

## The Effect of Interest Rates, Money Supply and Exchange Rate on Inflation in Indonesia and Libya

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### Abstract

*This research purposed to analyse the effect of changes in interest rates against inflation, to analyse the effect of money supply to inflation, to analyze the effect of rupiah exchange rate on inflation. In this study the authors used a quantitative approach. This research is a secondary and quantitative data study using sample data on interest rates, the money supply and the exchange rate in Indonesia and Libya in 2005-2019. With this method the objectives to be achieved must be able to describe certain characteristics of a population. Data analysis technique used is ECM (Error Correction Mechanism) Model with EViews programs. Based on the result and analysis, the conclusion are as follows; there is no significant influence between Interest Rate on Inflation in Indonesia. In Libya, we will not use IR (Interest rate) variables because the data is not achieved the ECM criteria and cointegration. There is significant influence between Money supply on Inflation, in both Indonesia and Libya. There is no significant influence between Exchange rate on Inflation in Indonesia and Libya.*

**Keywords :** Interest Rates, Money Supply, Exchange Rate, Inflation

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## INTRODUCTION

Inflation is one of the important monetary events found in almost all countries in the world. In general, inflation is a development in an economy where prices and wages increase, the demand for labor exceeds the supply and the money supply increases greatly. The crisis global has changed the Indonesian economic order. Increasingly, the crisis that began in the United States in 2007 had an impact on the rest of the planet, including the growth of countries in 2008 (Bank Indonesia, 2008). Despite the global financial crisis, Indonesia's economic performance deteriorated. As well as having an effect on the Indonesian economy, the global financial crisis is unpredictable factors influencing the economic and non-economic factors. These economic considerations include such as inflation, interest rates, money supply, national income and international balance of payments whereas non-economic factors such as national resilience, political, financial, cultural and security (Atmadja, 2002). As well as Libya, the political condition also will affecting inflation, money supply and also exchange rate will impact on Libya's inflation, so in this research will compare the situation in Indonesia and Libya.

Interest rate fluctuation in Indonesia and Libya can be caused by a number of factors, thus it is hard to control inflation. The government should be aware of the initial factors that can form inflation. In Indonesia and Libya, inflation is not only short-term inflation, as said in Keynes's theory, but also it is a long-term condition (Baasir, 2003). Inflation rate can be reduced or even can be prevented. To reach the inflation rate below government target, all parties need to work all together either from the Central Bank or the private sector.

The theme of this research is the effect of interest rates, money supply and exchange rates on inflation in Indonesia and Libya. Problem identification is identify factors affecting inflation conceptually/ theoretically in Keynes theory framework.

## LITERATURE REVIEW

Taking previous research is intended to find reference material and as a comparison, and with the aim of showing differences or avoiding assumptions about similarities with previous research. So in this literature review the researcher includes the results of previous research, such as:

Research conducted by Perlambang (2010) shows that By using eviews 4.0 software obtained from the results of research following the money supply and exchange rate (IDR / USD) had no significant effect on inflation while the interest rate (SBI) has a significant effect on inflation.

Mahendra (2016) states that by using the SPSS 22 software, the research results show that the money supply and the exchange rate (IDR / USD) have no significant effect on inflation while interest rates (SBI) also have no significant effect on inflation.

Ningsih and Kristiyanti (2018) The results of the t test show that the money supply variable has a negative and significant effect on inflation. The interest rate variable has no significant effect on inflation. In other words, the exchange rate variable partially has a positive and significant effect on inflation. For the government to be more careful in implementing monetary policy related to the money supply, interest rates and exchange rates that can affect inflation.

Suyati (2015) the result of this re-search indicates that by partial analysis with alpha 0,05 find that inflation does have a significant

effect on stock return of prop-erty but rate of interest. Does have a signifi-cant effect on stock return of property, and the exchange rate of Rupiah/ US Dollar does have a significant effect on stock re-turn of property.

Agusmianata et al (2018) showed the analysis revealed a significant effect of money supply on inflation, interest rates have a significant effect on inflation and government expenditures a significant ef-fect on inflation. The money supply affects most on inflation in Indonesia Keywords: Money Supply, Interest Rates, Government Expenditures and Inflation.

Imleesh et al (2017) concluded that there is relationship between interest rate, inflation and economic growth in Indonesia, Malaysia and Singapore.

Inflation can be interpreted as a symptom of a general and continuous increase in the price of goods (Rahardja and Manurung, 2004). From this definition, there are three conditions to say that inflation has occurred. First, there is an increase in prices. Second, the increase occurred in the prices of goods in general. Third, the increase lasted quite a long time. Thus, a price increase that occurs for only one type of goods, or an increase that occurs only temporarily, cannot be called inflation.

Inflation is an illustrative event in which situations and conditions in which the price of goods have increased and the value of the currency is weakening, and if this happens regularly continuously, it will result in worsening economic conditions as a whole and able to shake the political order of the country (Curatman, 2010). Inflation is showing economic symptom, rising price level in general ones continuous. The condition for inflation is that there are an increase prices continuously (Hasyim, 2016). Inflation is a symptom that shows an ongoing increase in the general price level continuously. The increase is not intended

to occur at a moment. From this understanding, if it happens, the price increase is temporary, it cannot be said inflation (Rozalinda, 2017).

Savings, savings according to the classical theory, is a function of the interest rate. Thehigher the interest rate, the higher the public's desire to save their funds in the bank. This means that at a higher interest rate, people will be motivated to sacrifice or reduce expenditure for consumption in order to increase savings. Meanwhile, interest is the "price" of (use) loanable funds, or it can be interpreted as funds available for loan or investment funds because according to classical theory, interest is the "price" that occurs in the investment market (Boediono, 2001). Investment is also the objective of the interest rate.

