

**ANALYSIS THE INFLUENCE OF MONEY SUPPLY, EXCHANGE RATE,  
INTEREST RATE, AND GROSS DOMESTIC PRODUCT TOWARDS  
INFLATION IN INDONESIA**

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**ABSTRACT**

This study is try to analyzed the influence of some independent variables which believed has impact towards inflation in Indonesia, which also as one of the variables that is watched by the central bank (Bank Indonesia) as a variable that could influence inflation stability in Indonesia based on its volatility. Those independent variables are, money supply, exchange rate, and BI rate as the interest rate, and gross domestic product. This study used an Error correction model (ECM) to get the equilibrium model and find out the influence of every independent variables on the short-run and long-run.

*Key words: Inflation, Money Supply, Exchange rate, Interest rate, Gross Domestic Product, Error Correction Model.*

**INTISARI**

Penelitian ini mencoba menganalisis pengaruh beberapa variabel yang di percaya memiliki dampak kepada inflasi di Indonesia dan merupakan variable yang di awasi oleh bank central (Bank Indonesia) sebagai variable yang dapat mempengaruhi stabilitas Inflasi di Indonesia berdasarkan volatilitasnya. Variabel-variable bebas tersebut adalah jumlah uang beredar, nilai tukar, dan BI rate sebagai tingkat suku bunga, dan produk domestik bruto (PDB). Penelitian ini menggunakan analisis Error Correction Model (ECM) untuk mendapatkan model ekuilibrium dan mengetahui pengaruh setiap variable bebas pada jangka panjang dan jangka pendek.

*Kata kunci: Inflasi, Jumlah Uang Beredar, Nilai Tukar, Suku Bunga Bank Indonesia, Produk Domestik Bruto, Error Correction Model.*

## INTRODUCTION

As written in the Bank Indonesia act No.23 on 1999, article 7 which now amended in the act No.3 on 2004 as states that “the ultimate goal of Bank Indonesia is to achieve and maintain the stability of rupiah” which then been elaborated that the stability of rupiah is reflected through two directions, the inward is through inflation and the outward is through exchange rate. Theoretically, inflation is a monetary phenomenon where all the general prices are increasing overtime in the economy. The increasing of price is a common thing yet it could worsen if the price is uncontrollable which lead to a catastrophe on the economy of nations. However, in the matter of controlling inflation Bank Indonesia only can control it from the monetary aspects and the outside of it is out of the control of Bank Indonesia (Bank Indonesia, 2004).

Since the implementation of inflation targeting framework (ITF) as a strategy for implementing monetary explicitly on July 2005, Government together with Bank Indonesia surely already take it into their consideration about the important impact of inflation towards economic growth in order to improve social welfare and the consideration so that Indonesia is able to compete with other countries.

Basically, the causes of inflation are demand-pull inflation and cost-push inflation. From the Central Bank, they can control it only from monetary aspects such as money supply, exchange rate, interest rate, and gross domestic product. First, taken from the quantity theory assumes that the increase in the quantity of money supply is matters and could lead to inflation. Second from Exchange rate aspects, in this global era international trade is cannot be avoided, on that kind of transaction one of the currencies that usually use and can be accepted is US dollar. The value of a domestic currency on exchange rate is important because it would affect the international trade that eventually will affect the domestic economy. The depreciation of domestic currency’s value on the exchange rate is often associated with higher inflation or vice versa. Move on to the interest rate, since the implementation of Inflation Targeting Framework on 2005 the central bank declared that interest rate is one of the tools that can influence the inflation volatility, the rise in the interest rate could suppress public and government spending so as to reduce the overall demand which ultimately decreases the inflation rate. The important of gross domestic product towards inflation is taken from the Keynesian theory of consumption where an increase in the consumption means an increase in the demand side, however if the shift of demand not followed by the aggregate supply because when GDP is low the aggregate supply is relatively flat then it could lead to the demand-pull inflation.

## **RESEARCH OBJECTIVE**

1. Analyze the influence of money supply towards inflation volatility.
2. Analyze the influence of exchange rate towards inflation volatility.
3. Analyze the influence of BI rate towards inflation volatility.
4. Analyze the influence of gross domestic product towards inflation volatility.

