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Inflation volatility as a phenomenon monetary-fiscal combination in Indonesia

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Abstract. *Inflation is generally seen as a monetary phenomenon whose effective control is through the management of the money supply, interest rates, and exchange rates. Another opinion views inflation as a fiscal phenomenon that is controlled through the effectiveness of tax revenues and state expenditures and avoiding a budget deficit that triggers an increase in government external debt. This study aims to examine and analyze the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia. The analysis was carried out descriptively and quantitatively through the Autoregressive Distributed Lag (ARDL) Model using secondary time series data from the 1st quarter of 2009 to the 2nd quarter of 2020. The results showed the dominance of the positive influence of interest rates from the monetary side and foreign debt from the fiscal side, as well as the ineffective role of tax revenue in reducing inflation in Indonesia. Bank Indonesia needs to streamline policies related to interest rate management in regulating the money supply. The government needs to make efforts to increase the effectiveness of tax revenues and state spending to minimize its foreign debt.*

Keywords: Inflation, Monetary, Fiscal, ARDL Model, Indonesia

JEL Codes: C32, E31, E52, E62

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1. Introduction

Inflation volatility is a condition of unstable inflation, which tends to vary and is difficult to predict. Inflation instability will cause uncertainty in decision making to invest and produce (for producers) and consume (for consumers). This is due to the close relationship between inflation uncertainty and production costs and commodity prices. Besides, the Granger causality test conducted by Jiranyakul and Opiela (2010) shows that an increase in inflation will increase inflation uncertainty and an increase in inflation uncertainty will raise inflation rates in Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Inflation volatility can lead to excessive inflation expectations. Where inflation expectations tend to increase along with the acceleration of inflation (Feldkircher and Siklos, 2019). This happens because inflation expectations play an important role in the process of pricing in the market (Soybilgen dan Yazgan, 2017; Binder, 2018; Berge, 2018; Hammoudeh dan Reboredo, 2018).

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Expectations arise due to information. Household inflation expectations are more responsive to inflation news (Baqaee, 2019) and have a central role in the implementation of monetary policy (Das et al., 2019). Information about past inflation plays a role in current inflation expectations and volatility. The market risk will increase because inflation expectations are very low or high and do not react to moderate or stable inflation expectations (Orlowski dan Soper, 2019). Price stability will significantly reduce inflation expectations (Rumler dan Valderrama, 2020).

The idea of inflation is generally understood as a monetary phenomenon as seen from the statement of Nobel laureate Milton Friedman when giving a lecture at the University of London on September 16, 1970, that "inflation is always and everywhere a monetary phenomenon" (Hossain, 2010: 142). The basis for this is the theory of monetarists, which argues that money growth is the main source of inflation (Jahan and Papageorgiou, 2014).

The empirical results of Jongwanich and Park (2009) show that inflation in Asia mostly comes from within the country due to excess aggregate demand and inflation expectations. In this regard, he thinks that monetary policy will remain the best tool in dealing with inflation in Asia. The policy referred to is related to control of the money supply, interest rates, and exchange rates.

Apart from the view of inflation as a monetary phenomenon, there has been a long time thinking about inflation as a fiscal phenomenon. This thinking is based on The Fiscal Theory of The Price Level. This theory states that inflation (the price level) does not have a direct relationship with monetary policy, but is influenced by fiscal conditions in the form of government spending plans including paying off debts and revenues from the taxation sector (Hervino, 2011). So it can be concluded that inflation is determined by the fiscal authority budget policy (Carlstrom and Fuerst, 2000).

Meanwhile, Tutino and Zarazaga (2014) argue that fiscal policy is as important and sometimes more important than monetary policy in determining the price level and inflation dynamics. According to this idea, it is not enough to control inflation through monetary policy, but it should also be done through fiscal policy. The policy referred to is related to the effectiveness of state expenditure and tax revenue as well as avoiding a budget deficit that triggers an increase in government debt.

This difference in thinking is what motivates researchers to study the volatility of inflation, especially in Indonesia. During the first quarter of 2009 to the second quarter of 2020, the highest inflation rate in Indonesia had reached 8.4 percent and the lowest was 1.96 percent with an average value of 4.65 percent. The highest inflation occurred in the third quarter of 2013. This was triggered by an increase of 18.92 percent of the USD exchange rate and 22.41 percent of government spending compared to the same quarter of the previous year. Inflation remains high even though at the same time the government has made efforts to reduce it by increasing tax revenue growth by 13.2 percent and increasing interest rates from 6 percent in the previous period to 7.25 percent.

The lowest inflation occurred in the second quarter of 2020 when the Covid-19 outbreak began to hit Indonesia. The decline in inflation was caused by a decrease in the money supply by 46.71 trillion rupiahs and an increase in tax revenue by 65.12 trillion rupiahs compared to the previous period. The increase in tax revenue was triggered by an increase in government spending of 164.12 trillion rupiahs, an increase of 36.28 percent from the previous quarter. In addition, the rupiah exchange rate against the US dollar also strengthened from 16,310 rupiahs to 14,265 rupiahs.

Based on these differences in theoretical views and data, the question arises, is the volatility of inflation in Indonesia a phenomenon monetary-fiscal combined? In this regard, this study aims to examine and analyze the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia.

