



Analysis of Factors Affecting Prices Indonesian Gold Spot With ARDL Model

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ABSTRACT

This study examines the impact of macroeconomic variables—namely inflation and exchange rates—on Indonesian gold spot prices from 1995 to 2018, employing the Autoregressive Distributed Lag (ARDL) model. The study seeks to comprehend the short-term and long-term correlations among these variables. Time series data were obtained from the Indonesian Central Statistics Agency, Index Mundi, and the Gold Price Chart. The findings indicate that, in the near term, inflation negatively and significantly affects gold prices, however, in the long term, it positively and significantly influences them. Likewise, the exchange rate exerts a substantial and adverse impact in both the short and long run, suggesting that a stronger Rupiah generally elevates gold prices. The ARDL model validates the existence of a cointegrated relationship among the variables, corroborated by the limits testing methodology. Diagnostic assessments confirm the stability and reliability of the calculated model. These findings indicate that the regulation of inflation and exchange rates is essential for maintaining gold price stability in Indonesia.

1. Introduction

Gold is a soft and malleable precious metal that is usually used as a material for jewelry or valuable properties. Apart from that, gold is a popular and trusted investment instrument from time to time (Ali et al., 2024). Gold is a financial standard determined by various countries, is also a relatively eternal medium of exchange, and is accepted in all countries in the world (J. Li et al., 2023). Consequently, in this case, every use of gold is measured in grams or kilograms (Hoque et al., 2024).

In world trade, gold is usually bought and sold between one country and another, and gold is also used as an investment (Ding et al., 2022). Investing in gold is a prudent measure to mitigate losses resulting from diminishing economic growth and inflation, which further erode the value of the rupiah (Madani & Ftiti, 2022). When deciding to invest in gold, it is essential to monitor price movements to facilitate predictions, necessitating an awareness of the elements that influence gold prices (Sahoo, 2024).

The price of gold could vary with time to either rise or fall. Uncertainty in global conditions causes this; many events that surround us—politics, economics, crises, recessions, or war—have been catalysts for the rise and fall of gold prices (Viner, 2024). There were riots in Indonesia itself in 1998 meant to challenge

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President Soeharto's authority. Gold is sometimes considered as a savior in turbulent political and economic times, so its value normally declines during a crisis(Jain & Jaiswal, 2023). Apart from the above-mentioned elements, one of them is rising inflation and changing exchange rates.(Chiang, 2022)s.

Inflation is the phenomenon of a sustained rise in the overall price level of products. This does not imply that the prices of different commodities will increase by the same percentage. These increases may not transpire concurrently; however, it is crucial that there is a sustained rise in the overall price of commodities over a specified duration. A singular increase, regardless of its substantial amount, does not constitute inflation.(Weber et al., 2025). The price escalation is measured by the price index, whereas inflation pertains to the worth of one currency compared to that of another nation. Inflation profoundly impacts spending decisions by standardizing prices across several countries into a singular indicator, namely inflation. Inflation is a phenomenon defined by a persistent rise in overall price levels.(Yilmaz & Bulut, 2025).

The devaluation of the US dollar may catalyze an increase in worldwide gold prices. When interest rates rise, there is a marked tendency to keep funds in interest-bearing deposits instead than in non-interest-bearing gold. This will apply pressure on gold prices. A decrease in interest rates generally leads to a rise in gold prices (Wang & Lee, 2022).

The exchange rate indicates the value of one currency relative to another. The currency rate is a vital determinant in an open economy, significantly influencing the current account balance and several macroeconomic indices.(B. Li et al., 2025). The exchange rate refers to the comparison of value or price between two specific currencies. The correlation between the aforementioned components is the inflation factor and the exchange rate, if the inflation increases, the prices of goods and services in the country will increase. Escalating prices of goods and services result in a depreciation of currency value. (Fevereiro et al., 2025).

Experts assert that the determinants of gold prices include the currency rate and inflation(Gulseven & Ekici, 2021). This research concentrates on examining the factors that affect the price of gold in Indonesia, including inflation and the exchange rate. Inflation and currency rate statistics are sourced from the Indonesian Central Statistics Agency, while world gold price data is obtained from Index Mundi and the Gold Price Chart. Experts indicate that the determinants of gold prices include the currency rate and inflation. The data utilized in this study as a research sample are as follows:

Table. 1 Data on Inflation, Exchange Rates and Indonesian Gold Prices 2010-2018

Year	Inflation (Percent)	Exchange Rates (Rupiah)	Indonesian Gold Prices (Rupiah)
2010	6,96	9.090	11.118.782
2011	3,79	8.770	13.771.050
2012	4,3	9.387	15.665.814
2013	8,38	10.461	14.672.009
2014	8,36	11.865	15.010.917
2015	3,35	13.389	15.519.141

The table indicates that inflation and exchange rate statistics exhibit volatility, yet the price of Indonesian gold rises annually. This suggests that fluctuations in inflation and exchange rates may not influence the price of Indonesian gold. In 2011, inflation declined to 3.79 percent compared to the prior year. The currency rate similarly declined from the previous year, reaching 8,770 rupiah. Conversely, the Indonesian gold price rose from the previous year, reaching 13,771,050 Rupiah.

