum_{i=1}^{q} \beta_6 \Delta lnIHSG_{t-i} + \beta_7 lnMPU_{t-1} + \sum_{i=1}^{q} \beta_4 lnIHK_{t-i} + \sum_{t-i}^{q} \beta_5 \Delta lnREER_{t-i} + \sum_{i=1}^{q} \beta_6 \Delta lnIHSG_{t-i} + \beta_7 lnMPU_{t-1} + \beta_8 lnGOLDL_{t-1} + \beta_9 lnIHK_{t-1} + \beta_{10} lnREER_{t-1} + \beta_{11} lnIHSG_{t-1} + \mu_t \quad (1)$$

If the bound test results show that there is cointegration between variables, then the ARDL approach can be applied by entering equation (1) into the error correction model (ECM) format to be able to determine the short-term relationships

of the model used, so that the equation is formed (2) as follows.

$$\Delta lnGOLDID_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta lnGOLDID_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta lnMPU_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta lnGOLDL_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta lnIHK_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta lnREER_{t-i} + \sum_{i=1}^{q} \beta_6 \Delta lnIHSG_{t-i} + \varphi ECT_{t-1} + \mu_i \quad (2)$$

From equation (1) and (2), GOLDID is Indonesian gold price per gram in rupiah; MPU is an index of monetary policy uncertainty; GOLDL is London gold price per gram in USD; CPI is the consumer price index; REER is the real effective exchange rate; IHSG is a composite stock price index; $\mu t$ is the error term; $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$, and $\beta_6$ are short-term multipliers, whereas $\beta_7$, $\beta_8$, $\beta_9$, $\beta_{10}$, and $\beta_{11}$ are long-term coefficients of the ARDL-ECM model.

This study using quantitative analysis of monthly time series data during the period January 2009 till December 2018. The data used in this study are secondary data (table 1) obtained from online databases and online publications which will then be analyzed using the ARDL-ECM method. In ARDL-ECM model there are two main stages of testing that must be carried out, namely the stationarity test and the diagnostic test of the ARDL-ECM model. The diagnostic tests include bound-test, autocorrelation test, heteroscedasticity test, linearity test, stationary variable residual model test, and model stability test.

**Table 1.** Data and sources

| Variables | Definition | Unit | Sources |
|---|---|---|---|
| GOLDID | Indonesia Gold Price/gr | IDR | World Gold Council |
| MPU | US Monetary Policy Uncertainty by Baker, Bloom, dan Davis (1985) | Index | www.policyuncertainty.com |
| GOLDL | London Gold Price/gr | USD | World Gold Council |
| CPI | Consumer Price Index as an indicator that show the movement of inflation rate | Index | Central Bureau of Statistics |
| REER | Real Effective Exchange Rate | Index | FRED |
| IHSG | Composite Stock Price Index | Index | CEIC |

One of the requirements prior to estimating time series data for regression is unit root test. This test is started with stationarity test

of the data to avoid spurious regression, a condition of which ther is significant relationship between the dependent variable and the

independent variable which in fact it is not. There are several ways to run stationarity tests, in this study we used Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron (PP) stationary test. The ADF test avoids serial correlation by increasing lag, whereas the PP test used nonparametric statistical methods to avoid serial correlation on disturbance variables without adding lag (Gujarati and Porter, 2009: 757-758). The result of unit root test can be seen at Table 3 in the next page.

The next estimation step is to run the cointegration test that is Bound tests are carried out to test long-term relationships with different degrees of integration in the ARDL model (Pesaran et al., 2001). If the results of bound test show that value of F-test is higher than the critical value of lower and upper levels at a significance level of 1 percent, 5 percent, or 10 percent, then it can be concluded that there is a long-term relationship between the dependent variable and explanatory variables. On the contrary, if the F-test is less than the lower bound test then there is no long-term relationship. H0 in this test is that there is no long-term relationship. The result of ARDL cointegrating test can be seen at Table 4. If we found the longrun cointegration between variables, then we can used ARDL model to find the best estimation result.