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2. Literature Review

Research on inflation in Indonesia related to its status as a fiscal or monetary phenomenon was conducted by Hervino (2011). He sees the fiscal side of the government's external debt variable while the monetary side is viewed from the money supply variable. The results of his research show that the money supply and foreign debt in the short term have a negative impact on Indonesian inflation. However, the opposite occurs in the long run, where the money supply and foreign debt have a positive effect on inflation volatility in the country. So he concluded that the monetary and fiscal side in the long term will affect the volatility of inflation in Indonesia. However, after the 1997 economic crisis, the monetary side was more dominant in influencing the volatility of inflation than the fiscal side. This is evidenced by the high coefficient of the money supply (0.031946) compared to the coefficient of foreign debt (0.000791).

Azhar et al. (2019) also found a dominance of the monetary phenomenon over regional inflation in the long term in West Sumatra. More detailed research results show that the money supply (M2) has a negative and insignificant effect in the short term and a significant positive effect in the long term. Interest rates have a significant positive effect in the short and long term. Government spending has a significant negative effect in the long run and negatives are not significant in the short term. In the short and long term, local taxes have an insignificant negative effect on inflation in West Sumatra.

There are very many studies on inflation in terms of monetary aspects, but there are still limited researchers who examine inflation from a fiscal aspect. One of them is Surjaningsih et al. (2012) who examined the impact of fiscal policy on output and inflation. His research is based on the fiscal theory of the price level, where fiscal policy plays an important role in determining prices through budget constraints related to debt, expenditure, and tax policies. Among the results of his research found that an increase in government spending causes a decrease in inflation, while an increase in taxes leads to an increase in inflation. The effect of debt policy and monetary factors on inflation is not discussed in this study.

Regarding government debt, Trisdian et al. (2015) found that local government debt has no significant effect on the regional inflation rate in Indonesia. However, fiscal transparency has a strong negative effect on inflation (Montes and da Cunha Lima, 2018).

The novelty of this research lies in the completeness of the variables used in assessing the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia. The monetary phenomenon is seen from the factor of the money supply, interest rates, and exchange rates. Meanwhile, the fiscal phenomenon can be seen from the tax revenue, state expenditure, and foreign debt factors that the government undertakes to cover the budget deficit. Thus, the monetary-fiscal combination phenomenon is seen from the interaction of all these factors in influencing the volatility of inflation in Indonesia.

3. Methodology

This study uses secondary data in the form of time series from the 1st quarter of 2009 to the 2nd quarter of 2020 obtained from Bank Indonesia (BI) and the Ministry of Finance. The objects of his research are inflation, money supply, interest rates, exchange rates, tax revenues, government spending, and foreign debt. The analysis was carried out descriptively and quantitatively using the Autoregressive Distributed Lag (ARDL) Model with the help of the Eviews 10 application.

As the dependent variable in this study, inflation is the percentage change in the Consumer Price Index (CPI) for the relevant quarter compared to the CPI for the same quarter in the previous year. The term volatility is used to indicate volatile data. This study uses data growth of the broad money (M2) and

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the Jakarta interbank spot dollar rate as independent variables. The BI Rate is used for interest rate data for the first quarter of 2009 (2009: Q1) to the second quarter of 2016 (2016: Q2) and the BI 7-day Repo Rate is used for further data. Tax revenue in this study is the percentage growth in the realization of state revenue from taxation, namely in the form of domestic taxes and international transactions. Government spending is the percentage of realized growth in state spending. External debt is the percentage growth in the amount of short-term (less or equal to 1 year) and long-term (more than 1 year) loans from the Indonesian government to other countries. All variables in this study are calculated in percentage units.

Autoregressive Distributed Lag (ARDL) model is used to see the effect of independent variables on the dependent variable in this study. The ARDL model is a combination of the Autoregressive (AR) model with Distributed Lag (DL). The AR model uses one or more past data (lag) from the dependent variable as the independent variable, while the DL model is a regression model that involves the current data and the lag of the independent variables. Thus, the ARDL model is a dynamic model that includes the lag of the dependent and independent variables in its regression.

There are 3 things behind the choice of the ARDL model in this study. First, the ARDL model accommodates research with a limited number of observations. Second, this model does not place too much importance on the level of data stationarity, as long as the data is maximally stationary in the first difference. Third, apart from being able to estimate the short-run effect, it can also produce an estimate of the long-term effect through the Error Correction Model (ECM) if there is cointegration in the model.

Inflation volatility as a phenomena monetary-fiscal combination is seen from the effect of inflation in the previous quarter, money supply, interest rates, exchange rates, tax revenues, government purchases, and foreign debt in the estimated ARDL form (p, q_1, q_2, q_3, q_4, q_5, q_6) as follows:

$$INF_t = \alpha_0 + \alpha_{11} INF_{t-1} + \alpha_{12} INF_{t-2} + \ldots + \alpha_{1p} INF_{t-p} + \beta_{10} JUB_t + \beta_{11} JUB_{t-1} + \ldots + \beta_{1q1} JUB_{t-q1} + \beta_{20} SB_t + \beta_{21} SB_{t-1} + \ldots + \beta_{2q2} SB_{t-q2} + \beta_{30} NT_t + \beta_{31} NT_{t-1} + \ldots + \beta_{3q3} NT_{t-q3} + \beta_{40} PP_t + \beta_{41} PP_{t-1} + \ldots + \beta_{4q4} PP_{t-q4} + \beta_{50} BP_t + \beta_{51} BP_{t-1} + \ldots + \beta_{5q5} BP_{t-q5} + \beta_{60} ULN_t + \beta_{61} ULN_{t-1} + \ldots + \beta_{6q6} ULN_{t-q6} + \varepsilon_t \quad (1)$$