Moreover, in 2014 inflation dropped from the year before to reach 8.36 percent; but the exchange rate rose from the year before to reach 11,865 Rupiah. The price of gold likewise changed, rising from the year before to reach 15,010,917 rupiah. While the price of gold rose from the previous year to reach the

amount of 16,604, 999-rupiah, inflation dropped from the previous year to 3.02 percent and the same thing also happened to the exchange rate, which also dropped from the previous year to 13,302 rupiah. Inspired by the above-mentioned description and ideas, the author is driven to investigate "Analysis of Factors Affecting Indonesian Gold Spot Prices Using the ARDL Model".

Conceptual Framework

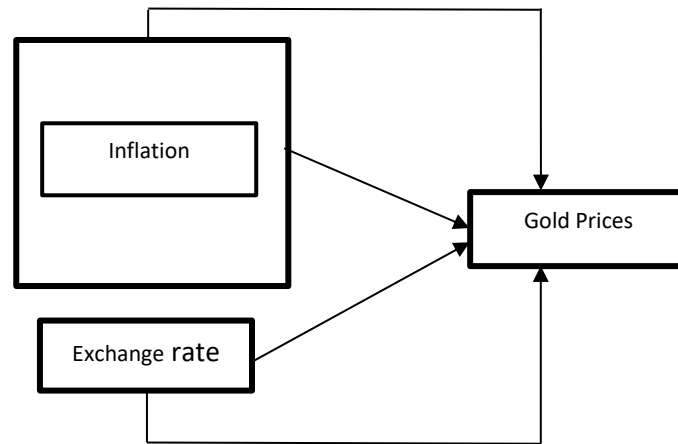


Fig. 1 Conceptual Framework

Hypothesis

A hypothesis is a passing solution for a statement of a problem. Its nature is still transient; hence it must be verified by means of gathered empirical evidence. Formulated hypotheses are based on a framework, a transient solution for the current issue. The following hypothesis can be developed depending on the definition of the problem and goals of this research:

- H_1 : Inflation has a long-term and short-term effect on the price of gold in Indonesia.
- H_2 : The exchange rate has an effect, both in the long and short term, on the price of gold in Indonesia.
- H_3 : Inflation and the exchange rate have long-term and short-term effects on the price of gold in Indonesia.

2. Methodology

2.1 Research Objects and Locations

The object of the research is Indonesian gold prices, inflation, and exchange rates. In this research, inflation and the exchange rate are the independent variables, while the dependent variable is the price of gold. The research location is in Indonesia.

2.2 Operational Definition of Variables

An operational definition of a variable is a definition given to a variable or construct by giving meaning, specifying activities, or providing an operation that is used to measure a particular construct or variable. To avoid errors in interpreting the variables analyzed and limit the problems in this research, it is necessary to explain the operational definition for each variable. Operationalization of variables is an indication of how the variables in research are measured. To clarify and facilitate understanding of the variables that will be analyzed in this research, it is necessary to formulate variable operationalization, namely as follows:

1. Inflation (Inf) is the process of increasing prices in general and continuously in connection with market mechanisms, which are influenced by many factors, such as increased public consumption, excessive liquidity in the market, which triggers consumption or even speculation, and the uneven distribution of goods. The inflation data used in this research is inflation data in the form of percent
2. The exchange rate is the exchange rate of the Rupiah currency against the US dollar currency, and the exchange rate is referred to as a comparison of the value of these currencies. The exchange rate data used in this research is exchange rate data in Rupiah.
3. The gold price (HE) is the gold price that applies in Indonesia. The gold price data used in this research is gold price data in Rupiah.

2.3 Data analysis method

Most economic analyses are related to time series analysis, which is realized by the relationship between changes in an economic quantity and economic phenomena and behavior at other times. This economic relationship is formulated using a dynamic linear model. Basically, the dynamic linear model places more emphasis on short-term dynamic structures. The ARDL model is as follows:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_k y_{t-p} + \beta_0 X_{t-1} + bX_{t-j} + e_t$$

After this research, the model is as follows:

$$\Delta HE_t = x_0 + x_1 \Delta HE_{t-1} + \beta_0 Inf_{t-1} + \beta_1 \Delta$$

A distribution lag model is one in which the regression model includes not only the present value but also the past value (lag) of the explanatory variable (X). Meanwhile, autoregressive distributed lag is a model that includes one or more past values (lag) of the dependent variable among the explanatory variables, a regression model that includes the value of a variable that explains the present value or past value (lag) of the dependent variable as one of the variables. The explanation is called autoregressive distributed lag (ARDL). This model can differentiate short-term and long-term responses of the dependent variable to a one-unit change in the value of the explanatory variable.