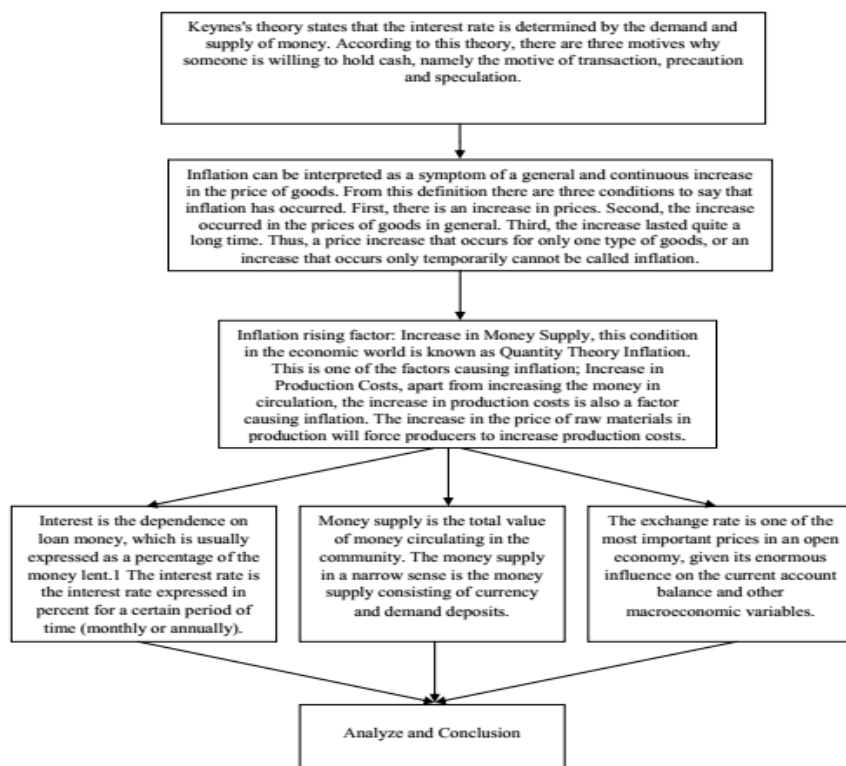
The higher the interest rate, the smaller the desire to invest. Thereason is that an entrepreneur will increase his investment expenditure if the expected profit from the investment is greater than the interest rate that must be paid for the investment fund as a cost for the use of funds (cost of investment). capital) (Nopirin, 2000). The lower the interest rate, the entrepreneur will be motivated to invest because the cost of using funds is also getting smaller, the interest rate is in balance (meaning there is no push to go up and down) will be achieved if the public's desire to save is the same as the entrepreneur's desire to invest.

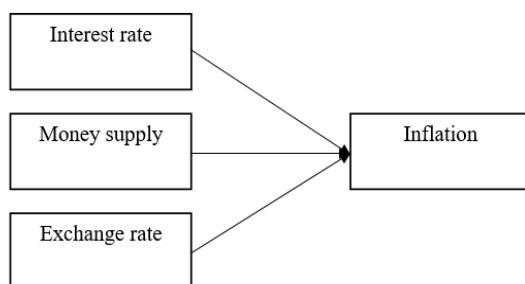
Money supply is the total value of money circulating in the community. The money supply in a narrow sense is the money supply consisting of currency and demand deposits. In people's lives, the money supply is determined by Hasoloan's monetary policy (2014: 149). The amount of money available is called the money supply. In an economy that uses commodity money, the money supply is the quantity of that commodity. In an economy that uses money on show, like most economies to-day, the

government controls the money supply: official regulations give the government the right to monopolize the printing of money. The level of taxation (taxation) and the level of government purchases (government spending in buying goods and services that are being produced) are government policy instruments, as is the money supply control over supply which is called Mankiw's (2000) Monetary Policy. The money supply (JUB) is  $M_1$  (money in the narrow sense) consisting of currency and demand deposits, and  $M_2$  (money in the broad sense) which consists of  $M_1$  plus Ni-lawati's quasi money in Prayitno et al (2002). Currency (currencies) are money issued by the government and/ or the central bank in the form of banknotes or coins. Demand money (deposit money) is money issued by a commercial bank. Examples of demand deposits are checks, bilyet giro. Quasi money includes savings, time deposits, and foreign currency

accounts. Subagyo (1997: 10) in Prayitno et al (2002).

The exchange rate (exchange rate) or often called the exchange rate is the price of currency against other currencies. The exchange rate is one of the most important prices in an open economy, given its enormous influence on the current account balance and other macroeconomic variables ". According to Ekananda (2014: 168) exchange is the exchange rate which is the price of currency relative to the currencies of other countries. The exchange rate plays an important role in spending decisions because it allows us to translate prices from various countries into the same language.". Based on the above meanings, it comes to the author's understanding that the exchange rate is the price of currency against foreign currency, how much the domestic currency is valued by foreign currency, the exchange rate is a very important price in the economy.



**Figure 1.** Theoretical Framework**Figure 2.** Research Framework

Inflation can be interpreted as a symptom of a general and continuous increase in the price of goods (Rahardja and Manurung, 2004). From this definition, there are three conditions to say that inflation has occurred. First, there is an increase in prices. Second, the increase occurred in the prices of goods in general. Third, the increase lasted quite a long time. Thus, a price increase that occurs for only one type of goods, or an increase that occurs only temporarily cannot be called inflation.

The higher the interest rate, the smaller the desire to invest. The reason is that an entrepreneur will increase his investment expenditure if the expected profit from the investment is greater than the interest rate that must be paid for the investment fund as a cost for the use of funds (cost of investment). capital) (Nopirin, 2000). The lower the interest rate, the entrepreneur will be motivated to invest because the cost of using funds is also getting smaller, the interest rate is in balance (meaning there is no push to go up and down) will be achieved if the public's desire to save is the same as the entrepreneur's desire to invest.

The results of research conducted by Perlambang (2010) by using eviews 4.0 software obtained from the results of research following the money supply and exchange rate (Rp/USD) had no significant effect on inflation while the interest rate (SBI) have a significant effect on inflation. So the first hypothesis is:

H1: There is an influence between the interest rate on inflation.