This test is based on the cumulative value of the amount recursive residuals. The result is valid if the cumulative value of recursive residuals is in the critical line band of 5 percent. The CUSUM test aims to detect systematic changes in the regression coefficient, so if there is a change in the regression coefficient (H0 is rejected), the stability test will be continued with the CUSUM Square test which aims to interpretation the data in taking policy when the regression coefficient is not systematic.

## RESULTS AND DISCUSSION

The data used in this study are time series secondary data obtained from various sources, namely the World Gold Council, CEIC, Central Bureau of Statistik, and Economic Policy Uncertainty. Monthly time series data is taken from January 2009 to December 2018, with the Indonesia gold price as the dependent variable. Meanwhile, the independent variable consists of the Monetary Policy Uncertainty (MPU), London gold price which is taken from the London Bullion Market Association (LBMA), the inflation rate which is indicated by consumer price index (IHK), the real effective rupiah exchange rate (REER), and the composite stock price index (IHSG). Good sample data is indicated by standard deviation values that are smaller than the average value as shown in Table 2. Also shown in Table 2, Indonesia Gold Price (GOLDID) has the highest volatility, calculated by standard deviation, than the other variables, where US Monetary Policy Uncertainty (MPU) is about half of GOLDID in its standard deviation. The others have a much smaller magnitude of standard deviation.

To start with, the first step carried out in this research is to ensure that the model can be estimated using the ARDL model. To be able to use the ARDL method, the variables used must be stationary at level I (0) or level I (1). There are two ways to do stationary tests, namely the unit root test and the correlogram. In this study the unit root test used was the Augmented Dickey-Fuller (ADF) test and the Phillips Perron (PP) test show in Table 3. Based on Table 3, it can be seen that the ADF and PP values show almost the same results, and produce decisions at the level of level I(0) for the MPU and IHSG variables are stationary. While other variables are not stationary at the level level. Therefore, the unit root test is then performed at the first difference level I(1) which then shows that each stationary variable at I(1) is at a significance level of 1%. Combination of this stationary level reinforced our reasons for using ARDL model. At this stage all variables that will be used in the model have been transformed into natural logarithms (Ln).

**Table 2.** Statistic Descriptive

| Variable | Obs | Unit | Mean | Median | Max. | Min. | Std. Dev |
|---|---|---|---|---|---|---|---|
| GOLDID | 120 | IDR | 473.112,4 | 490.262,9 | 593.012,6 | 303.266,4 | 79.815,9 |
| MPU | 120 | Index | 68,84856 | 57,90783 | 231,1490 | 18,68333 | 38,79915 |
| GOLDL | 120 | Dollar | 41,91906 | 40,79444 | 58,30534 | 28,39713 | 6,743664 |
| REER | 120 | Index | 92,87967 | 92,83000 | 102,5900 | 79,58000 | 5,261594 |
| IHK | 120 | Index | 110,2074 | 110,4050 | 135,3900 | 85,87000 | 15,81121 |
| IHSG | 120 | Index | 4.433,66 | 4.601,69 | 6.605,63 | 1.285,47 | 1.214,52 |

*(Source: Output Eviews 10, 2019)*

**Table 3.** Result of ADF and PP Unit Root Test

| Variable | ADF | | PP | | Decision |
|---|---|---|---|---|---|
| | Level | 1st Difference | Level | 1st Difference | |
| GOLDID | -1,960679 | -10,18682* | -1.992861 | -10.53325* | I(1) |
| MPU | -4,921432* | -8,565453* | -4,898407* | -16,26400* | I(0) |
| GOLDL | -2,412497 | -12,34860* | -2,313033 | -12,39208* | I(1) |
| REER | -2,217877 | -8,859153* | -2,385671 | -8.878844* | I(1) |
| IHK | -0,966802 | -8,954508* | -0,963007 | -9,222759* | I(1) |
| IHSG | -4,701803* | -9,174406* | -4,835576* | -9,314991* | I(0) |

Indicates the rejection of the null hypothesis on the non-stationarity of the variable under consideration at *significance at 1%.