In situations where Y_t and X_t are not stationary but have cointegration, the appropriate model is the Error Correction Model (ECM). Before doing the ARDL analysis, there are several estimation steps that will be used in this analysis, namely:

1. Data Stationarity Test
2. Determination of Lag Length
3. Cointegration Bound Test
4. ARDL estimation
5. Normality Test
6. Auto Correlation Test
7. Heteroscedasticity Test
8. CUSUM and CUSUMQ Test

The first stage in conducting research using the ARDL method is to ascertain whether the data is stationary at level, 1. Differentiating 1 is not recommended for differencing 2, because the ARDL method is not suitable for stationary data at level 2. One way that can be used to determine the stationarity of sequential data time in the mean is to use the differentiation method (difference). In this study, unit roots were tested using the Dickey-Fuller method. The concept of the Augmented Dickey Fuller Test is that if a time series data is not stationary at order zero, $I(0)$, then the stationarity of the data can be searched through the next order so that the level of stationarity at the n-th order (first difference) or $I(1)$ is obtained, or $I(2)$, and so on.

2.4 The Stationarity Test

The stationarity test is very important in time series analysis. This stationarity test is carried out by testing the unit roots to test whether the time series data is stationary or not. Stationary data is time series data that does not contain unit roots; conversely, data is not stationary if the mean, variance, and covariance of the data are constant over time (Prawoto & Basuki, 2022).

The stationarity test or unit root test (unit root test) is carried out to determine whether or not a variable is stationary. Data is said to be stationary if it is close to the average and if the data observed in the integration test results in stationary data. Form of stationarity test equation with ADF (Augmented Dickey Fuller) analysis. If this test shows that the statistical ADF value is greater than the Mackinnon critical value, then the data is stationary, and if the statistical ADF value is smaller than the Mackinnon critical value, then the data is not stationary.

2.5 Examination of Bound Cointegration Test

The cointegration approach is closely related to testing the possibility of a long-term equilibrium relationship between economic variables, as required by economic theory. The cointegration approach can also be viewed as a theory test and is an important part in the formulation and estimation of a dynamic model. To determine whether a time series is stationary or not, regression can be used. The cointegration test used in this research is the cointegration test developed by Johansen. The Johansen test uses trace statistical analysis and critical values at a confidence level of $\alpha = 5\%$. The null hypothesis is that if the trace statistic value is greater than the critical value at the confidence level $\alpha = 5\%$ or the probability value (p-value) is smaller than $\alpha = 5\%$, then cointegration is indicated.

The ARDL method has several operational advantages; it can be used on short-series data and does not require pre-estimated classification of variables, so it can be carried out on variables $I(0)$, $I(1)$, or a combination of both. The cointegration test in this method is carried out by comparing the F-statistic value with the F table value that has been prepared. By estimating, the first step is taken in the ARDL Bound Test approach to see the F-statistics obtained. The F-statistics obtained will explain whether or not there is a long-term relationship between variables. The hypothesis in this F test is as follows:

- $H_0 = \alpha_1 = \alpha_2 = \alpha_n = 0$; there is no long-term relationship,
- $H_1 \neq \alpha_1 \neq \alpha_2 \neq \alpha_n \neq 0$; there is a long-term relationship

If the F-statistic value obtained from the bound test computational results is greater than the linear value of $I(0)$ df.

2.6 Autoregressive Distributed Lag (ARDL) Estimation Model

ARDL is a regression technique that incorporates the lags of both dependent and independent variables concurrently. This model enables the analysis of long-term relationships when the explanatory variables are a combination of $I(1)$ and $I(0)$. The ARDL estimator yields consistent long-term coefficients, derivable from basic normal asymptotic theory. The ARDL approach offers the advantage of yielding consistent estimates with robust long-term coefficients, irrespective of whether the explanatory variables or regressors are integrated of order 0 or order 1. In the context of long-term trend stationarity, utilizing ARDL, one can detrend the series and model the detrended series as a stationary distributed lag. (FADHILLAH, 2017).

The AR model employs one or more historical data points from the dependent variable as explanatory factors (Kamel & Abonazel, 2023). The DL model is a regression model that incorporates current and lagged data from descriptive variables (Jin et al., 2024). The ARDL model is highly useful in empirical econometrics as it transforms static economic theory into a dynamic framework by explicitly including the temporal dimension (Jin et al., 2024). This model can distinguish between short-term and long-term responses of the dependent variable to a one-unit change in the explanatory variable's value. (Gujarati, 2012). In general, the ARDL model used is expressed in the following equation:

The model in this research is as follows:

$$\Delta HE_t = \alpha_0 + \alpha_1 HE_{t-1} + \beta_0 + \beta_1 Inf_{t-1} + \beta_2 Kurs_{t-1} + e_t$$

HE : Indonesian Gold Price
Inf : Inflation
Kurs : Exchange rate
 $\alpha_0 \alpha_1$: Constants
 $\beta_0 \beta_1$: ARDL Model Coefficient
 e_t : Residual (error term)