Equation (1) can be summarized as:

$$INF_t = \alpha_0 + \sum_{i=1}^{i=p} \alpha_{1i} INF_{t-i} + \sum_{i=0}^{i=q_1} \beta_{1i} JUB_{t-i} + \sum_{i=0}^{i=q_2} \beta_{2i} SB_{t-i} + \sum_{i=0}^{i=q_3} \beta_{3i} NT_{t-i} + \sum_{i=0}^{i=q_4} \beta_{4i} PP_{t-i} + \sum_{i=0}^{i=q_5} \beta_{5i} BP_{t-i} + \sum_{i=0}^{i=q_6} \beta_{6i} ULN_{t-i} + \varepsilon_t \quad (2)$$

If there is cointegration in equation (2), then the short-term and long-term effects of the independent variable on the dependent variable form the following estimate.

$$\Delta INF_t = \alpha_0 + \sum_{i=1}^{i=p} \alpha_{11i} \Delta INF_{t-i} + \sum_{i=0}^{i=q_1} \beta_{11i} \Delta JUB_{t-i} + \sum_{i=0}^{i=q_2} \beta_{21i} \Delta SB_{t-i} + \sum_{i=0}^{i=q_3} \beta_{31i} \Delta NT_{t-i} + \sum_{i=0}^{i=q_4} \beta_{41i} \Delta PP_{t-i} + \sum_{i=0}^{i=q_5} \beta_{51i} \Delta BP_{t-i} + \sum_{i=0}^{i=q_6} \beta_{61i} \Delta ULN_{t-i} + \alpha_{12} INF_{t-1} + \beta_{12} JUB_{t-1} + \beta_{22} SB_{t-1} + \beta_{32} NT_{t-1} + \beta_{42} PP_{t-1} + \beta_{52} BP_{t-1} + \beta_{62} ULN_{t-1} + \varepsilon_t \quad (3)$$

The short-run effects of equation (3) are:

$$\Delta INF_t = \alpha_0 + \sum_{i=1}^{i=p} \alpha_{11i} \Delta INF_{t-i} + \sum_{i=0}^{i=q_1} \beta_{11i} \Delta JUB_{t-i} + \sum_{i=0}^{i=q_2} \beta_{21i} \Delta SB_{t-i} + \sum_{i=0}^{i=q_3} \beta_{31i} \Delta NT_{t-i} + \sum_{i=0}^{i=q_4} \beta_{41i} \Delta PP_{t-i} + \sum_{i=0}^{i=q_5} \beta_{51i} \Delta BP_{t-i} + \sum_{i=0}^{i=q_6} \beta_{61i} \Delta ULN_{t-i} + ECM_{t-1} + \varepsilon_t \quad (4)$$

The long-run effects of equation (3) are:

$$INF_t = \alpha_0 + \alpha_{12} INF_{t-1} + \beta_{12} JUB_{t-1} + \beta_{22} SB_{t-1} + \beta_{32} NT_{t-1} + \beta_{42} PP_{t-1} + \beta_{52} BP_{t-1} + \beta_{62} ULN_{t-1} + \varepsilon_t \quad (5)$$

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INF is inflation while α_0 is constant. The short-run coefficients are denoted by $\alpha_{11}, \beta_{11}, \beta_{21}, \beta_{31}, \beta_{41}, \beta_{51}$, and β_{61} while $\alpha_{12}, \beta_{12}, \beta_{22}, \beta_{32}, \beta_{42}, \beta_{52}$, and β_{62} are long-run coefficients. JUB, SB, NT, PP, BP, and ULN show the money supply, interest rates, exchange rates, tax revenues, government purchases, and foreign debt. The symbols p, q_1, q_2, q_3, q_4, q_5, and q_6 are the optimum lag. The ECM is an Error Correction Model, ε is the error term and t represents the time series data.

To find out whether the independent variable individually affects the dependent variable, a t-test is performed by looking at the probability. If the probability t is less than α, which is 0.05, then H_0 is rejected, which means that there is a significant effect individually between the independent variables on the dependent variable. The individual influence of each independent variable can be positive or negative. The magnitude of this influence will be seen in each coefficient.

In order to test the effect of all independent variables simultaneously on the dependent variable, an F test is performed by looking at the probability. If the probability F is less than α, which is 0.05, then H0 is rejected, which means that all independent variables simultaneously have a significant effect on the dependent variable. The magnitude of this influence is known from the coefficient of determination (R-square). The coefficient of determination is between zero and one. A value close to one indicates that the independent variables provide almost all the information needed to predict the dependent variable.

4. Result and Discussion

4.1 Stationarity Test

A stationarity test is performed to identify whether all data is stationary at the level or not. If the data are not stationary at the level, then a stationarity test is carried out for the first difference. If there is data on research variables that are not stationary at the level or first difference, then the ARDL model is not appropriate to use.

Table 1. Unit Root Test

Level				Firs difference			
Series	t-Statistic	Test critical values 5% level	Prob.	Series	t-Statistic	Test critical values 5% level	Prob.
INF	-2.816417	-2.928142	0.0640	D(INF)	-8.542189	-2.929734	0.0000
JUB	-2.636055	-2.928142	0.0934	D(JUB)	-8.369191	-2.929734	0.0000
SB	-1.714231	-2.929734	0.4173	D(SB)	-4.361539	-2.929734	0.0011
NT	-3.304219	-2.928142	0.0205	D(NT)	-6.943002	-2.935001	0.0000
PP	-3.272701	-2.933158	0.0226	D(PP)	-9.610992	-2.931404	0.0000
BP	-7.319974	-2.928142	0.0000	D(BP)	-5.357958	-2.935001	0.0001
ULN	-2.547511	-2.928142	0.1114	D(ULN)	-6.734071	-2.929734	0.0000

There are 3 ways to test the stationarity of time series data, namely graph analysis, correlogram, and unit root (Gujarati, 2015: 251). The stationarity test in this study used the unit root test with the Augmented Dickey-Fuller (ADF) method. If the probability is smaller than the α value, which is 0.05, then H_0 is rejected and the time series data used are stationary.

