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Inflation analysis in Indonesia: A monetary or fiscal phenomenon?

Abstract: *This study seeks to identify and analyze the effects of monetary phenomena (operationalized with the quantity of money supply and interest rates), fiscal phenomena (operationalized with fiscal deficits), and the implementation of inflation-targeting monetary policies on inflation rates in Indonesia. Using Engle-Granger's Error Correction Model (EG-ECM) and time-series data of 1990-2020, this study empirically demonstrates that interest rates negatively affect inflation rates in Indonesia in both the short-run and long-run. Further, the EG-ECM estimation results suggest that inflation in Indonesia is a monetary phenomenon, as indicated by the significantly negative impact of interest rates on inflation rates in both the short and long runs. Inflation in Indonesia is not a fiscal phenomenon because fiscal deficits do not affect inflation rates in both the short and long runs. Besides, this study also documents that ITF policies negatively affect inflation rates in the long run. This study implies that an inflation-targeting monetary policy framework remains effective in maintaining price stability in Indonesia. The current ITF policy is*

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flexible and can control publicly expected inflation since its implementation in 2005, leading to stable inflation rates.

Keywords: *Inflation, the Quantity of money supply, Interest Rates, Budget Deficits, EG-ECM*

Analiza inflacije u Indoneziji: Monetarni ili fiskalni fenomen?

Apstrakt: *Ova studija nastoji da identifikuje i analizira efekte monetarnih fenomena (operacionalizovanih kvantitetom novčane mase i kamatnih stopa), fiskalnih fenomena (operacionalizovanih fiskalnim deficitima) i implementacije monetarnih politika ciljanih na inflaciju na stope inflacije u Indoneziji. Koristeći Engle-Granger's Error Correction Model (EG-ECM) i podatke vremenske serije od 1990-2020, ova studija empirijski pokazuje da kamatne stope negativno utiču na stope inflacije u Indoneziji i kratkoročno i dugoročno. Dalje, rezultati procene EG-ECM sugerišu da je inflacija u Indoneziji monetarni fenomen, na šta ukazuje značajno negativan uticaj kamatnih stopa na stope inflacije i na kratak i na dugi rok. Inflacija u Indoneziji nije fiskalni fenomen jer fiskalni deficiti ne utiču na stope inflacije i na kratak i na dugi rok. Osim toga, ova studija takođe dokumentuje da politike ITF negativno utiču na stope inflacije na dugi rok. Ova studija implicira da okvir monetarne politike koji cilja inflaciju ostaje efikasan u održavanju stabilnosti cena u Indoneziji. Trenutna politika ITF je fleksibilna i može kontrolisati javno očekivanu inflaciju od njene implementacije 2005. godine, što dovodi do stabilnih stopa inflacije.*

Ključne reči: *Inflacija, količina novčane mase, kamate, budžetski deficiti, EG-ECM*

1. Introduction

Inflation, alongside unemployment, constitutes one of the primary economic problems. Inflation is defined as general and continuous price increases. It affects the economy because higher inflation rates will erode real income and eventually public welfare. Besides, higher inflation rates reduce purchasing power, which will affect the business sector in the economy (Amaliyah & Aryanto, 2022). Accordingly, each economy will control and monitor inflation stability through its macroeconomic policies. Susmiati et al. (2021) define macroeconomic policies as governments' policies to solve various economic problems like inflation, the amount of outstanding money, and government budget deficits.

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The Indonesian economy has historically experienced extreme inflation rates in 1965/1967. In 1966, the inflation rate spiked to about 650 percent of what is categorized as hyperinflation. This figure was the impact of the Indonesian government's money-printing policy to reduce the budget deficit during the period. The deficit was triggered by funding for the confrontation with Malaysia and the conflict against the Dutch within the context of the West Papua takeover (Tim Kajian Pusat Kebijakan Ekonomi Makro, 2012). The money printing carried out in this period boosted the quantity of money supply, which was not adequately matched by the corresponding growth in output growth in the economy. The prevailing circumstances led to an enormous inflation rate of 650 percent. Besides, the Indonesian economy encountered a significant surge in inflation in 1997/1998. The economic crisis that unfolded in 1997/1998 was initiated by the crisis that Thailand encountered, subsequently leading to the propagation of the Asian economic crisis. In 1998, the inflation rate in Indonesia escalated to 75.27 percent. According to Putri (2021), the 1998 inflation was attributed to the monetary crisis. The circumstance significantly affected Indonesian economic growth. The economic growth rate experienced a decline of 13.16 percent in that period. The economic landscape experiences stagnated as numerous firms ceased operations and the unemployment rate escalated. During that period, a lack of incoming revenue resulted in much lower economic growth.