If the variables in linear regression, both the dependent variable and the independent variable, have unit roots, the error will also contain unit roots. In this situation, a sudden regression occurs. However, it is often found that the error does not contain a trend, even though the dependent variable and independent variable contain a trend. This situation is often referred to as the case of the dependent variable being cointegrated with the independent variable. Thus, if cointegration occurs, the biased regression problem will disappear. In situations where the dependent and independent variables are not stationary but are cointegrated, the appropriate model to use is the Error Correction Model (ECM). Meanwhile, if it is not cointegrated, the suitable model to use is the ARDL model. The ARDL model for situations where Y_t and X_t are not stationary and not cointegrated is as follows:

$$\Delta Y_t = \alpha + \alpha_1 \Delta Y_{t-1} + \dots + \alpha_p \Delta Y_{t-p} + \beta_0 \Delta X_t + \beta_1 \Delta X_{t-1} + \beta_q \Delta X_{t-q} + \epsilon_t$$

According to the Eviews 10 usage guidelines, ARDL is a regression method that includes lags from both dependent and independent variables. This ARDL will produce consistent estimates with good long-term coefficients regardless of whether the explanatory variables or regressors are $I(0)$ or $I(1)$. In the case of a long-term relationship that has trend stationarity, with ARDL you can detrend the series and model the detrended series as a stationary distributed lag. (Falianty, 2003).

2.7 Determination of Optimum Lag

The optimal lag test is carried out to find out how many lags are suitable for interest. Selecting the optimal interval will utilize information criteria obtained from the Akaike Information Criteria (AIC). AIC penalizes additional variables (including interval variables) that reduce degrees of freedom. Therefore, the optimal interval will be found in the model specification that provides the minimum AIC value. AIC penalizes additions that reduce degrees of freedom. Therefore, the optimal lag will be found in the model specification that provides the minimum AIC value.

Classic assumption test

The classical assumption test is an analysis carried out to assess whether, in a multiple linear regression model, there are problems with the classical assumptions. The classic assumption test in this research consists of:

2.8 Normality test

The normality test aims to test whether, in the regression model, the dependent variable, independent variable, or both have a normal distribution or not. A good regression model has a normal data distribution, or distribution of statistical data, on the diagonal axis of a normal distribution graph. Testing the normality assumption in parametric statistics such as regression and Anova is the first requirement. The normality test aims to test whether, in the regression model, the confounding or residual variables have a normal distribution. If this assumption is violated, the statistical test will be invalid or biased, especially for small samples. The normality test can be carried out using the Chi-Square and Jarque Bera tests.

2.9 Autocorrelation Test

The basic assumptions that must be met in the analysis include the absence of autocorrelation in the residual values; in other words, each residual value does not depend on the residual values before and after it. To test this assumption, Bruesch-Godfrey (BG) statistics can be used. Autocorrelation testing in general is the BG test because one of the weaknesses of the LM test is that it only describes autocorrelation at lag-1; it does not see or test autocorrelation at lag-2, and so on. Logically, the autocorrelation coefficient at lag t is indeed the largest compared to the correlation coefficient at the next lag. However, the coefficient at lag-1 is significant, the autocorrelation coefficient at lag-2, and so on, needs to be tested.

2.10 Heteroscedasticity Test

The Heteroscedasticity test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. If these assumptions are not met, a heteroscedasticity problem will occur, namely a situation where the variance of the confounding error is not the same for all values of the independent variable.

Another testing method that can be used is the White method, where the heteroscedasticity hypothesis is used.

Ho : there is no heteroscedasticity if the probability is $>\alpha = 0,05$

Ha : there is heteroscedasticity if the probability $<\alpha = 0,05$

The basis for decision-making, if the probability value of $\text{Obs} \cdot R\text{-Squared} < X_2$, then Ho is rejected; if the probability value of $\text{Obs} \cdot R\text{-Squared} > X_2$, then Ho is accepted.

Model Stability Test

2.11 Cusum and Cusum SQ

The suitability of the ARDL model can be seen through stability tests. The stability test can be carried out using the cumulative sum of the recursive model (CUSUM) and the cumulative sum of the squares of the recursive model (CUSUMSQ). Stability tests are used to detect stability in both the short and long term. The CUSUM and CUSUMQ graphs, which are significant at $\alpha = 5\%$, indicate the stability of the parameters of the research variables.

3. Result

3.1 Descriptive Statistics Test Results

Statistics are used to describe data statistically. Statistics in this research refer to the average value (mean) and standard savings (standard deviation), minimum and maximum values, as well as all the variables in this research, namely the Indonesian gold price (Y), inflation (X1), and exchange rate (X2). Before entering classical assumption testing, we need to analyse descriptive statistics, namely as follows:

Table 2 Descriptive Statistics Test Results

	HE (Gold Price)	Inflation	Exchange Rate
Mean	7936364.	9.928333	9285.875
Median	5953010.	6.595000	9349.000
Maximum	19572165	77.60000	14237.00
Minimum	554834.0	2.010000	2249.000
Std. Dev.	6499879.	14.87140	3145.352
Observations	24	24	24

Source: Researcher Data Processing Results (2022)

Based on Table 2 above, the variable value for the Indonesian gold price has an average (mean) value of 793.63 Rupiah, a minimum value of 554.83 Rupiah, and a maximum value of 195,721 Rupiah. Furthermore, the standard deviation value is 649.98 rupiah. It indicates that the distribution of Indonesian gold price data is well distributed because the average value is greater than the standard deviation value ($793.63 > 649.98$). This distribution shows normal results and is evenly distributed so as not to cause bias from 24 observations.