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Table 1 shows the data on inflation, money supply, interest rates, and foreign debt are not stationary at the level, however, all data have been stationary at the first difference, because the probability is less than 0.05. Thus, the ARDL model can be used for this study.

4.2 Model Estimation

ARDL estimation is obtained by selecting the optimum lag with the model selection method using Akaike Information Criteria (AIC), Schwarz Criteria (SC), or Hannan-Quinn Criteria (HQC). The optimum lag is indicated by the smallest value in at least one of the three criteria. Inflation volatility as a phenomena monetary-fiscal combination has the ARDL model (1, 0, 3, 1, 0, 0, 0). This is the best model with optimal lag based on the smallest HQC value criteria as shown in Figure 1.

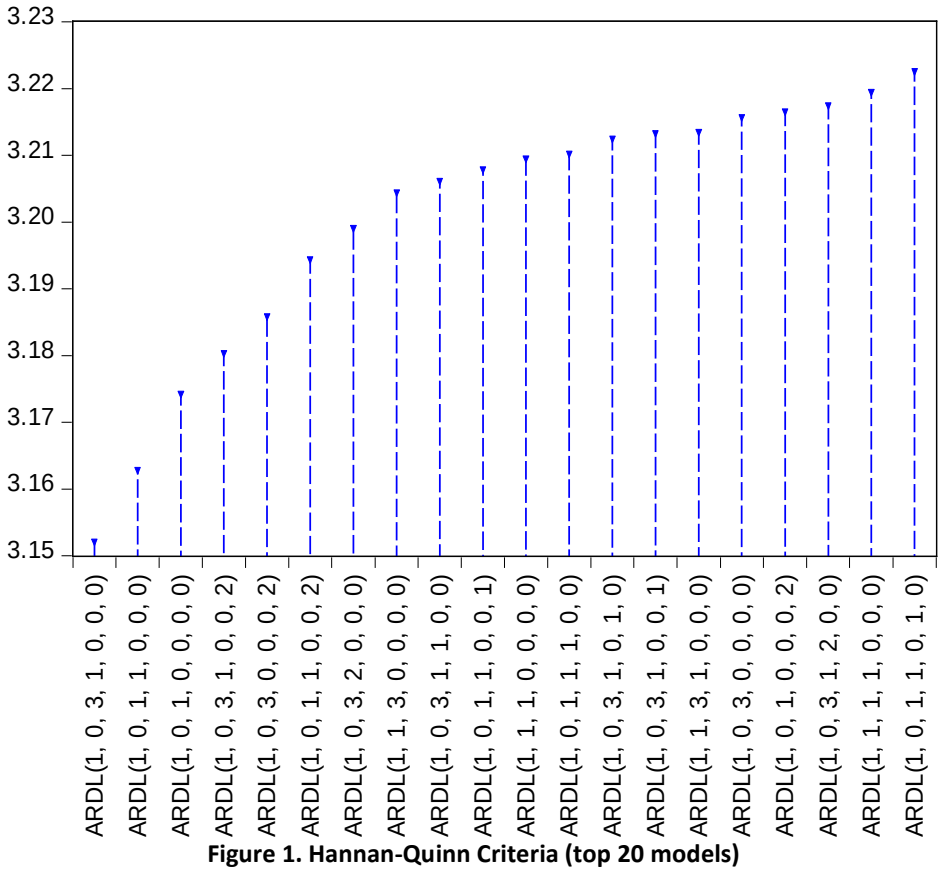

Figure 1. Hannan-Quinn Criteria (top 20 models)

ARDL estimates (1, 0, 3, 1, 0, 0, 0) which model the volatility of inflation as a monetary-fiscal combination phenomenon are presented in table 2.

Table 2. ARDL Estimation (1, 0, 3, 1, 0, 0, 0)

Variable	Coefficient	Prob.
INF(-1)	0.222951	0.2485

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JUB	0.200892	0.0070
SB	1.671093	0.0014
SB(-1)	-1.475898	0.0499
SB(-2)	1.257158	0.1023
SB(-3)	-0.970622	0.0432
NT	0.084216	0.0283
NT(-1)	-0.054559	0.0506
PP	-0.029305	0.0645
BP	-0.030423	0.0389
ULN	0.097703	0.0805
C	-1.818119	0.1065
R-squared	0.786405	
Adjusted R-squared	0.710613	
Prob(F-statistic)	0.000000	

The ARDL model (1, 0, 3, 1, 0, 0, 0) has a probability F-statistic of 0.000000 less than 0.05, so H_0 is rejected. This means that the current INF is very significantly influenced simultaneously by INF in the previous quarter as well as JUB, SB, NT, PP, BP, and ULN. The magnitude of the influence of all these variables simultaneously can be seen from the coefficient of determination, namely 0.786405. This means that 78.64 percent of INF can be explained by all of these variables. Meanwhile, the remaining 21.36 percent is explained by other variables that are outside the model. To continue estimating the short-term and long-term models from the ARDL model (1, 0, 3, 1, 0, 0, 0), a cointegration test is necessary.