Money supply is the total value of money circulating in the community. The money supply in a narrow sense is the money supply consisting of currency and demand deposits. In people's lives, the money supply is determined by Hasoloan's monetary policy (2014: 149). The amount of money available is called the money supply. In an economy that uses commodity money, the money supply is the quantity of that commodity. In an economy that uses money on show, like most economies today, the government controls the money supply: official regulations give the government the right to monopolize the printing of money.

Inflation can be interpreted as a symptom of a general and continuous increase in the price of goods (Rahardja and Manurung, 2004). From this definition, there are three conditions to say that inflation has occurred. First, there is an increase in prices. Second, the increase occurred in the prices of goods in general. Third, the increase lasted quite a long time.

The results of research conducted by Azizah et al (2020) the results of the data analysis show that simultaneously there is an influence between the rupiah exchange rate and the money supply widely on inflation in Indonesia in 2010-2019. The second hypothesis is:

H2 : There is an influence between the money supply on inflation.

The exchange rate (exchange rate) or often called the exchange rate is the price of currency against other currencies. The exchange rate is one of the most important prices in an open economy, given its enormous influence on the current account balance and other macroeconomic variables ". According to

Ekananda (2014: 168) exchange is the exchange rate which is the price of currency relative to the currencies of other countries. The exchange rate plays an important role in spending decisions because it allows us to translate prices from various countries into the same language.”. Based on the above meanings, it comes to the author's understanding that the exchange rate is the price of currency against foreign currency, how much the domestic currency is valued by foreign currency, the exchange rate is a very important price in the economy.

Meta (2007) with the title differences in the effect of inflation, interest rates and the rupiah / us dollar exchange rate on stock returns (case study on property and manufacturing stocks listed on the Jakarta Stock Exchange 2000-2005). By using the independent variable inflation, interest rates, the rupiah exchange rate and the dependent variable stock returns. The results showed that the interest rate has no effect on returns on property stocks but has a negative effect on returns on manufacturing stocks.

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H<sub>3</sub> : There is an influence between the exchange rate on inflation

## RESEARCH METHOD

In this study the authors used a quantitative approach. Cresweel (2010, p. 24) states that the quantitative approach is a measurement Quantitative data and objective statistics are calculated using the following sample of people or residents who serve answer a number of Survey questions to determine the frequency and percentage of responses them.

Based on the explanation above, it can be concluded that the quantitative approach is an approach in research to test hypotheses using accurate statistical data tests. Based on the background and formulation of the problems that have come, this study uses an approach to measure interest rates and exchange rates in Indonesia and Libya in 2005-2019.

The population is also not just the number of objects/ subjects that exist studied, but includes all the characteristics/ properties possessed by the subject/ object. Based on the description above, it can be explained that the population is the whole subject or object that is the focus of research with pay attention to several characteristics that are in accordance with the current research done.

This research is a secondary and quantitative data study using sample data on interest rates, the money supply and the exchange rate in Indonesia and Libya in 2005-2019. With this method, the objectives to be achieved must be able to describe certain characteristics of a population.

Operational research variables are intended to describe and facilitate the determination of measurements of the observed variables. According to Uep and Sambas (2011) Variable is characteristics that will be observed from the observation unit. Muhidin and Sontani (2011) explain that "the operationalization of

variables is an activity to describe the concept of a variable into a simpler concept, namely indicators". In this study, there are two research variables, namely: Independent Variable (X) The definition of independent variable according to Sugiyono (2012) states that, this variable is often referred to as the stimulus variable, predictor, antecedent, in Indonesian it is often called the independent variable. The independent variable is the variable that influences or becomes the cause the change or the emergence of the dependent variable (bound). The independent variables or the independent variables in this study are interest rates (in %), money supply (in Rp), and exchange rates (in %).

Dependent Variable (Y) The definition of dependent variable according to Sugiyono (2012) is often referred to as the output variable, criteria, consequences. In Indonesian, it is often referred to as the dependent variable, the dependent variable is the variable that is influenced or that is the result because of the independent variable. The dependent variable in this study is the inflation (in %).

Quantitative data is a type of data that can be measured or calculated directly, in the form of information or explanation expressed in numbers or in the form of numbers. In this case, the quantitative data required are interest rates, money supply, exchange rates, and inflation rates.

Secondary data sources, namely data directly collected by researchers as support from the first source. It can also be said that the data is arranged in the form of documents. Secondary data obtained in this study are in yahoo finance 2014-2019.

Error Correction Mechanism (ECM) is an analysis of time series data used for dependent variables which are often referred to as cointegration. The ECM method is used to balance the short-term economic relationships

of variables that have long-term economic equilibrium. The advantages of ECM as a dynamic model in time series data analysis:

1. ECM can perform model specifications on its general form.
2. ECM can explain long-term and short-term information from data, and it can be seen whether the empirical model is consistent with economic theory.
3. ECM as a dynamic model to find the completion of time series data that is not stationary.
4. Seeking to solve multicollinearity problems and smart regression.

#### ECM Implementation Stages

1. Check the stationarity of all variables → if it doesn't meet the requirements, ECM cannot be used
2. Estimation of the long run equation → the long run equation on the ECM is an ordinary regression equation with the variables y and x, which are not stationary at level. Then, the error (e) in the long-run regression equation determines whether or not there is cointegration in the y and x variables. If e is stationary at the level, then y and x are cointegrated. This long-run equation is often referred to as the equilibrium equation and can only be used if the residual / error (e) is stationary at the level.

$$Y_t = \beta_0 + \beta_1 X_t + e_t \quad (\text{Long run equation})$$

$$e_t = \beta_0 - \beta_1 X_t \quad (\text{Residual})$$

3. Cointegration test → check stationarity of residuals / error (e), if stationary at the level, the ECM is continued
4. The short-run equation → e, which is stationary in the long-term equation, is not used only to find out whether there is cointegration but is also used as one of the variables in the short-term equation. The

short-run equation also uses the same variables as the variables in the long-run equation, it's just that the variables are stationary, all in the same order. Maybe it will be better understood through the following equation:

$$\Delta y_t = \beta_0 + \beta_1 \Delta X_t + \Delta e_{t-1} + v_t \quad (\text{Short run equation})$$

$\Delta y_t$  = Variable y indifference in first order

$\Delta X_t$  = Variable x indifference in first order

$e_t$  = residual/error in long run at period t-1

$v_t$  = error in the short run.