Figure 1. The Development of Inflation Rates in Indonesia, 1990-2021 (percentages)
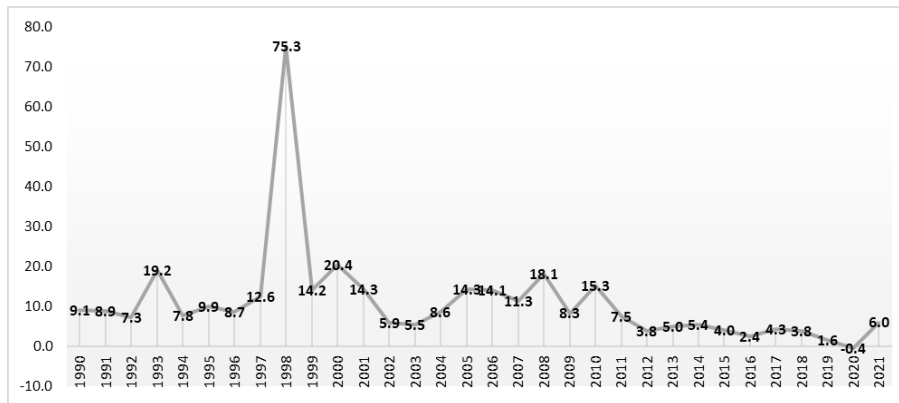
Source: World Bank Open Data (2023), processed

The 1997/1998 economic crisis motivated the Indonesian government through Bank Indonesia to establish an inflation-targeting monetary policy effective from

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2005. However, the Indonesian inflation rates tend to fluctuate in 1990-2021, indicating unstable price levels. Higher inflation rates greatly affect the economy by reducing purchasing power and eventually consumption and economic growth as the indicators of public well-being. Consequently, the government must implement appropriate policies to maintain price stability as reflected in inflation.

The classical theory, especially Irving Fisher's money quantity theory, argues that inflation is attributed to money supply growth. In other words, inflation is a monetary phenomenon (Mishkin, 2015). Prior studies have demonstrated that inflation is a monetary phenomenon, such as Trisdian et al. (2015), Agusmianata et al. (2017), Ningsih & Kristiyanti (2016), Heru Perlambang (2010) and Don Sama Lelo et al. (2018), Panjaitan & Wardoyo (2014), Sholikhin & Cahyono (2016), and Lissovolik (2003) who observe that inflation is affected by money supply. However, Langi et al. (2014) and Luwihadi & Arka (2017) indicate that money supply does not affect inflation. The impact of interest rates on inflation also indicates that inflation is a monetary phenomenon. Prior studies, such as Agusmianata et al. (2017), Langi et al. (2014), and Heru Perlambang (2010), empirically demonstrate that interest rates affect inflation. Nevertheless, Ningsih & Kristiyanti (2016) document that inflation rates do not affect inflation.

Nevertheless, inflation is not only affected by money supply or not merely a monetary phenomenon. It is also affected by fiscal factors like government expenditures. Lopez-Martin et al. (2018) observe that inflation in Mexico is affected by fiscal policymakers' roles in inflation targeting. Hashem (2017) finds that inflation in Egypt is a fiscal phenomenon. Further, Lim & Sek (2015) indicate that long-run inflation rates in two country groups (high-inflation and low-inflation ones) are not only affected by money supply but also by national expenditures.