4.3 Cointegration Test

The bound test is carried out to see whether there is cointegration in the ARDL model which has data with different stationarity, namely a combination of levels and first differences. This test aims to measure short-term and long-term imbalances and see the short-term to a long-term relationship. If the F-statistic value of the Bounds Test is greater than the upper critical value bound I (1), then H_0 which states there is no cointegration is rejected. This concludes a short-term to a long-term relationship in the model. So that the ARDL model can be translated into short and long term models.

Table 3. Test Bounds

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.843857	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

The ARDL model (1, 0, 3, 1, 0, 0, 0) has an F-statistical Bound Test value of 3.843857 more than the upper critical value Bound I (1) at 5 percent significance which shows 3.28 as shown in table 3. Thus, H_0 which states there is no cointegration is rejected. So it can be concluded that there is cointegration or

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short-term to long-term relationships in the model. The existence of cointegration in ARDL (1, 0, 3, 1, 0, 0, 0) makes the short-term and long-term models can be estimated.

4.4 Short and Long Term Estimates

Short-term estimation is done through the Error Correction Model (ECM) which is denoted as CointEq. The coefficient shows the speed of adjustment to equilibrium in each period in the cointegration relationship. If the variables are truly cointegrated, then the coefficient must be negative and significant.

The short-term estimation results of the ARDL model (1, 0, 3, 1, 0, 0, 0) show the CointEq coefficient (-1) of -0.777049 with a probability of 0.0000 as shown in table 4. This means that there is a cointegration relationship. in the model the velocity towards equilibrium was 77.7 percent per quarter.

Table 4. Short Run Estimates

Variable	Coefficient	Prob.
D(SB)	1.671093	0.0001
D(SB(-1))	-0.286536	0.4553
D(SB(-2))	0.970622	0.0162
D(NT)	0.084216	0.0005
CointEq(-1)	-0.777049	0.0000

INF in the short term is significantly affected by the current SB and 2 previous quarters as well as the current NT, assuming ceteris paribus. A 1 percent increase in the current difference between SB and the past 2 quarters will increase the current 1.67 and 0.97 percent differences in INF. Meanwhile, a 1 percent increase in the current NT difference would increase the INF difference by 0.08 percent.

Table 5. Long-Term Estimates

Variable	Coefficient	Prob.
JUB	0.258532	0.0024
SB	0.619949	0.0269
NT	0.038166	0.3475
PP	-0.037713	0.0751
BP	-0.039152	0.0522
ULN	0.125736	0.0283
C	-2.339774	0.0792
EC = INF - (0.2585*JUB + 0.6199*SB + 0.0382*NT - 0.0377*PP - 0.0392*BP + 0.1257*ULN - 2.3398)		

The long-term estimation results as presented in table 5 show that JUB, SB, and external debt have a positive and significant effect on INF with a confidence level of more than 95 percent. Meanwhile, PP and BP in the long run have a negative effect with confidence levels of 92.49 and 94.78 percent, respectively. Meanwhile, NT has a positive but insignificant effect in the long term on INF. In the long run, assuming ceteris paribus, a 1 percent increase in JUB will increase 0.26 percent for INF. A 1 percent increase in SB will

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increase by 0.62 percent for INF and a 1 percent increase in external debt will increase INF by 0.13 percent. Before the results of these short and long-term estimates are analyzed in more detail, it is necessary to test for stability, normality, serial correlation, and heteroscedasticity.

4.5 Stability Test

The ARDL model stability test really needs to be done before analyzing the estimation results. This test is performed using the CUSUM Test and the CUSUM of Squares Test. The ARDL model is declared stable if the resulting lines of these two tests are in line at the 5 percent significance level. If any of the stability test lines go out of the way, it can be concluded that the model is unstable.

Figures 2 and 3 show the results of the ARDL model stability test (1, 0, 3, 1, 0, 0, 0) using the CUSUM Test and the CUSUM of Squares Test. The two figures show that the resulting line of this test is on track at 5 percent significance. So it can be concluded that the model is stable.