The inflation variable value has an average (mean) value of 9.92%, with a minimum value of 2.01% and a maximum value of 77.60%. Furthermore, the standard deviation value of inflation is 14.87%. This means that the mean value is smaller than the standard deviation, thus indicating that the results are poor and uneven because the standard deviation reflects a very high deviation, so that the distribution of data shows abnormal results and causes bias in observation 24.

The value of the exchange rate variable has an average (mean) value of IDR 7,067.31, with a minimum value of IDR 631.00 and a maximum value of IDR 14,864.00. Furthermore, the standard deviation value of IDR 4,858,168 indicates that the exchange rate data is well distributed because the average value is greater than the standard deviation value ($7,067.31 > 4,858.16$). This distribution shows normal and even results, so it does not cause bias from observations of 41.

3.2 Stationarity Test Results

Stationarity is an important concept in time series analysis. As previously discussed, time series data is said to be stationary if the average value and variance do not experience systematic changes over time, or, in other words, the average and variance are constant. To determine whether the time series data used is stationary or not, a test is used with unit roots (unit root test) using the Phillip-Peron method. If testing at the level level shows that the data is not stationary, then testing will be carried out at the first difference level to see the suitability of the model used for research, which we can see in Table 3 below:

Table.3 Stationarity Test Results

Variable	Unit Root	Adj. t-Stat	Critical Value 5%	Prob	Explanation
Indonesian Gold Price	Level	-1.02255	-2.99806	0.7273	Not stationary
	First Diff	-4.83893	-3.00486	0.0009	stationary
Inflation	Level	-4.80238	-2.99806	0.0009	stationary
	First Diff	-20.5630	-3.00486	0.0000	stationary
Exchange Rate	Level	-4.51859	-2.99806	0.0018	stationary
	First Diff	-4.92272	-3.00486	0.0008	stationary

Source: Researcher Data Processing Results (2022)

1. The Indonesian gold price variable is not stationary at the level and *first difference* but is stationary at the *second difference* at the 5% confidence level, as evidenced by the AJ value. T-Stat is smaller than the *critical value* of 5%, namely $-1.02 < -2.99$ with a probability value of 0.7273.
2. The inflation variable is stationary at level and *first different* because Adj. t-Stat is greater than the *critical value* of 5%, namely $-4.83 > -3.00$ with a probability value of 0.0009.
3. The exchange rate variable is stationary at level and *first different* because Adj. t-Stat is greater than the *critical value* of 5%, namely $-4.92 > -3.00$ with a probability value of 0.0008.

From the results of the table above, it can be seen that the probability value of each variable at the significance level $\alpha = 5\%$ indicates that the variables are stationary, namely inflation and exchange rate, because the value of each variable at the level level is greater than the critical value of 5%, while the price of gold in Indonesia is not stationary at level and stationary at first difference.

3.3 Normality Test Results

The normality test aims to test whether in this model the confounding or residual variables have a normal distribution or not. As we know, the t test and f test assume that the residual values follow a normal distribution. If some of these assumptions are violated, then the statistical test will be invalid for small sample sizes (Gujarati and Porter, 2012). To find out the results of the testing in this research, you can see the image below:

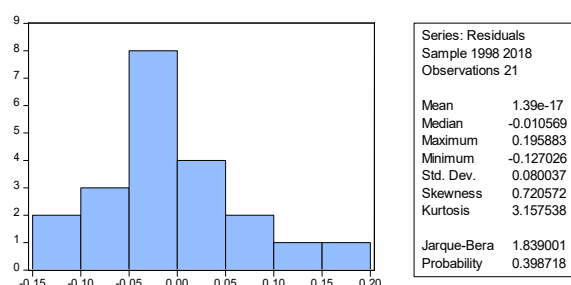


Fig.2 Normality Test Results

From Figure 2, it shows that the results for detecting whether the residuals are normally distributed or not are obtained by comparing the Jarque Bera value with the (chi-square) table. Based on the results of the normality test, it shows that the JB value is 1.83 in the df (2) table of 5.99, so $1.83 < 5.99$, so it can be concluded that the residual data in this model is normally distributed. This can also be seen from the probability value, which is greater than the 5% alpha error rate ($0.39 > 0.05$).

3.4 Autocorrelation Test Results

Whether there is autocorrelation or not can be seen from Obs*R-squared and the chi-square probability value (X2). If the probability value is $> \alpha 5\%$, then there is no indication of autocorrelation. Conversely, if the probability $< \alpha$, then the model is indicative of autocorrelation. To see the results of data processing in approaching autocorrelation, you can see the table below:

Table.4 Autocorrelation Test Results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.648544	Prob. F(2,10)	0.5435
Obs*R-squared	2.411140	Prob. Chi-Square(2)	0.2995

Source: Researcher Data Processing Results (2022)

Based on Table 4 in this study, the autocorrelation test was carried out using the correlation LM test by looking at the value of Obs*R-Squared compared to the Chi Square value (2). Meanwhile, in this test, it can be seen that the value of Obs*R-Squared is smaller than the Chi Square value (2) ($0.46 < 5.99$), so it can be concluded that the data in this model is free from indications of autocorrelation. This can also be seen from the probability of $0.299 > 0.05$.