The estimation using the ARDL-ECM approach are used to analyze the long-term relationship between variables. So, the cointegration test is then performed using the bounds test. Table 4 shows the results of the ARDL cointegration test using the bounds test. The F-test value (5.373745) is greater than the lower bounds value and the upper bound value which means that there is a long-term relationship between variables in the model at a significance level of 1 percent. These results indicate that the null hypothesis is rejected and there is a long-term cointegration between US monetary policy uncertainty, London gold price, inflation, exchange rates, and composite stock price index on gold prices dynamics in Indonesia during the observation period, January 2009 to December 2018.

**Table 4.** ARDL Cointegrating Test

| Estimated Model | Cointegration Result |
|---|---|
| Lag optimum | (3,0,3,4,2,1) |
| F-test for cointegration | 5,373745 |
| Critical value | 1% |
| Lower bounds | 3,06 |
| Upper bounds | 4,15 |

*(Source: Output Eviews 10, 2019)*

The estimation results using ARDL-ECM model in this study can be seen in Table 5 which shows the short-term and long-term relationship between the dependent variable (GOLDID) with the dependent variable in the past and the independent variables of the present and the past. The results of autocorrelation test, heteroscedasticity test, normality test, and linearity test, proved that the estimation result in this study has passed the diagnostic test and fulfills the analysis requirements. The F-statistic value which is higher than the Pesharan critical value - *in the bound test* - indicates the existence of long-term cointegration between variables during the period January 2009 to December 2018. Thus, the ARDL-ECM estimation model was used in conducting the short-term and long-term analysis.

The coefficient value of GOLDID$_{t-1}$ 0.285699 shows that when the rise of 1% on Indonesian gold price in the previous period or one month earlier (in this study we used monthly data), the gold price will respond negatively with a decrease of 28%. It can be concluded that in the short term the price of gold in the past has a negative and significant relationship to the

current price of gold. Contrarily, the coefficients of $GOLDL_t$ and $GOLDL_{t-1}$ are 0.425623 and 0.383585 respectively, this value shows that when the London gold price increased by 1%, it would be followed by an increase in gold prices in Indonesia 42%. It means that there is a positive and significant relationship between London gold price and the movement of gold prices in Indonesia.

In table 5 we can see that in the short term, for every 1% increase in $REER_{t-1}$ and $REER_t$ will cause the lower Indonesian gold price 29% and 55% respectively. These results indicate a significant negative relationship between the exchange rate and the movement of gold prices in Indonesia. When the exchange rate USD-IDR is high (rupiah is depreciation), the gold price tends to be low, but when the exchange rate is low (rupiah appreciation), the gold price will tend to strengthen. This is because the price of gold in Indonesia and in other countries refers to the world price denoted using the US dollar. As shown by the results of Giannellis (2019) that the price of gold has a positive correlation with the US exchange rate. Investors will choose to invest in gold when financial market risk is high, i.e when the US dollar depreciates.

$IHSG_t$ coefficient value is -0.144875, it means that in the short term, for every 1% increase in the IHSGt, there will be a decline in Indonesian gold prices at about 14,4%. The results are in line with research conducted by Gaur and Bansal (2010) which shows that stock prices have a negative relationship with gold price movements. Gold prices are generally counter-cyclical with economic conditions, while stock price is pro-cyclical with economic conditions, it means that when the economy is bullish (rising), stock prices will also go up, and when the economy is bearish (declining), stock prices will also go down. In other words, when the stock market falls, fear is usually high, and investors typically seek out the safe haven of gold (Clark, 2021).

From this result, we can see that in the short run, gold play its role as a good investment hedging in Indonesia. When IHSG stengthened and financial instruments are in the well condition, investors will tend to release their real investment, such as gold. Then it will cause Indonesian gold price fell down.

The coefficient of CPI in Table 5 is 0.904963 indicating that for every increasing in the inflation rate as indicated by a 1% increase in CPI will cause an increase in Indonesian gold prices by 90%. This result indicates a positive and significant relationship between the inflation rate and gold price movements in the short term. The estimation results are in line with the results of previous studies which proved a positive relationship between the gold prices with inflation rates (Batten, et al., 2014; Narayan, et al., 2015; Zhu, et al., 2017; and Lucey et al., 2017). In the higher inflation condition, indicated the high purchasing power in the country. This condition will reduce the value of money and higher the value of golds, then increased the price of gold.