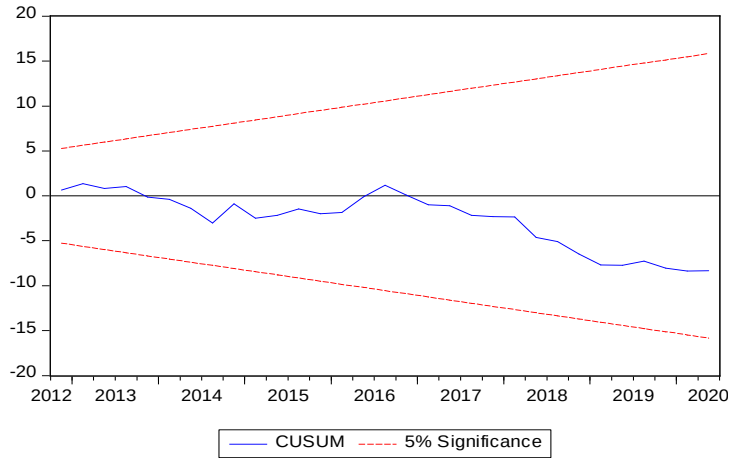

Figure 2. ***CUSUM Test***

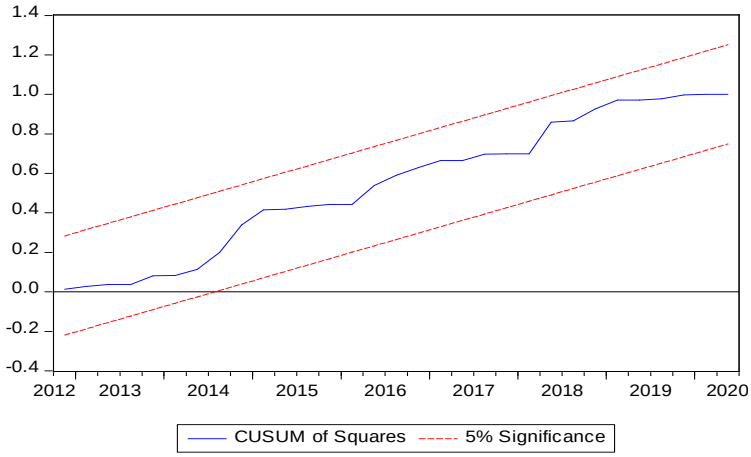

Figure 3. ***CUSUM of Squares Test***

4.6 Normality Test

In order to determine whether or not the confounding / residual variables have been normally distributed in a linear regression model, a normality test is performed. The Jarque-Bera method was used in

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the normality test of this study. If the Jarque-Bera probability is more than the α value, which is 0.05, then there is no normality problem in the model or in other words that the model residuals are normally distributed.

The probability of the normality test using the Jarque-Bera method is 0.536208 as shown in Figure 4. This probability value is more than 0.05. Thus, it can be concluded that the residuals of the ARDL model (1, 0, 3, 1, 0, 0, 0) are normally distributed.

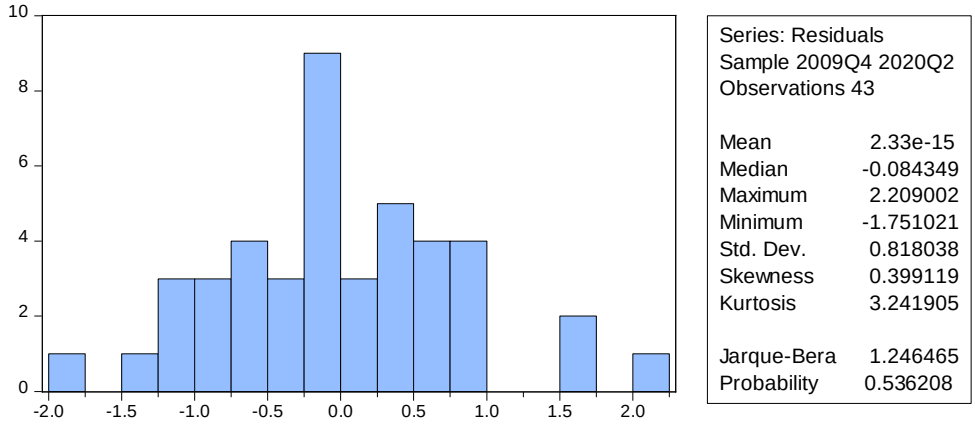

Figure 4. Normality Test

4.7 Serial Correlation Test

To detect a correlation between observation members using time series data, a serial correlation test is necessary. The Lagrange Multiplier test (LM test) was used in the serial correlation test in this study. If the probability is more than the α value, namely 0.05, then H_0 is accepted, which means that there is no serial correlation. The serial correlation test using the LM test method presented in table 6 shows the probability F-statistic of 0.9281. This probability value which is more than 0.05 gives the conclusion that H_0 which states that there is no serial correlation cannot be rejected. That is, there is no serial correlation on the ARDL residuals (1, 0, 3, 1, 0, 0, 0).

Table 6. LM test

F-statistic	0.074760	Prob. F(2,29)	0.9281
Obs*R-squared	0.220564	Prob. Chi-Square(2)	0.8956

4.8 Heteroscedasticity Test

Heteroscedasticity occurs when the error or residual of the observed model does not have a constant variance from one observation to another. The heteroscedasticity test using the Glejser method gives a probability F-statistic of 0.7684. This can be seen in table 7. The probability value which is more than 0.05 gives the conclusion that H_0 which states homoscedastic cannot be rejected. That is, there is no heteroscedasticity in the residuals of the ARDL model (1, 0, 3, 1, 0, 0, 0).

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Table 7. Heteroscedasticity Test

F-statistic	0.654665	Prob. F(11,31)	0.7684
Obs*R-squared	8.105912	Prob. Chi-Square(11)	0.7038
Scaled explained SS	6.269363	Prob. Chi-Square(11)	0.8548

4.9 Discussion

As a phenomenon monetary-fiscal combination, inflation volatility is seen from a combination of monetary and fiscal factors, namely the money supply, interest rates, exchange rates, tax revenues, government spending, and foreign debt. With the ceteris paribus assumption, the following is an analysis of the results of this study's estimate.

First, the coefficient of the money supply is 0.200892 with a probability of 0.0070 (less than 0.05). This shows that an increase in the growth of the money supply by 1 percent will lead to an inflation of 0.2 percent and a confidence level of 99.3 percent. In conclusion, the money supply plays a positive and significant role in explaining inflation in Indonesia. Relatively similar results are obtained in long-run estimates.

The coefficient of money supply, in the long run, is 0.258532 with a probability of 0.0024. This means that a 1 percent increase in the money supply will increase 0.26 percent of inflation with a confidence level of 99.76 percent. The money supply, in the long run, has a positive and significant effect on inflation in Indonesia.

These findings prove the research hypothesis that the money supply plays a role in explaining the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia. The amount of money circulating in a country's economy has a positive impact on national inflation. An increase in the money supply will increase people's purchasing power. If this is not followed by an increase in production, there will be excess demand which will trigger producers to increase the price of their products, causing inflation. Thus, the occurrence of inflation volatility, in this case, is due to demand-pull inflation.