## **TEORITICAL FRAMEWORK**

### **Inflation**

According to Mankiw(2009), Inflation is an increase in the overall general price level of goods and services in the economy over a period of time, which constantly makes the purchasing power of the domestic currency is falling. However, inflation is not an easy thing to explained and control because this instrument of policy is potentially so powerful that can impact the economic conditions such as the society will face a short-run tradeoff between inflation and unemployment.

Based on Law No. 3 of 2004, concerned in the effectiveness of monetary policy to achieve and maintain the stable value of rupiah rate, which the stability is shown through inflation rate and the exchange rate, the central bank of Indonesia called Bank Indonesia implemented an inflation targeting framework in order to keep the economy running smoothly.

a) Based on the caused, the rising and falling inflation is caused by two factors:

1) Demand -Pull inflation.

Demand-pull inflation is inflation caused by the pull of demand this condition occurs when the production is in a state of full employment and inflation stems from their aggregate demand. In these circumstances, the increase in total demand will lead to the raising of prices may also increase production or output due to the rise of demand.

2) Cost-Push Inflation.

Cost-push inflation is inflation due to the rise in production costs. The increase in costs production itself can be caused by several factors, including as a result of exchange rate fluctuation, international trading, government administration price, shocks in the supply side due to natural disasters and disruption of distribution by the central bank, monopolistic industry, and demand on increasing wage by unity trade unions.

b) Based on the origin of occurrence, inflation is divided into two:

1) Domestic inflation.

Domestic inflation is usually caused by domestic causes, such as the printing of money to cover the deficit of government expenditure.

## 2) Imported Inflation.

Imported inflation occurred because there is any international trade. If a country experiences inflation, this inflation can spread to other countries that have trade relations with them caused by their production of goods and services certainly will be sold more expensive.

## c) There is three theories on inflation:

### 1) The Quantity Theory (Theory of Monetarist).

Based on monetarist the higher money supply will cause higher inflation. Therefore the government has to calculate the inflation if they going to print money because printing too much money will cause an economic shock that can lead to inflation.

### 2) Keynesian Theory.

Based on this theory inflation appears because the aggregate demand is higher than the aggregate supply in full employment conditions (over the potential output).

### 3) The Structural Theory.

The economist try to solve the problems of unbalanced economy based on the structured caused, through monetary and fiscal approach. The unbalanced of economic conditions could be from domestics shocks (harvest failure, natural disaster) or anything related to international trade (worsening in the term of trade, production rigidity, foreign debt, and the condition of the exchange rate) which can lead to the price fluctuation in the domestic market.

## **Money Supply**

Money supply is the quantity of money available in an economy. In an economy that uses fiat money, the government controls the money supply through a monetary policy with controlling the quantity of money printing, level of taxation, and the level of government purchases. The relationship between money supply and inflation is the higher the money supply caused by either printing or buying a legitimate certificate or bonds from the public could lead to the inflation is supported in the theory monetarist or also called the quantity theory.

## **Exchange Rate**

The exchange rate actually is concluded in one of the shocks which influence the economy. The shock is mayor may not jeopardize the inflation targeting, or even it may contribute to stabilize the prices. When the domestic currency value on the exchange rate is relatively high, it tends to lower the inflation rate by lowering the cost of imports, discouraging exports, and

lowering the interest rate to stimulate the economy, unless the inflation rate is too high, to begin with.

### **Interest Rate**

Since Bank Indonesia officially implemented Inflation Targeting Framework (ITF) in full on July 2005 they change its operational final target monetary policy from base money to the full-fledged inflation targeting framework with the announcement of BI rate in monthly basis as a target operational with the power through monetary policy that the central bank has.

### **Gross Domestic Product**

One of the variables that include in the domestic products calculation is consumption which based on the Keynesian theory of consumption when the incomes are increases then the people tend to spend more in their consumption. Increase in the consumption means increase in the demand side, an increase in the demand side if it is not followed by the supply side, because of the economy is in low output conditions or low GDP levels then the country relatively has a flat aggregate supply, then this conditions will increase the price level because of the scarcity of supply side, if this is happened in overall price level it can be a catastrophic of demand-pull inflation.