The coefficient  $\gamma$  in the equation above, which is also often referred to as the speed of adjustment, is the residual speed / error (e) in the previous period to correct for changes in the y variable towards equilibrium in the next period. At this stage there are final requirements that must be met in order for the ECM to be valid; The coefficient  $\gamma$  must be significant and negative. The long-term equations in the ECM method have limitations to interpretation, while the short-term equations are free to interpret, of course by testing the regression assumptions beforehand. The regression coefficient in the long-run equation can only be interpreted based on the direction of the effect, positive or negative.

The unit root test was then used to look at the stationery of time series of the results. If there is no static mean or vari-ance, or both, in a time series, it is said to be non-stationary. At each lag, the mean, vari-ance, and autocovariance of a stationary sequence remain constant. To ensure that the data series did not have a unit root prob-lem, this analysis will use unit root tests for Augmented Dickey-Fuller (ADF). This test was selected by the researcher because it is the most widely used when

checking for stationarity. The hypothesis of the presence of a unit root for the time series is checked in Dickey and Fuller and Phillips and Perron tests ( $H_0: B_1=1$ ), which implies that the level of the series is non-static and includes a unit root. We reject the null hypothesis  $H_0$  if the (P-value) is less than or equal to 5%, and consider the alternative hypothesis  $H_1$  if the (P-value) is less than or equal to 5%. This shows that there is no unit root, and thus the time series of the studied variable is static, and vice versa. Since several financial and economic levels appear to be random walks (Nowbutsing, 2009), verifying the staticity of the time series is one of the most important conditions required before beginning to analyze, where the variables used in any analytical study are subjected to static tests to examine the degree of integration of each time series for the variables under study Al-Madi (2016).

The error correction model is used to determine the degree to which the variables are co-integrated in the short run and to reveal the rate at which variables will be corrected in the long run after the unit root test and co-integration test for the study variables have been verified. Islam and Hossin (2019). By adding the amount of the equilibrium error to the equations of the model called the error correction limit, the researcher will estimate the Vector Error Correction Model (VECM), which is a self-restricted regression model. The model provides us with a way to link the short-term and long-term variables during the adjustment processes to reach the long-term equilibrium. The VECM could only be used to estimate the short-run and long-run dynamics of the variables if the cointegration test showed a long-term approximate relationship between them.



## RESULT AND DISCUSSION

This section will discuss descriptive statistics in this study about the data from Indonesia from period 2005-2019:

**Table 1.** Statistic Descriptive Indonesia

	IR	MS	ER	INF
Mean	3.493733	2122002.	9403.767	5.802333
Median	2.770000	1093817.	8941.500	5.425000
Maximum	9.220000	6136552.	14481.00	13.11000
Minimum	-3.850000	754210.0	6215.000	3.030000
Std. Dev.	3.027491	1742526.	2523.040	2.156520
Skewness	0.080786	1.082686	0.729806	1.751075
Kurtosis	2.751528	2.704378	2.268948	6.399985
Jarque-Bera Probability	0.109804 0.946578	5.970281 0.050532	3.331131 0.189084	29.78120 0.000000
Sum	104.8120	63660046	282113.0	174.0700
Sum Sq. Dev.	265.8053	8.81E+13	1.85E+08	134.8667
Observations	30	30	30	30

Based on table 1. It is known that for the interest rate (IR) variable the minimum value is -3.850000, the maximum value is 9.220000 the mean or average value is 3.493733 and the standard deviation value is 3.027491. For the Money supply (MS) variable the minimum value is 754210.0 the maximum value is 6136552 the mean or average value is 2122002 and the standard deviation value is 1742526. value is 13.11000, the mean or average value is 5.802333 and the standard deviation value is 2.156520. For the Exchange rate (ER) variable the minimum value is 6215.000, the maximum value is 14481.00 the mean or average value is 9403.767 and the standard deviation value is 2523.040. For the Inflation variable (INF) the minimum value is 3.030000, the maximum.

Based on table 2. it is known that for the Money supply (MS) variable, the minimum value is 21548.00 the maximum value is 11960.0 the mean or average value is 44736.80 and the standard deviation value is 28994.85. For the Exchange rate (ER) variable the minimum value is 1224.000, the maximum value is 1486.000 the

mean or average value is 1335.567 and the standard deviation value is 81.88709. For the Inflation variable (INF) the minimum value is -1.200000, the maximum value is 28.05000 the mean or average value is 5.450000 and the standard deviation value is 6.688859.

**Table 2.** Statistic Descriptive Libya

	MS	ER	INF
Mean	44736.80	1335.567	5.450000
Median	26576.00	1337.000	2.725000
Maximum	111960.0	1486.000	28.05000
Minimum	21548.00	1224.000	-1.200000
Std. Dev.	28994.85	81.88709	6.688859
Skewness	1.293865	0.309959	2.228793
Kurtosis	3.366552	1.874555	7.167319
Jarque-Bera Probability	8.538387 0.013993	2.063654 0.356355	46.54577 0.000000
Sum	1342104.	40067.00	163.5000
Sum Sq. Dev.	2.44E+10	194459.4	1297.484
Observations	30	30	30

**Table 3.** ADF test results (Unit Root test)

### Indonesia

		Level	1st Difference
IR	Intercept	0.8540	0.0000
	Trend and intercept	0.0393	0.0000
	None	0.8676	0.0000
MS	Intercept	0.9974	0.8453
	Trend and intercept	0.9996	0.0858
	None	0.9805	0.7434
ER	Intercept	0.8981	0.0001
	Trend and intercept	0.4240	0.0005
	None	0.9688	0.0000
INF	Intercept	0.0355	0.0000
	Trend and intercept	0.1277	0.0000
	None	0.3919	0.0000

From table 3 above, this can be seen based on the statistical ADF numbers obtained in the critical value for the level and 1st dif-ferences is not significant in level but in 1st difference IR and ER, INF are significant. These results indicate that the statistical ADF value is lower than the critical value. Thus, it can be concluded that the data is not stationary in 1st differences, but in level are stationary.