In this connection, the growth in the money supply should not be higher than the ability of producers to increase their aggregate supply. In other words, BI as the central bank and controlling the money supply in Indonesia plays an important role in controlling inflation volatility in this country.

The results of this study are in line with Rizqiansyah (2019), Ginting (2016), Trisdian et al. (2015), Saputra dan SBM (2014), and Maggi dan Saraswati (2013) who find that the money supply has a significant positive effect on inflation in Indonesia. Azhar et al. (2019) found that the money supply (M2) has a significant positive effect in the long run, although negative is not significant in the short term.

Second, the interest rate coefficient is 1.671093 with a probability of 0.0014 (less than 0.05). This means that interest rates have a positive and significant effect on inflation in Indonesia. A 1 percent increase in interest rates triggered inflation of 1.67 percent and a confidence level of 99.86 percent.

Different effects can occur due to interest rates in the past 1 and 3 quarters. The interest rates in the past 1 and 3 quarters have a coefficient of -1.475898 and -0.970622 with a probability of 0.0499 and 0.0432 (less than 0.05). This means that the interest rates in the past 3 and 9 months have had a negative and significant effect on inflation this month. However, in the short run estimation, it is found that the negative effect of interest rates on inflation is not significant.

The current interest rate and the two previous quarters in the short term have a significant positive effect on inflation. This month's interest rate coefficient is 1.671093 with a probability of 0.0001 and the

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interest rate coefficient 6 months ago is 0.970622 with a probability of 0.0162. This means that in the short term a 1 percent increase in interest rates this month raises 1.67 percent of inflation with a confidence level of 99.99 percent. The 1 percent increase in interest rates in the past 6 months also played a role in explaining the current 0.97 percent inflation with a confidence level of 98.38 percent. Relatively similar results are given by long-run estimates.

The long-run interest rate coefficient is 0.619949 with a probability of 0.0269. A 1 percent increase in interest rates over the long term will increase 0.62 percent of inflation with a confidence level of 97.31. Interest rates play a positive and significant role in influencing inflation in Indonesia, both in the short and long term.

This finding proves the research hypothesis that interest rates play a role in explaining the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia, although it gives different results than the theory. The policy to raise interest rates theoretically aims to reduce the inflation rate. The results of this study indicate that an increase in interest rates is not effective in reducing inflation in Indonesia. The impact is just the opposite. An increase in the interest rate will increase production and investment costs obtained through bank credit, thus triggering producers to increase the price of their commodities. Thus, the occurrence of inflation, in this case, is caused by cost-push inflation.

The results of this study are in line with Azhar et al. (2019) which states that interest rates have a significant positive effect in the short and long term in West Sumatra. Likewise, Ginting (2016) found that interest rates have a significant positive effect on inflation in Indonesia, both in the short and long term. It is clear that high-interest rates actually drive inflation higher in Indonesia.

Third, the exchange rate coefficient is 0.084216 with a probability of 0.0283 (less than 0.05). This shows that a 1 percent increase in the exchange rate will cause inflation of 0.08 percent and a confidence level of 97.17 percent. This means that the rupiah exchange rate against the US dollar has a significant positive effect on inflation in Indonesia.

Relatively the same results are found in the short-run estimates, but it is different from those in the long-run estimates. In the short term, the exchange rate has a significant positive effect on inflation in Indonesia. Meanwhile, in the long term, the effect of the exchange rate is still positive but insignificant.

These findings prove the research hypothesis that the exchange rate plays a role in explaining the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia. Changes in the exchange rate of the rupiah against the US dollar have a positive impact on inflation in Indonesia, although not significantly in the long term. An increase in the exchange rate will make imported commodities more expensive and export commodities cheaper in international trade.

If producers have production factors derived from imported commodities, the increase in the exchange rate will increase production costs. This will encourage producers to raise commodity prices (cost-push inflation).

The increase in the exchange rate allows foreign consumers to buy export commodities cheaper than usual. This allows for increased sales and the profitability and competitiveness of local companies in international markets.

The positive influence of the exchange rate on inflation is in line with the research results of Rizqiansyah (2019), Ginting (2016), Utami and Soebagiyo (2013), and Saputra and SBM (2014). They found that the exchange rate had a positive and significant effect on inflation in Indonesia.

Fourth, the tax revenue coefficient is -0.029305 with a probability of 0.0645 (more than 0.05). This shows that an increase in tax revenue of 1 percent has the potential to reduce inflation by 0.03 percent

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with a confidence level of 93.55 percent. This means that tax revenue has a negative effect on inflation, but not significantly at the 5 percent error rate. The same conclusion is obtained for the long-run estimation, where tax revenue has a negative but insignificant effect on inflation in Indonesia.

This finding is different from the research hypothesis that tax revenue plays a role in explaining the volatility of inflation in Indonesia. An increase in tax revenue due to an increase in the rate will reduce people's purchasing power, because of the reduced income they can spend. This decrease in purchasing power will reduce the income of producers so that they will reduce production and investment, and may even reduce the price of their products. In the end, this will lower inflation.

Ideally, an increase in tax revenue has a significant effect on reducing inflation. In fact, an increase in tax revenue has the potential to reduce inflation, but it is not significant. The insignificance of the negative effect of tax revenue on inflation indicates that the implementation of taxation policy in this country is still ineffective. Supposedly, an increase in tax revenue that reflects the policy of increasing tax rates collected by the government should be able to significantly reduce inflation, and vice versa.