## **RESEARCH METHODOLOGY**

This study used a quantitative methodology on its analysis. The quantitative data are secondary data in quarterly basis derived from [www.bi.go.id](http://www.bi.go.id) and [www.bps.go.id](http://www.bps.go.id) from January 2010 until December 2017. They are inflation, money supply, exchange rate, interest rate, and gross domestic product.

## **RESEARCH FINDINGS**

### **1. Descriptive statistics.**

Descriptive statistics provide a brief summary through descriptive coefficient that represents the given data set. The descriptive statistics of all variable with regards to changes in inflation, money supply, exchange rates, interest rate, and gross domestic product with result based on the table as follows: First, the inflation's mean, median, maximum, and minimum value respectively are 0.444375, 0.435000, 2.460000, -0.350000. Secondly, the money supply's mean, median, maximum, and minimum value respectively are 15.09452, 15.12148, 15.50545, 14.56319. Thirdly, the exchange rate's mean, median, maximum, and minimum value respectively are 9.318436, 9.374978, 9.592673, 9.059169. Fourthly, the interest rate or BI rate's mean, median, maximum, and minimum

value respectively are 6.335938, 6.500000, 7.750000, 4.250000. Lastly, the gross domestic product's mean, median, maximum, and minimum value respectively are 14.54602, 14.54834, 14.75247, 14.31164. The results indicate that all variables have a positive mean, median, and maximum value where the inflation is the only variable which has a negative minimum value.

## **2. Unit Root Test.**

Before running an Error Correction Model regression, the first thing that has to be done is checking the stationary status, because if the data is not stationary the result will be spurious, and having an autocorrelation problem. And from the result of unit root test shows that the data stationary on second-difference.

## **3. Long-run Estimation**

From the Ordinary Least Square or long-run estimation we can construct the residual which is the Error Correction Term. However, from the result from long-run estimation there are no single variables of independent that significantly influence towards inflation in the long-term looking from the probability value which is none of them are less than 0.05 values. Shown from the R squared also, that the model or the variables actually only explained 9.7 percent of the change in inflation in the long-term form.

## **4. ECT Generating and Testing**

Based on (Basuki and Yuliadi, 2015)The residuals must be stationer on the level to be said having a co-integration relationship. From the data analysis the result of unit root test of the residual shown that the p-value is 0.0000 which means that the residual of the data which is the error correction term is stationary and there is co-integration between variables because the p-value is significant at level 5% even in 1% significance level.

## **5. ECM regression**

From the error correction model estimation result shows that in the short-run the variables independent that used are significantly influence towards the change of inflation in Indonesia. With R squared 0.769591 or around 77 percent is can be concluded that the independent variables used for the model are quite good because of only around 23 percent diversity of dependent variable that is influenced by other independent variables outside the model. With variables money supply and exchange rate are the one which significantly affecting towards inflation volatility in Indonesia, with money supply coefficient 12.95818 and exchange rate coefficient -7.532157.

## 6. Classical Assumption

### i. Autocorrelation test

From the test result shows that the value of prob. Chi-Square is  $0.2679 > \alpha = 5\%$  or 0.05 than it can be concluded that the data is free from autocorrelation problem.

#### Autocorrelation Test Result.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.06791	Prob. F(2,23)	0.3602
Obs*R-squared	2.6341	Prob. Chi-Square(2)	0.2679

### ii. Linearity test

#### Linearity Test Result

Ramsey RESET Test			
Equation: DEQ01			
Specification: D(INF) C D(LOG_M2) D(LOG_ER) D(BIR) D(LOG_GDP)			
ECT(-1)			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	0.263015	24	0.7948
F-statistic	0.069177	(1, 24)	0.7948
Likelihood ratio	0.089225	1	0.7652

The probability of F-Statistic's value is greater than the  $\alpha = 5$  percent:  $0.7948 > 0.05$  means that the model is free from linearity problem.