**Table 4.** ADF test results (Unit Root test) Libya

		Level	1st Difference
<b>IR</b>	Intercept	0.0000	0.0001
	Trend and intercept	0.0003	0.0004
	None	0.0000	0.0000
<b>MS</b>	Intercept	0.9968	0.0026
	Trend and intercept	0.9400	0.0108
	None	0.9965	0.0004
<b>ER</b>	Intercept	0.1166	0.0000
	Trend and intercept	0.3052	0.0000
	None	0.7553	0.0003
<b>INF</b>	Intercept	0.0204	0.8914
	Trend and intercept	0.0060	0.1664
	None	0.9338	0.6630

This can be seen from in Table 4 based on the statistical ADF numbers obtained in the critical value for the 1% significance, 5% significance, and the 10% significance is not significant in level but in 1st differences is significant. These results indicate that the statistical ADF value is higher than the critical value in level, but in 1st differences is significant for MS and ER, IR.

**Table 5.** Engle Granger Cointegration test  
Indonesia

Null Hypothesis: ECT has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.111166	0.0035
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ECT)

Method: Least Squares

Date: 07/26/21 Time: 07:26

Sample (adjusted): 2 30

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.763130	0.185624	-4.111166	0.0003
C	0.032203	0.287426	0.112039	0.9116
R-squared	0.384989	Mean dependent var		0.028937
Adjusted R-squared	0.362211	S.D. dependent var		1.938141
S.E. of regression	1.547832	Akaike info criterion		3.778059
Sum squared resid	64.68615	Schwarz criterion		3.872356
Log likelihood	-52.78186	Hannan-Quinn criter.		3.807592
F-statistic	16.90169	Durbin-Watson stat		1.937957
Prob(F-statistic)	0.000330			

From the results given in Table 5 for the Engle Granger co-integration test above, it can be seen that the statistic value assigned is 0.000330 for the trace which is less than the probability value of 0.05. This means that the variants have a long-term relationship. From the results of the cointegration test above, it can be seen that the trace statistic value is lower than the critical value at 5% alpha. This means that the two variables mentioned above have a long-term relationship. Thus, it can be concluded that the interest rate, exchange rate, inflation and money supply in annual data for 15 consecutive years that are from the period 2005-2019 years have a long-term relationship.

**Table 6.** Engle Granger Cointegration test  
Libya

Null Hypothesis: ECT has a unit root  
 Exogenous: Constant  
 Lag Length: 1 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.027929	0.0000
Test critical values: 1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(ECT)  
 Method: Least Squares  
 Date: 07/26/21 Time: 07:22  
 Sample (adjusted): 3 30  
 Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-1.581249	0.262320	-6.027929	0.0000
D(ECT(-1))	0.739029	0.199847	3.697972	0.0011
C	0.605990	0.919676	0.658917	0.5160
R-squared	0.606709	Mean dependent var	-0.315485	
Adjusted R-squared	0.575246	S.D. dependent var	7.318200	
S.E. of regression	4.769503	Akaike info criterion	6.063318	
Sum squared resid	568.7039	Schwarz criterion	6.206054	
Log likelihood	-81.88645	Hannan-Quinn criter.	6.106954	
F-statistic	19.28309	Durbin-Watson stat	2.244200	
Prob(F-statistic)	0.000009			

From the results given in Table 6 for the Engle Granger co-integration test above, it can be seen that the statistic value assigned is 0.00009 for the trace which is larger than the probability value of 0.05. This means that the variants have a long-term relationship. From the results of the cointegration test above, it can be seen that the trace statistic value is larger than the critical value at 5% alpha. This means that the two variables mentioned above have a long-term relationship. Thus, it can be concluded that the exchange rate, inflation and money supply in annual data for 15 consecutive years that are from the period 2005-2019 years have a long-term relationship.

**Table 7.** Error Correction Model (ECM) Result Indonesia

Dependent Variable: D(INF)  
 Method: Least Squares  
 Date: 07/26/21 Time: 07:30  
 Sample (adjusted): 2 30  
 Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.064056	0.423864	-0.151125	0.8811
D(ER)	0.000619	0.000456	1.357548	0.1872
D(MS)	-1.51E-07	1.61E-06	-0.093595	0.9262
D(IR)	-0.378753	0.148209	-2.555527	0.0174
ECT(-1)	-0.720457	0.200661	-3.590425	0.0015
R-squared	0.588166	Mean dependent var	-0.040345	
Adjusted R-squared	0.519527	S.D. dependent var	2.278680	
S.E. of regression	1.579493	Akaike info criterion	3.907670	
Sum squared resid	59.87514	Schwarz criterion	4.143411	
Log likelihood	-51.66122	Hannan-Quinn criter.	3.981501	
F-statistic	8.568988	Durbin-Watson stat	1.891360	
Prob(F-statistic)	0.000192			

An examination of the results in Table 7 shows that the error-correction estimate has an impressive goodness of fit. The  $R^2$  value is 0.588166 and the adjusted R Squared is 0.519527, indicating that more than 42% of the short-term systematic variation in Inflation is explained by the explanatory variables during the study period. The F value of 0.000192 is significant at the 5% level. Thus, the hypothesis of a significant linear relationship between the dependent variables is validated. In the case of the contribution of the individual explanatory variables, all signs of the coefficient.

The ECM term in the results has the expected negative sign and is significant at the five percent level. The error correction term captures the speed of adjustment from the short-run equilibrium. The coefficient shows that the contemporary adjustment for inflation is about 42 percent, which tends to be medium. Coefficient of ECT is -0.720457, which shows the speed of adjustment toward equilibrium. Here the speed is 72,0457 percent per unit time. The significant or probability value of the exchange rate (ER) variable is 0.1872 > 0.05 so  $H_1$  rejected. This means that the exchange rate has no significant influence on inflation in Indonesia.