**Table 5**. Estimation Result

| Model: ARDL (3,0,3,4,2,1) | | | | | |
|---|---|---|---|---|---|
| Dependent Variable: LGOLDID | | | | | |
| **Short Run Coefficient** | | | | | |
| **Variable** | **Coefficient** | **Std. Eror** | **t-statistic** | **Prob.** | |
| $\Delta GOLDID_{t-1}$ | -0.285699 | 0.074643 | -3.827522 | 0.0002 | |
| $\Delta GOLDL_{t-1}$ | 0.383585 | 0.049413 | 7.762921 | 0.0000 | |
| $\Delta GOLDL_t$ | 0.425623 | 0.025630 | 16.60611 | 0.0000 | |
| $\Delta REER_{t-1}$ | -0.296047 | 0.100410 | -2.948396 | 0.0040 | |
| $\Delta REER_t$ | -0.551239 | 0.083962 | -6.565372 | 0.0000 | |
| $\Delta IHSG_{t-1}$ | -0.055621 | 0.030166 | -1.843818 | 0.0683 | |
| $\Delta IHSG_t$ | -0.144875 | 0.031759 | -4.561648 | 0.0000 | |
| $\Delta IHK_t$ | 0.904963 | 0.226818 | 3.989816 | 0.0001 | |
| ECT | -0.338169 | 0.053507 | -6.320047 | 0.0000 | |
| **Long Run Coefficient** | | | | | |
| **Variable** | **Coefficient** | **Std. Eror** | **t-statistic** | **Prob.** | |
| MPU | 0.040219 | 0.015123 | 2.659407 | 0.0092 | |
| GOLDL | 0.739855 | 0.056578 | 13.07666 | 0.0000 | |
| REER | -0.827640 | 0.128833 | -6.424129 | 0.0000 | |
| IHSG | -0.087262 | 0.071973 | -1.212422 | 0.2283 | |
| IHK | 1.226685 | 0.131391 | 9.336145 | 0.0000 | |
| C | 8.865466 | 0.627954 | 14.11802 | 0.0000 | |
| **Diagnostic Test** | | | | | |
| $R^2$ | | | | 0.864002 | |
| Adjusted $R^2$ | | | | 0.848157 | |
| Durbin-Watson | | | | 1.988998 | |
| F-statistik | | | | 1149.637 (0,000000) | |
| Serial Corelation LM | | | | **0.049043 (0.9419)** | |
| Breusch-Pagan-Godfrey | | | | **1.132139 (0.6909)** | |
| Normality Jarque-Berra | | | | **0.298631 (0.861297)** | |
| Linierity Ramsey RESET | | | | **0.001817 (0.9661)** | |

(*Source: Output Eviews 10, 2019*)

Based on Table 5, the results of long-term estimates that indicated a positive and significant relationship between MPU and CPI on Indonesian gold prices dynamics. The results support previous studies (Beckman et al., 2015; Balcilar et al., 2016; Bouoiyour et al., 2018) which proved that in the long run, uncertain economic conditions will contribute to raising the price of gold. We can conclude that when there is a shock in US such as political shock, economic shock, or anything which caused the US economy experiences high uncertainty, investors will change from financial invesment to real investment such as gold. In this case, gold play its role as investment hedging in Indonesia. Meanwhile, the GOLDL coefficient shows positive and significant results (0.739855), while

REER shows negative and significant results (-0.827640) on the movement of gold prices in Indonesia. The results shows that the Indonesian gold prices dynamics has strong dependency on London gold price. In addition, the results of this study are also in line with Eni and Halim (2014) which proved a positive relationship between the London Gold Price and the movement of gold prices in Indonesia. Indonesia can't determine its own gold price, because the one that determines the world gold price is the London Bullion Market Association (LBMA), based on the demand and supply of gold which is depend on the world economic conditions. So, we can conclude that when there is a shock in the world shocks, like global pandemic in 2019, many people worry about their financial assets and tend

to convert their financial assets into the real assets, such as gold. An increase in gold demand while gold supply is doesn not change in short run, will ecourage LBMA to raise the gold price.