### iii. Multicollinearity test.

#### Multicollinearity Test Result

	LOG_M2	LOG_ER	BIR	LOG_GDP
LOG_M2	0.0774	0.04647	-0.068175	0.033458
LOG_ER	0.04647	0.03161	-0.002877	0.020073
BIR	-0.068175	-0.002877	1.060974	-0.036721
LOG_GDP	0.033458	0.020073	-0.036721	0.014891

The rule of the thumb to pass the multicollinearity test is none of the variables has a greater value than 0.85 towards another variable, it means that the data above is free from multicollinearity problem.

**iv. Heteroscedasticity test.**

**Heteroscedasticity Test Result**

Heteroskedasticity Test: White			
F-statistic	1.024053	Prob. F(20,10)	0.5075
Obs*R-squared	20.82975	Prob. Chi-Square(20)	0.4072
Scaled explained SS	50.13741	Prob. Chi-Square(20)	0.0002

From the results above show that the Probability of Obs\*R-squared is 0.4072 is bigger than 5%\_means that the Error Correction model is free from heteroscedasticity problem.

**7. Statistics Test.**

**i. T-test**

**T-test Result**

Long-Run Estimation				
Variable	t-Statistic	t-table (df:32 , $\alpha$ :0.05 )	Prob.	significant Effect
C	0.557507	2.042	0.5818	
LOG_M2	1.361812	2.042	0.1845	No
LOG_ER	-1.04372	2.042	0.3059	No
BIR	0.992125	2.042	0.3299	No
GDP	-0.66764	2.042	0.5100	No
Short-Run Estimation				
Variable	t-Statistic	t-table (df:32 , $\alpha$ :0.05 )	Prob.	significant Effect
C	-1.38665	2.042	0.1778	
D(LOG_M2)	3.038008	2.042	0.0055	Yes
D(LOG_ER)	-2.78393	2.042	0.0101	Yes
D(BIR)	0.991329	2.042	0.3310	No
D(GDP)	-0.93835	2.042	0.3570	No
ECT(-1)	-6.14525		0.0000	

In long-run estimation, all independent variables, individually, are not significantly affecting the change of inflation (absolute value of t statistic < t-table value). In short-run estimation only money supply, and exchange rate individually, are significantly affecting the inflation (absolute value of t statistic > t-table value)

**ii. F-test**

**F-test Result**

<b>Estimation Period</b>	<b>F-Statistic</b>	<b>F-Table <math>\alpha</math> , dfn , dfd</b>	<b>F-Table Value</b>	<b>p-value</b>	<b>Effect is Significant?</b>
Long-Run	0.728552	0.05 , 4 , 32	2.67	0.580289	No
Short-Run	16.70052	0.05 , 5 , 32	2.51	0.000000	Yes

On the long-run ,the F-statistic value (0.728552) < the f table value (2.67), means that all the variables jointly are not influencing the dependent variable together. On the short-run estimation, the F-statistic > F value. 16.70052 > 2.51 means that through the estimation of all the variables jointly together are influencing the inflation significantly.

**iii. R<sup>2</sup> Interpretation.**

**R<sup>2</sup> Interpretation**

<b>Estimation Period</b>	<b>R<sup>2</sup></b>
Long-Run	0.097419
Short-Run	0.769591

In the Long-run, the independent variables on the model only can explained or predict the variance of the dependent variable by 9.7 percent. While the rest, 90.3 percent is probably affected by other variables outside of this model. In the short-run estimation, the independent variables on the model only can explained or predict the variance of the dependent variable by 77 percent.

**DISCUSSION**

**1. Money Supply towards Inflation.**

Based on the analysis result, the money supply has a positive influence towards inflation, but it is only significantly influenced towards inflation on the short-run estimation. On long-run estimation, when money supply increase by 1 point the inflation will increase 2.979706 points. On the short-

run, when the money supply increase by 1 point than the inflation will also increase by 12.95818 points. Therefore, we have to keep monitor the fluctuation of money supply considering the theory of quantity or Fisher theory that says inflation is closely related to the money supply in the short-run.