The significant or probability value of the money supply (MS) variable is  $0.9262 > 0.05$  so  $H_2$  rejected. This means that money supply has no significant influence on inflation in Indonesia. The significant or probability value of the interest rate (IR) variable is  $0.0174 < 0.05$ , so  $H_3$  accepted. This means that the interest rate has a significant influence on inflation in Indonesia.

An examination of the results in table 8 shows that the error-correction estimate has an impressive goodness of fit. The  $R^2$  value is 0.599764 and the adjusted R Squared is 0.551736, indicating that more than 31% of the short-term systematic variation in Inflation is explained by the explanatory variables during the study period. The F value of 0.000035 is significant at the 5% level. Thus, the hypothesis of a significant linear relationship between the dependent variables is validated. In the case of the contribution of the individual explanatory variables, all signs of the coefficient.

**Table 8.** Error Correction Model (ECM) Result Libya

Dependent Variable: D(INF)  
 Method: Least Squares  
 Date: 07/26/21 Time: 07:26  
 Sample (adjusted): 2 30  
 Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.386214	1.003591	-1.381254	0.1794
D(ER)	-0.004424	0.013487	-0.328050	0.7456
D(MS)	0.000620	0.000147	4.207821	0.0003
ECT(-1)	-1.120728	0.193341	-5.796624	0.0000
R-squared	0.599764	Mean dependent var	0.084138	
Adjusted R-squared	0.551736	S.D. dependent var	7.362047	
S.E. of regression	4.929078	Akaike info criterion	6.155623	
Sum squared resid	607.3953	Schwarz criterion	6.344216	
Log likelihood	-85.25653	Hannan-Quinn criter.	6.214688	
F-statistic	12.48771	Durbin-Watson stat	1.947549	
Prob(F-statistic)	0.000035			

The ECM term in the results has the expected negative sign and is significant at the five percent level. The error correction term

captures the speed of adjustment from the short-run equilibrium. The coefficient shows that the contemporary adjustment for inflation is about 31 percent, which is tends to be medium. Coefficient of ECT is -1.120728, which shows the speed of adjustment toward equilibrium. Here the speed is 11,120728 percent per unit time.

The significant or probability value of the exchange rate (ER) variable is  $0.7456 > 0.05$ , so  $H_1$  rejected. This means that the exchange rate has no significant influence on inflation in Libya. The significant or probability value of the money supply (MS) variable is  $0.0003 < 0.05$ , so  $H_2$  accepted. This means that money supply has a significant influence on inflation in Libya.

At table 9, the significant or probability value of the exchange rate (ER) variable is  $0.0027 < 0.05$ , so  $H_1$  accepted. This means that the exchange rate has significant influence on inflation in Indonesia.

**Table 9.** Error Correction Model (ECM) Long Run Indonesia

Dependent Variable: INF  
 Method: Least Squares  
 Date: 07/26/21 Time: 07:26  
 Sample: 1 30  
 Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER	0.001162	0.000350	3.320261	0.0027
MS	-1.63E-06	6.34E-07	-2.578136	0.0160
IR	-0.256211	0.182404	-1.404636	0.1720
C	-0.761885	2.371704	-0.321240	0.7506
R-squared	0.484326	Mean dependent var	5.802333	
Adjusted R-squared	0.424825	S.D. dependent var	2.156520	
S.E. of regression	1.635511	Akaike info criterion	3.945354	
Sum squared resid	69.54731	Schwarz criterion	4.132180	
Log likelihood	-55.18030	Hannan-Quinn criter.	4.005121	
F-statistic	8.139807	Durbin-Watson stat	1.512686	
Prob(F-statistic)	0.000551			

The significant or probability value of the money supply (MS) variable is  $0.0160 < 0.05$ , so  $H_2$  accepted. This means that money supply has

significant influence on inflation in Indonesia. The significant or probability value of the interest rate (IR) variable is  $0.1720 > 0.05$ , so  $H_3$  rejected. This means that the interest rate has a significant influence on inflation in Indonesia.

**Table 10.** Error Correction Model (ECM) Long Run Libya

Dependent Variable: INF  
 Method: Least Squares  
 Date: 07/26/21 Time: 07:20  
 Sample: 1 30  
 Included observations: 30

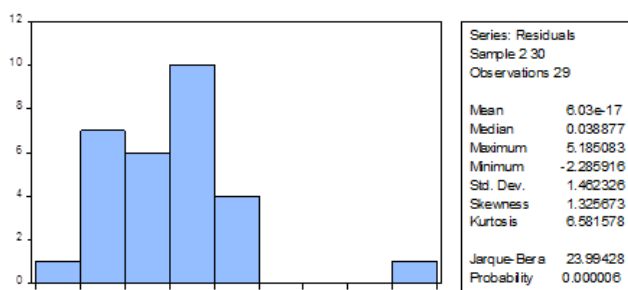
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER	0.002969	0.013121	0.226307	0.8227
MS	0.000127	3.71E-05	3.418149	0.0020
C	-4.182489	17.57156	-0.238026	0.8137

R-squared	0.304313	Mean dependent var	5.450000
Adjusted R-squared	0.252781	S.D. dependent var	6.688859
S.E. of regression	5.781973	Akaike info criterion	6.442007
Sum squared resid	902.6428	Schwarz criterion	6.582126
Log likelihood	-93.63010	Hannan-Quinn criter.	6.486832
F-statistic	5.905282	Durbin-Watson stat	1.605081
Prob(F-statistic)	0.007457		

The significant or probability value of the exchange rate (ER) variable is  $0.8227 > 0.05$ , so  $H_1$  rejected. This means that the exchange rate has not significant influence on inflation in Libya.

The significant or probability value of the money supply (MS) variable is  $0.0020 < 0.05$ , so  $H_2$  accepted. This means that money supply has a significant influence on inflation in Libya.