3.5 Heteroscedasticity Test Results

The heteroscedasticity test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. The results of this test using the *White* Test method can be seen in this table:

Table.5 Heteroscedasticity Test Results

Heteroskedasticity Test: White

F-statistic	0.450693	Prob. F(8,12)	0.8679
Obs*R-squared	4.851891	Prob. Chi-Square(8)	0.7733
Scaled explained SS	1.709084	Prob. Chi-Square(8)	0.9887

Source: Researcher Data Processing Results (2022)

Based on the *White* test results, it can be seen that the Obs*R-squared value is 4.85 with χ^2 with df (8) at χ^2 in the $\alpha:5\%$ table of 15.50. Based on the results of Obs*R.squared, $4.85 < 15.50$, this can also be seen from the probability of $0.77 > 0.05$. So it can be concluded that the residual data in this study is free from indications of heterosdasticity.

3.6 Multicollinearity Test Results

The multicollinearity test aims to test whether the regression model found has a correlation between variables or not. This multicollinearity aims to find out whether each independent variable is linearly related to each other in the regression equation model used. The results of the multicollinearity test are concluded as follows:

Table.6 Multicollinearity Test Results

Correlation			
t-Statistic	LNHEI	INF	LNKURS
LNHEI	1.000000		

INF	-0.404841	1.000000	
	-2.076660	----	
LNKURS	0.719367	0.010492	1.000000
	4.857448	0.049216	----

Source: Researcher Data Processing Results (2022)

Based on Table 6 above, it can be concluded that the results of this research show that there is no correlation between the variables in the research or that there is no multicollinearity in this research. This is proven by the correlation value for each variable below 0.80. The correlation between variables is as follows: the correlation between the inflation variable and the exchange rate is 0.01, which is smaller than 0.80, indicating that this model is free from the multicollinearity test.

3.7 Optimum Lag Test Results

In this research, the determination of lag length is used using the basic model of ARDL by looking at the values of the Akaike Information Criteria, Schwarz Criteria, and Hannan-Quinn Criteria. The optimum lag test results can be seen in Table 7 as follows:

Table.7 Optimum Lag Test Results

R-squared	0.794072	Mean dependent var	0.169676
Adjusted R-squared	0.656787	S.D. dependent var	0.176374
S.E. of regression	0.103328	Akaike info criterion	-1.404292
Sum squared resid	0.128120	Schwarz criterion	-0.956640
Log likelihood	23.74507	Hannan-Quinn criter.	-1.307140
F-statistic	5.784109	Durbin-Watson stat	1.931501
Prob(F-statistic)	0.003588		

Based on the test results in Table 6, the lag selection criteria have been automatically carried out by Eviews. The criteria are determined by looking at the values of the Akaike Information Criteria, Schwarz Criteria, and Hannan-Quinn Criteria offered by the basic model criteria of ARDL, and the selected criteria are ARDL (1, 0, 1), meaning that the Indonesian gold price is 1 lag, inflation is 0 lag, and the exchange rate amounts to 1 lag.

By using the ARDL basic model in this research, it can also be seen that the best model for the next 20 years is using the *Akaike Information Criteria* method. The best model for the next 20 years using the *Akaike Information Criteria* method can be seen as follows:

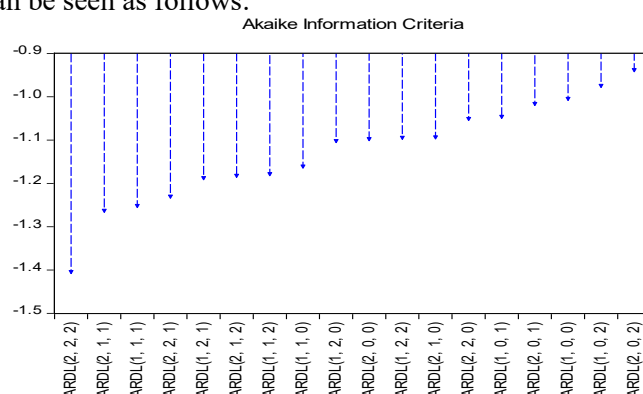


Fig.3 ARDL Model Results

In the Summary Criteria Graph Selection Model used with the Akaike Information Criteria method, the criterion with the smallest Akaike Information Criteria value is the best of the 20 best models offered by the Akaike Information Criteria, and the selected criterion is ARDL (2, 2).