The value of the ECT (error correction term) is significant and negative, this value indicates the speed of adjustment towards long-term balance. ECT value of -0.338169 with a probability of 0.0000 means that there is a long-term cointegration between variables. A negative value of ECT indicates that the model will reach equilibrium at a speed of 33.81% per month.

The model stability test used in this study is the CUSUM and CUSUM of square tests to check the stability of the parameters. In this study, Figure 1 and Figure 2 shows the CUSUM and CUSUM of squares plots that are in the 5% critical line band. This means that the model used in this study has a regression coefficient that has been systematic or there has been stability in the parameters in the model used.
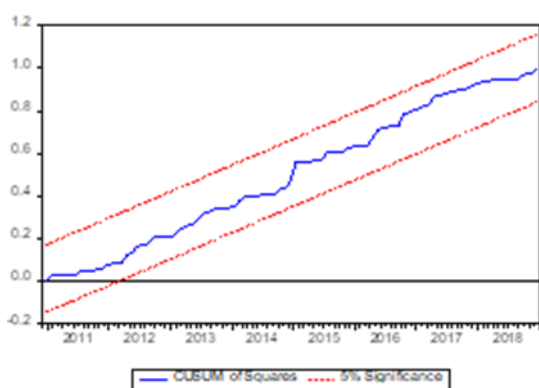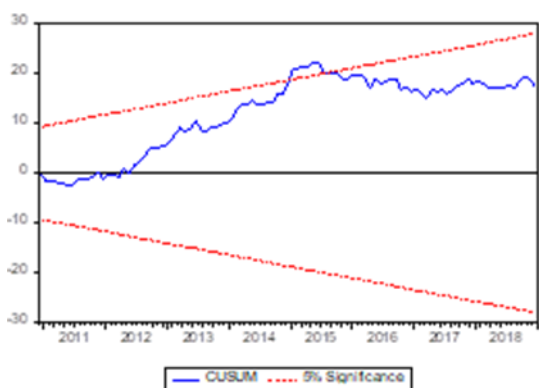


**Figure 1**. Result of Stability CUSUM



**Figure 2.** Result of CUSUM Square

## CONCLUSION

This study investigated the short-term and long-term effects of US monetary policy uncertainty and macroeconomic variables toward gold prices dynamics in Indonesia during the period January 2009 to December 2018 using the ARDL-ECM approach.

Short-term estimation results show that the previous period's gold price, exchange rate, and IHSG had a negative and significant relationship to the movement of gold prices in Indonesia, while the London gold price and inflation had a positive and significant relationship to the movement of gold prices in Indonesia.

Meanwhile, the results of long-term estimates show that there is a positive and significant relationship between US monetary policy uncertainty, London gold prices, and inflation on the movement of gold prices. In contrary, there is a negative and significant relationship between the exchange rate and the movement of gold prices in Indonesia. IHSG has a negative relationship with the price of gold in the long run but it is not significant.

The estimation results of this study proved that gold has an important role as inflation hedging and safe haven in Indonesia over the observation period, but gold can play a role as a good safe haven in investment only in the short term. Because, Indonesia's gold price is depends on the condition of the world economy, especially US economic uncertainty. Hence, it is important for Bank Indonesia as monetary authorities to pay attention on policies that will or are being issued by The Fed and watch the various global economic issues that might affect world gold prices, so can make anticipation for the impact that may be caused.

We proved that gold has an important role as inflation hedging in Indonesia, but correlation between gold and IHSG only significant in the short run. That makes sense, if Indonesia's gold price dynamics in the long run also affected by the others variables and the world gold price. Therefore, in making gold investment decision, it is necessary to have good knowledge about the current condition of the world economy. Thus, investors can safely diversify their financial assets in gold.

This study has some limitations which are related to sample size and problem point of view. First, this study only focused on the side of gold demand, while the price of gold actually

determined by the equilibrium of supply and demand for gold. Secondly, the estimation result of this study is only able to capture macroeconomic aspect, whereas, gold demand also influenced by various micro variables, such as consumer tastes, income rate, etc.

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