**Figure 3.** Normality test for Indonesia

**Table 11.** Autocorrelation test for Indonesia

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.441040	Prob. F(2,22)	0.6489
Obs*R-squared	1.117919	Prob. Chi-Square(2)	0.5718

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 07/26/21 Time: 07:34

Sample: 2 30

Included observations: 29

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.197213	0.485470	-0.406231	0.6885
D(ER)	2.94E-05	0.000477	0.061678	0.9514
D(MS)	9.50E-07	1.95E-06	0.486396	0.6315
D(IR)	0.004037	0.165245	0.024430	0.9807
ECT(-1)	-0.701138	0.781967	-0.896634	0.3796
RESID(-1)	0.741622	0.790522	0.938142	0.3584
RESID(-2)	0.163593	0.331487	0.493512	0.6265

R-squared	0.038549	Mean dependent var	6.03E-17
Adjusted R-squared	-0.223665	S.D. dependent var	1.462326
S.E. of regression	1.617616	Akaike info criterion	4.006290
Sum squared resid	57.56702	Schwarz criterion	4.336327
Log likelihood	-51.09120	Hannan-Quinn criter.	4.109653
F-statistic	0.147013	Durbin-Watson stat	2.025951
Prob(F-statistic)	0.987749		

Based on the figure above, it is known that Probability  $0.000006 < 0.05$  and Jarque Bera 23.99428. This can be concluded that the data is not normally distributed, based on central limit theorem, the statistical principle that the number of independent values of any distribution will approach normal distribution as the number of values in the distribution increases. In other words, the larger the sample size, the closer the sampling distribution is to the normal distribution. So because the sample number in this research is only a little sample number size so this is no problem.

Based on Breusch-Godfrey Serial Correlation LM Test, the Probability is  $0.6489 > 0.05$ , So, there is no autocorrelation.

**Table 12.** Heteroscedasticity test for Indonesia

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.636150	Prob. F(4,24)	0.1978
Obs*R-squared	6.213649	Prob. Chi-Square(4)	0.1838
Scaled explained SS	11.87682	Prob. Chi-Square(4)	0.0183

Test Equation:  
 Dependent Variable: RESID^2  
 Method: Least Squares  
 Date: 07/26/21 Time: 07:36  
 Sample: 2 30  
 Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.955006	1.275462	2.316811	0.0294
D(ER)	-0.002390	0.001373	-1.741071	0.0945
D(MS)	-9.65E-07	4.86E-06	-0.198544	0.8443
D(IR)	-0.288615	0.445982	-0.647146	0.5237
ECT(-1)	1.299285	0.603815	2.151795	0.0417
R-squared	0.214264	Mean dependent var	2.064660	
Adjusted R-squared	0.083308	S.D. dependent var	4.964174	
S.E. of regression	4.752901	Akaike info criterion	6.110973	
Sum squared resid	542.1617	Schwarz criterion	6.346714	
Log likelihood	-83.60911	Hannan-Quinn criter.	6.184804	
F-statistic	1.636150	Durbin-Watson stat	1.993486	
Prob(F-statistic)	0.197757			

**Figure 4.** Normality test for Libya

Based on the figure above, it is known that Probability  $0.017317 < 0.05$  and Jarque Bera  $8.112189$ . This can be concluded that the data is not normally distributed based on central limit theorem, the statistical principle that the number of independent values of any distribution will approach normal distribution as the number of values in the distribution increases.

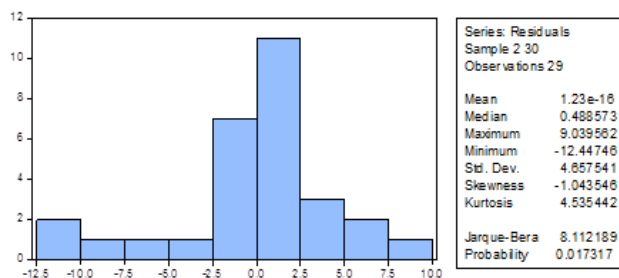
Based on the table above, it can be say that there is no heteroscedasticity because the Significant value is  $0.197757 > 0.05$ .

**Table 13.** Multicollinearity test for Indonesia

	ER	INF	MS
ER	1	-0.1142440196085462	0.930565939988987
INF	-0.1142440196085462	1	-0.3469926680518039
MS	0.930565939988987	-0.3469926680518039	1

Based on the multicollinearity test, there is high correlation between ER and MS because the value is more than 0.8 but it is still has BLUE

**Table 14.** Autocorrelation test for Libya



F-statistic	0.065571	Prob. F(1,24)	0.8001
Obs*R-squared	0.079016	Prob. Chi-Square(1)	0.7786

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 07/26/21 Time: 07:47

Sample: 2 30

Included observations: 29

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002232	1.022926	0.002182	0.9983
D(ER)	-9.84E-05	0.013752	-0.007156	0.9943
D(MS)	1.99E-06	0.000150	0.013213	0.9896
ECT(-1)	0.058827	0.302669	0.194360	0.8475
RESID(-1)	-0.092538	0.361380	-0.256069	0.8001
R-squared	0.002725	Mean dependent var	1.23E-16	
Adjusted R-squared	-0.163488	S.D. dependent var	4.657541	
S.E. of regression	5.023861	Akaike info criterion	6.221860	
Sum squared resid	605.7403	Schwarz criterion	6.457601	
Log likelihood	-85.21697	Hannan-Quinn criter.	6.295691	
F-statistic	0.016393	Durbin-Watson stat	1.887812	
Prob(F-statistic)	0.999432			

**Table 15.** Heteroscedasticity test for Libya

F-statistic	1.584178	Prob. F(3,25)	0.2181
Obs*R-squared	4.632328	Prob. Chi-Square(3)	0.2008
Scaled explained SS	6.074254	Prob. Chi-Square(3)	0.1081

Test Equation:

Dependent Variable: ARESID

Method: Least Squares

Date: 07/26/21 Time: 07:48

Sample: 2 30

Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.667488	0.683945	3.900152	0.0006
D(ER)	0.002674	0.009191	0.290924	0.7735
D(MS)	0.000111	0.000100	1.104011	0.2801
ECT(-1)	0.154598	0.131762	1.173313	0.2517
R-squared	0.159735	Mean dependent var	3.060707	
Adjusted R-squared	0.058904	S.D. dependent var	3.462686	
S.E. of regression	3.359156	Akaike info criterion	5.388699	
Sum squared resid	282.0982	Schwarz criterion	5.577291	
Log likelihood	-74.13613	Hannan-Quinn criter.	5.447763	
F-statistic	1.584178	Durbin-Watson stat	0.957353	
Prob(F-statistic)	0.218135			

Based on Breusch-Godfrey Serial Correlation LM Test, the Probability is 0.8001 > 0.05, So, there is no autocorrelation.