3.8 Bound Test Results

The cointegration test in this method is carried out by comparing the F-statistic value with the F table value. By estimating, the first step is taken in the ARDL Bound Test approach to see the F-statistics obtained. The F-statistic obtained will explain whether or not there is a long-term relationship between variables. The hypothesis in this F test is as follows:

- $H_0 = \alpha_1 = \alpha_2 = \alpha_n = 0$; there is no long term relationship
- $H_1 \neq \alpha_1 \neq \alpha_2 \neq \alpha_n \neq 0$; there is a long term relationship

To see the results of the F-Bound Test, see Table 8 below

Table.8 Bound Test Results

F-Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	12.24687	10%	2.915	3.695
K	2	5%	3.538	4.428
		1%	5.155	6.265

Source: Researcher Data Processing Results (2022)

From Table 8, it shows that the statistical F value results are below I (0) and I (1) bound $12.24687 > 6.265$, so it can be concluded that the research variables have co-integration or there is a long-term relationship with the following conditions:

1. If the F-statistic value obtained from the bound test computational results is greater than the *upper critical value* I(1), then reject H_0 , so that in the model there is a long-term relationship or cointegration.
2. If the F-statistic value is below the *lower critical value* I(0), then do not reject H_0 , so that in the model there is no long-term relationship or cointegration. If the F-statistic value is between the *upper* and *lower* critical values, then the result cannot be concluded.

3.9 Model Stability Test Results

CUSUM Test Results

The CUSUM and CUSUMS-Q graphs, which are significant at $\alpha = 5\%$ indicate the stability of the parameters of the research variables. To see the results of CUSUM and CUSUMS-Q, you can see the graph below:

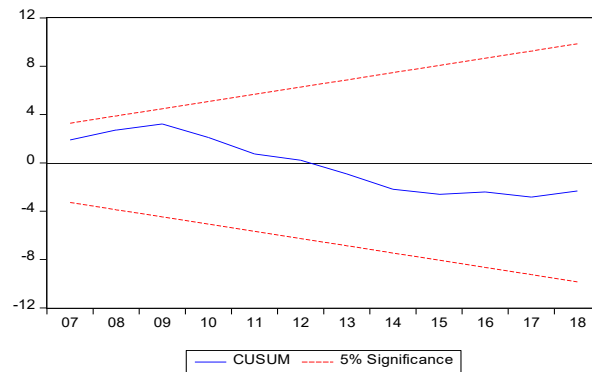


Fig.4 CUSUM Test Results

Source: Researcher Data Processing Results (2022)

Based on Figure 4, the CUSUM test results can be explained, namely that the W_r quantity plot is not above the limit line at the 5% significance level; the plot forms a linear line, which indicates that the model is stable.

CUSUM-Q Test Results

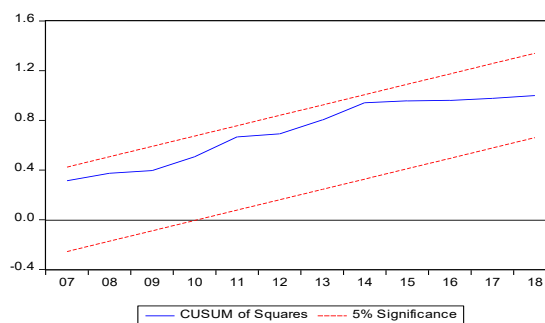


Fig.5 CUSUM-Q Test Results

Source: Researcher Data Processing Results (2022)

Based on Figure 5 above, the results of the CUSUM-Q test can be explained, namely that the S_r quantity plot is not above the limit line at the 5% significance level; the plot forms a linear line. Based on the results of the two model stability tests above, it can be concluded that if the plot is stable and the validation produced by Q-Stat has a prob of up to lag 20 > 0.05 , then this model is valid, and there is no Akaike in the model.

Short-Term ARDL Model Results

Table.9 Short Term ARDL Estimation Results

ECM Regression					
Case 2: Restricted Constant and No Trend					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
D(LNHEI(-1), 2)	0.520746	0.163812	3.178935	0.0079	
D(INF)	0.016019	0.003518	4.554003	0.0007	
D(INF(-1))	-0.015752	0.006080	-2.591017	0.0236	
D(LNKURS, 2)	-1.067370	0.190185	-5.612270	0.0001	
D(LNKURS(-1), 2)	0.722798	0.289206	2.499253	0.0280	
CointEq(-1)*	-2.305885	0.294673	-7.825239	0.0000	
R-squared	0.932413	Mean dependent var		0.030546	
Adjusted R-squared	0.909884	S.D. dependent var		0.307866	
S.E. of regression	0.092419	Akaike info criterion		1.690006	
Sum squared resid	0.128120	Schwarz criterion		1.391571	
Log likelihood	23.74507	Hannan-Quinn criter.		1.625238	
Durbin-Watson stat	1.931501				

Source: Researcher Data Processing Results (2022)

Based on test results from short-term results, the model can be seen as follows:

$$\Delta \text{LnHE}_t = 0.521 \text{LnHE}_t(-1) + 0.016 \Delta \text{Inf}_t - 0.026 \Delta \text{Inf}_t(-1) - 1.067 \Delta \text{LnKurs}_t + 0.723 \Delta \text{LnKurs}_t(-1) - 2.306 \text{ECT}(-1)$$

Based on Table 4.8, it can be seen that the value of *ect/CointEq* is -2.306, if a *shock* occurs in this model, it can be resolved after 2.3 years, and the cointegration variable is significant at the 1% level with a probability of 0.000. The conclusions are as follows:

1. The variable for the change in gold prices at lag 1 is 0.521; that is, if the change in the price of Indonesian gold at lag 1 increases by 1%, then the change in the gold price for the current year will increase by 0.52% and this variable is significant at the 1% level with a probability of 0.0079.