## **2. Exchange Rate towards Inflation.**

Based on the analysis result, the exchange rate has a negative influence towards inflation, but it is only significantly influenced towards inflation on the short-run estimation. On long-run estimation, when the exchange rate increase by 1 point the inflation will decrease by 2.130555 points. On the short-run, when the exchange rate increase by 1 points than the inflation will decrease by 7.532157 points. Although based on the theory, appreciate in the exchange rate might increase the inflation because of imported inflation, it seems that in this case the fall of domestic currency value actually also could provide a competitive boost to an economy, and can lead to positive multiplier and accelerator effect within the circular flow of income and spending.

## **3. BI Rate towards Inflation.**

Based on the analysis result, even though the Bank Indonesia rate has a positive influenced towards inflation, and both in the long-run and short-run estimation but they are not significantly influence towards inflation. On long-run estimation, when the Bank Indonesia rate increase by 1 point the inflation will also increase by 0.131634 points. On the short-run, when the Bank Indonesia rate is increased by 1 point than the inflation will increase by 0.229182 points with status not significantly influence towards inflation is should keep it in mind.

The not significance of interest rate influencing inflation in this result study is probably because the use of variables on this study is on a quarterly basis which it is quite too long to be in the act to correct the inflation dynamics or the time lag problem in monetary policy to adjust the speed that has been increase during great moderation. The not significance also can caused by 'decoupling', a condition when economic pass through complexities even though in the short-term interest rate may encounter significant difficulties perform in monetary policy.

## **4. Gross Domestic Product towards Inflation.**

Based on the analysis result, even though the gross domestic product has a negative influenced towards inflation both in the long-run and short-run estimation but they are not significantly influence towards inflation. On long-run estimation, when the gross domestic product increase by 1 point the inflation will decrease by 3.347274 points. On the short-run, when the

gross domestic product is increases by 1 point than the inflation will decrease by 1.136458 points with status not significantly influence towards inflation is should keep it in mind.

The negative sign of influence between gross domestics product towards inflation indicates that the increase in gross domestic product or total output will decrease the inflation. The total output on agricultural sectors, for instance, could reduce or calm down the inflation rate. But on the other hand, looking at the non-significance influence's status of the gross domestic product towards inflation in this study indicates that every increase degrees of gross domestic product are not always followed by the increase of inflation rate or the number of gross domestic product does not really matter in controlling the inflation.

## **CONCLUSION**

- 1) The money supply has no significant influence in the long-run equilibrium but it has a positive and significant influence towards inflation in the short-run with coefficient 2.979706 points will increase inflation rate in every one point increase in the money supply.
- 2) The exchange rate has no significant influence in the long-run equilibrium but it has a negative and significant influence towards inflation in the short-run with estimation when the exchange rate increase by one point the inflation will decrease by 7.532157 points.
- 3) The BI rate has no significant effect on inflation neither in long-run nor short-run
- 4) The gross domestics product has no significant effect towards inflation both in long-run and short-run equilibrium.
- 5) From the R-squared in the short-run estimation shows that the model only can explain around 77 percent of the Inflation volatility while the other 23 percent diversity is influenced by other independent variables outside the model.

## **RECOMMENDATION**

- 1) The Central Bank and Government should pay attention to the effect of money supply in order to keep the stability of inflation in the short-run.
- 2) The Central Bank and Government should pay attention to the effect of exchange rate in order to keep the stability of inflation in the short-run.
- 3) For the future researcher it would be better to consider using the BI 7-Day (Reverse) Repo Rate in line with the latest Central Bank policies on using it as the interest rate as the reference rate. Even though in this study the result is not

significant but we still should control and watch the volatility of the interest rate to keep the inflation stability.

- 4) Although the gross domestics product has no significant influence towards inflation in this study but we still should watch the movement of gross domestics product value to keep the inflation stability.
- 5) For the future researcher who might be interested in Inflation analysis, it is advisable to reconsider adding other variables which might have the other 23 percent of influence to the change of inflation rate in order to improve and strengthen the model's estimation, including adding more references related.

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