Based on the table above, it can say that there is no heteroscedasticity because the significant value is  $0.218135 > 0.05$  and also the significant value for all independent variables higher than 0.05, so it can be concluded there is no heteroscedasticity in this research.

**Table 16.** Multicollinearity test for Libya

	ER	MS
ER	1	0.03790236611059829
MS	0.03790236611059829	1

Based on the table above, it can be concluded there is no multicollinearity because the value  $< 0.8$ .

Based on the research results, it is known that the significance value for the interest rate variable is  $< 0.05$ , so it means that the first hypothesis in this study is accepted for Indonesia. So there is no significant influence between Interest Rate on Inflation in Indonesia. In Libya, we will not use IR (Interest rate) variables because the data is not achieving the ECM criteria and cointegration.

Inflation can be interpreted as a symptom of a general and continuous increase in the price of goods (Rahardja and Manurung, 2004). From this definition, there are three conditions to say that inflation has occurred. First, there is an increase in prices. Second, the increase occurred in the prices of goods in general. Third, the increase lasted quite a long time. Thus, a price increase that occurs for only one type of goods, or an increase that occurs only temporarily, cannot be called inflation.

The higher the interest rate, the smaller the desire to invest. The reason is that an entrepreneur will increase his investment expenditure if the expected profit from the investment is greater than the interest rate that must be paid for the investment fund as a cost for the use of funds (cost of investment). capital) (Nopirin, 2000). The lower the interest rate, the

entrepreneur will be motivated to invest because the cost of using funds is also getting smaller, the interest rate is in balance (meaning there is no push to go up and down) will be achieved if the public's desire to save is the same as the entrepreneur's desire to invest.

The results of research conducted by Perlambang (2010) by using eviews 4.0 software obtained from the results of research following the money supply and exchange rate (Rp/USD) had no significant effect on inflation while the interest rate (SBI) have a significant effect on inflation.

Based on the research results, it is known that the significance value for the interest rate variable is  $< 0.05$ , so it means that the second hypothesis in this study is accepted for Libya and Indonesia. So there is significant influence between money supply and inflation in both Indonesia and Libya.

Money supply is the total value of money circulating in the community. The money supply in a narrow sense is the money supply consisting of currency and demand deposits. In people's lives, the money supply is determined by Hasoloan's monetary policy (2014: 149). The amount of money available is called the money supply. In an economy that uses commodity money, the money supply is the quantity of that commodity. In an economy that uses money on show, like most economies today, the government controls the money supply: official regulations give the government the right to monopolize the printing of money.

Inflation can be interpreted as a symptom of a general and continuous increase in the price of goods (Rahardja and Manurung, 2004). From this definition, there are three conditions to say that inflation has occurred. First, there is an increase in prices. Second, the increase occurred

in the prices of goods in general. Third, the increase lasted quite a long time.

The results of research conducted by Azizah et al (2020) the results of the data analysis show that simultaneously there is an influence between the rupiah exchange rate and the money supply widely on inflation in Indonesia in 2010-2019.

Based on the research results, it is known that the significance value for the exchange rate variable is  $> 0.05$ , so it means that the third hypothesis in this study is rejected for Indonesia and Libya. So in Indonesia and Libya, there is no significant influence between Exchange rate on inflation.

The exchange rate (exchange rate) or often called the exchange rate is the price of currency against other currencies. The exchange rate is one of the most important prices in an open economy, given its enormous influence on the current account balance and other macroeconomic variables ". According to Ekananda (2014: 168) exchange is the exchange rate which is the price of currency relative to the currencies of other countries. The exchange rate plays an important role in spending decisions because it allows us to translate prices from various countries into the same language.". Based on the above meanings, it comes to the author's understanding that the exchange rate is the price of currency against foreign currency, how much the domestic currency is valued by foreign currency, the exchange rate is a very important price in the economy.

Meta (2007) with the title differences in the effect of inflation, interest rates and the rupiah/ us dollar exchange rate on stock returns (case study on property and manufacturing stocks listed on the Jakarta Stock Exchange 2000-2005). By using the independent variable inflation, interest rates, the rupiah exchange rate and the



dependent variable stock returns. The results showed that the interest rate has no effect on returns on property stocks but has a negative effect on returns on manufacturing stocks.

Inflation can be interpreted as a symptom of a general and continuous increase in the price of goods (Rahardja and Manurung, 2004). From this definition, there are three conditions to say that inflation has occurred. First, there is an increase in prices. Second, the increase occurred in the prices of goods in general. Third, the increase lasted quite a long time. Thus, a price increase that occurs for only one type of goods, or an increase that occurs only temporarily, cannot be called inflation.

## CONCLUSION

The results of this study are, first, there is no significant influence of the Interest Rate on inflation in Indonesia. In Libya, we will not use IR (Interest rate) variables because the data is not achieving the ECM criteria and cointegration.

Second, there is a significant influence Money supply on Inflation in both Indonesia and Libya.

Third, there is no significant influence There is no significant influence Exchange rate on inflation in Indonesia and Libya.

Fourth, in the short run Indonesia condition, interested rates (IR) has no significant influence on inflation (INF). Exchange rate (ER) and Money Supply (MS) has significant influence on inflation (INF). In the short run Libya condition, Money Supply (MS) as significant influence on inflation (INF). Exchange rate (ER) has no significant influence on inflation (INF).

Fifth, in the long run Indonesia condition, interested rates (IR) has significant influence on inflation (INF). Exchange rate (ER) and Money

Supply (MS) has no significant influence on inflation (INF). In the long run Libya condition, Money Supply (MS) has significant influence on inflation (INF). Exchange rate (ER) has no significant influence on inflation (INF).

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