2. The change in inflation variable is 0.016; if the change in inflation for the current year increases by 1%, then the change in the price of Indonesian gold will increase by 0.02%, and the change in inflation will have a positive and significant effect at the 1% level with a probability of 0.0007.
3. The change in inflation variable at lag 1 is -0.016; if inflation at lag 1 increases by 1%, then the change in Indonesian gold prices decreases by 0.02%, and the inflation variable at lag 1 is significant at the 5% level with a probability of 0,0236.
4. The exchange rate change variable is -1.067; if the exchange rate change in the current year increases by 1%, then the change in the Indonesian gold price will decrease by 1.07%, and the exchange rate increase variable is significant at the 1% level with a probability of 0.0001.
5. The exchange rate change variable at lag 1 is 0.723; if the exchange rate change at lag 1 increases by 1%, then the change in the Indonesian gold price in the current year will increase by 0.72%, and the exchange rate change variable is significant at the 5% level with a probability of 0.028.

The coefficient of determination is 0.9099, meaning that the influence of inflation and the exchange rate on Indonesian gold prices is 0.9099 (90.99%), while that which is influenced by variables outside this model is 0.0901 (09.01%). The relationship between the variables tied to the independent variable can be seen from the correlation coefficient (R), which is = 0.9650, so it can be concluded that the relationship between inflation and the exchange rate on the Indonesian gold price is very strong (very close) in a positive way because the correlation coefficient value of 0.9656 is close to positive (+1).

ARDL Model Results in the Long Run

Table.10 Long Term ARDL Estimation Results
Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	0.022079	0.003137	7.037910	0.0000
D(LNKURS)	-1.210274	0.189165	-6.397993	0.0000
C	0.020682	0.022099	0.935895	0.3678

Based on the test results in table 10 above, the long-term capital is as follows:

$$HE_t = 0,021 + 0,022Inf_t - 1.210LnKurs_t$$

The constant () of 0.021 is that if inflation and the exchange rate are constant (fixed), then the gold price will also be constant at 0.021. The inflation variable of 0.022 is that if inflation increases by 1%, then the Indonesian gold price will increase by 0.022%. This variable is significant at the 1% level with a probability of 0.000, assuming a constant exchange rate.

Furthermore, the exchange rate variable is -1.210; if the exchange rate increases by 1%, then the price of Indonesian gold will decrease by 1.21% assuming constant inflation, and the exchange rate variable is significant and negative at the 1% level with a probability of 0.000.

4. Discussion

4.1 The Correlation between Inflation and Indonesian Gold Prices

Based on the results of research that has been carried out using the analysis model, namely *Autoregressive Distributed Lag* (ARDL), the result shows that the inflation variable in the short term does not have a significant and negative effect on Indonesian Gold Prices. The results of this research are in line with research conducted by (Kesarditama, 2020) with the research title "The Influence of Inflation, Rupiah Exchange Rate Per US Dollar, World Crude Oil Prices and the Composite Stock Price Index on Gold Prices in Indonesia" with research results showing that the Inflation variable shows a negative trend and the results of this research are not in line with research conducted by (Wicaksono, 2016) with the research title "The Influence of Inflation, Dollar Exchange Rates and Interest Rates on Gold Prices in Indonesia" with research results showing that the inflation variable has a positive and significant effect on the price of gold in Indonesia by 3.68%.

4.2 The Correlation between Exchange Rates and Indonesian Gold Prices

Based on the results of research that has been carried out using an analysis model, namely *Autoregressive Distributed Lag* (ARDL) in the long term, the results obtained are that the exchange rate variable has a significant and negative effect on world gold prices. The results of this research are in line with research conducted by (Nurulhuda, 2019) with the research title "The Influence of Inflation, the US Dollar Exchange Rate, and Interest Rates (BI), on Determining Gold Prices (Empirical Study: Pt Antam Tbk 2014-2018)" with the research results showing that the exchange rate variable has a positive and insignificant influence on prices gold and the results of this research are not in line with research conducted by (Serdawati, 2018) with the research title "Use of the Autoregressive Distributed Lag (ARDL) Method for Analysis of Factors Affecting Gold Prices in Indonesia 2007-2017" with the research results showing that The exchange rate variable is not stationary and no cointegration occurs.

5. Conclusions

This research finds that inflation and currency rates substantially affect Indonesian gold market prices, both in the short and long term, as examined using the Autoregressive Distributed Lag (ARDL) model. In the near term, inflation adversely and markedly influences gold prices, demonstrating that increasing inflation initially diminishes gold value; but, in the long run, inflation has a positive and substantial effect, suggesting that gold acts as a safeguard against prolonged inflation. The exchange rate exhibits a persistent negative and considerable impact on gold prices in both the short and long term, indicating that a depreciation of the rupiah generally results in a decline in domestic gold prices. The short-term lagged value of the exchange rate demonstrates a positive effect, indicating a temporal adjustment in investor behaviour.

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