The results of this study are in line with the findings of Azhar et al. (2019) which examines regional inflation in West Sumatra. The findings conclude that tax revenue has an insignificant negative effect on inflation in the province, both in the short and long term.

Fifth, the coefficient of government spending is -0.030423 with a probability of 0.0389 (less than 0.05). This shows that a 1 percent increase in government spending will lower 0.03 percent of inflation and the confidence level is 96.11 percent. This means that government spending has a significant negative effect on inflation in Indonesia.

The significance of this negative effect of government spending on inflation diminishes in the long run. Long-term estimates show that government spending has a negative impact on inflation with a confidence level of 94.78 percent. This means that the error rate is more than 5 percent.

This finding is consistent with the research hypothesis that government spending plays a role in explaining the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia, although it is different from the theory. An increase in government spending would theoretically increase inflation due to an increase in the money supply. The results show that an increase in government spending does not always lead to inflation, even though the money supply increases.

The price increase is not only affected by the money supply. Production costs play an important role in determining commodity prices. Although the money supply increases due to an increase in government spending, the production cost does not increase significantly, so it will not have a positive impact on the price of the commodity produced.

The influence of negative government spending on inflation was also found by Azhar et al. (2019), although they differ in significance. The findings show that government spending has a significant negative effect in the long run and negatives are not significant in the short term.

Sixth, the coefficient of external debt is 0.097703 with a probability of 0.0805 (more than 0.05). This means that a 1 percent increase in foreign debt plays a role in 0.1 percent of inflation with a confidence level of 91.95 percent. This means that foreign debt has a positive but insignificant impact on inflation in Indonesia. Slightly different conclusions are drawn from the long-run estimates.

Long-term Indonesian government external debt has a significant positive effect on inflation in the country. The coefficient is 0.125736 with a probability of 0.0283. This means that a 1 percent increase in foreign debt will increase by 0.13 percent inflation in the long term with a confidence level of 97.17 percent.

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These findings prove the research hypothesis that foreign debt plays a role in explaining the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia. Government external debt that arises due to a budget deficit will push inflation higher in the long run. The budget deficit and foreign debt are mutually influencing (Satrianto, 2015). The more the government budget deficit, the greater the amount of foreign debt and the higher the inflation that occurs in the country.

One of the ways to deal with the increase in foreign debt is to seek higher tax revenue than the expenditure that must be issued by the government. This prompted the government to increase the tax rate. An increase in tax rates will increase production costs for producers. Furthermore, producers will increase commodity prices to cover the increase in production costs. Thus, the positive effect of foreign debt on inflation, in this case, is due to cost-push inflation.

The results of this study are in line with the findings of Hutauruk et al. (2015) which states that inflation in Indonesia is explained positively and significantly by its government debt budget. Hervino (2011) also found that in the long term, foreign debt has a positive effect on inflation volatility in Indonesia.

The general conclusion that can be drawn is that as a phenomena monetary-fiscal combination, there is a significant role of the money supply (positive), interest rates (positive), an exchange rate (positive), and government spending (negative) in explaining the volatility of inflation in Indonesia. Tax revenues and foreign debt also play a role, although not significant.

In the short term, inflation in Indonesia is significantly and positively influenced by interest rates and exchange rates. Meanwhile, in the long term, interest rates, money supply, and foreign debt dominantly have a significant positive effect on inflation in Indonesia. Exchange rates, tax revenues, and government spending also contribute to inflation in the long term, but not significantly.

This conclusion confirms that inflation in Indonesia is not only influenced by the monetary side in the form of the money supply, interest rates, and the rupiah exchange rate against the US dollar as the monetarists view. The fiscal side in the form of tax revenues, government spending, and foreign debt also plays a role in explaining the volatility of inflation in Indonesia.

This is in accordance with the theory of John Maynard Keynes which explains that in a country's economic system, inflation is influenced by two things, namely the level of expenditure spent and tax revenue received by the government of the country concerned. When government spending is greater than tax revenue, government foreign debt will emerge which in turn will also affect inflation in the country in question.

In this regard, controlling inflation through the management of the money supply, interest rates, and exchange rates as instruments of monetary b policy has not been able to fully influence inflation volatility in Indonesia, however, it is necessary to combine it with fiscal policy in the form of effective tax revenue and government spending and minimizing debt. foreign government. Fiscal and monetary policymakers should be able to make appropriate and proportional policies in controlling inflation in Indonesia.

5. Conclusion and Recommendation

An important point that can be concluded from the results of this study is that the money supply, interest rates, exchange rates, and government spending in general play a significant role in explaining the volatility of inflation as a phenomenon monetary-fiscal combination in Indonesia. The positive effect of interest rates dominates inflation in the short and long term. Apart from interest rates, the positive influence of the money supply and foreign debt also dominates inflation in the long run. This means that

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inflation volatility in Indonesia is dominated by interest rates from the monetary side and foreign debt from the fiscal side. Meanwhile, tax revenue has not played an effective role in reducing inflation in Indonesia. The implication is that Bank Indonesia needs to streamline policies related to interest rate management while the government needs to review the effectiveness of tax revenues and reduce foreign debt. From a monetary perspective, the effectiveness of policies related to interest rate management in regulating the money supply needs to be improved. Meanwhile, from the fiscal side, further efforts are needed to increase the effectiveness of tax revenues and government spending to minimize government foreign debt.

This research analysis is limited to inflation from the money market side, does not analyze inflation from the goods market side, such as output or economic growth, and so on. The variables used in modeling are limited to a few main variables that represent monetary and fiscal phenomena. Future research is expected to examine inflation with more varied variables in terms of the money market and the goods market.

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