Inflation control must match monetary and fiscal policies because it is crucial in the economy, and inflation destabilizes countries' economies (Sukirno, 2000). Accordingly, this study is expected to develop indicators to accurately identify inflation signals as a fiscal or monetary phenomenon to formulate appropriate state policies. Thus, this study focuses on identifying factors that affect inflation from the monetary side (operationalized with the quantity of money supply and interest rates) and the fiscal side (operationalized with fiscal deficits). Besides, this study identifies the effect of the inflation-targeting framework (ITF) monetary policy effective from 2005 on inflation in Indonesia.

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2. Literature review

2.1. Classical inflation theory (Irving Fisher)

Irving Fisher's theory of money quantity explains the movement of price levels that proportional changes in price levels. The inflation-related theories start with the theory of money quantity. The theory of money quantity illustrates the direct and systematic relationship between the quantity of money supply and inflation rates as formulated by the following formula:

$$MV = PT \quad \text{.. 1}$$

where:
M = the quantity of money supply
V = the velocity of money
P = price levels
T = output volume

The theory of money quantity implies that greater amounts of money supply (M) increase price levels (P) in the short run, given that the velocity of money (V) and output volume (T) remain constant (Mishkin, 2016). In the long run, the quantity of money supply does not affect real output growth but increases price levels proportionally. This theory does not solely focus on the quantity of money supply as the cause of inflation but it is a theory of (a) the balance between money supply and price levels, (b) money neutrality, (c) the mechanisms of monetary transmission, and (d) monetary theory of inflation (Suseno & Astiyah, 2010).

2.2. Keynes' inflation theory

According to Frederic S. Mishkin (2015), like the classical theory, Keynes maintains that the money supply growth increases inflation. The difference between Keynesian and classical economic theories lies in Keynes's assertion that aggregate demand can be influenced not only by the quantity of money supply but also by fiscal factors like government expenditures. However, the impact of increased government expenditures on inflation is limited, as the effect of such spending on price levels is only temporary. Inflation increases when both government expenditures and the quantity of money supply increase.

2.3. Inflation-targeting monetary policies

According to Bank Indonesia (2023), the Inflation-Targeting Framework is a monetary policy approach characterized by inflation stability as the primary long-term objective of monetary policies. The inflation-targeting monetary plan incorporates several components: 1) the public dissemination of numerical objectives about inflation in the medium term, 2) the institutional commitment to maintaining primary price stability, implementing monetary policies, and adhering to agreements aimed at reaching inflation targets as a long-term objective, 3) an inclusive informational approach in which various variables (not only monetary ones) are used to formulate monetary policies, 4) enhanced transparency of monetary policymaking strategies through effective communication with the public and financial markets regarding monetary policy makers' objectives and planning, and 5) strengthened central bank's accountability in achieving inflation objectives. After the 2008/2009 global financial crisis, Bank Indonesia has strengthened the ITF to become a flexible one that effectively maintains stability in the economy's financial and macroeconomic domains.

2.4. The relationship between money supply and inflation

Money supply may cause inflation when the growth of money is excessive. This argument is supported by Irving Fisher's theory of money quantity, suggesting that greater money supply will increase price levels in the short run, given that the velocity of money (V) and output volumes (T) remain constant (Mishkin, 2016). The theory of money quantity is the basis for the argument that inflation is a monetary phenomenon. Using the multiple linear regression model, Agusmianata et al. (2017) empirically support the classical inflation theory by documenting that money supply positively and significantly affects inflation in Indonesia. Meanwhile, Trisdian et al. (2015) analyze the volatility of regional inflation in Indonesia using the fixed-effect model (FEM) and reveal that money supply positively affects inflation volatility (inflation as a monetary phenomenon). Hussain & Zafar (2018) examine the relationships between money supply and inflation using ARDL, ECM, and Granger Causality. Their ECM results demonstrate a short-run relationship between the variables, and their causality test indicates a two-way relationship between inflation and money supply.

Further, Lim & Sek (2015) utilize the Error Correction Model based on the Autoregressive Distributed Lag (ARDL) method to demonstrate that money supply negatively and significantly affects inflation in Indonesia from January 2013 to November 2017, both in the long and short runs. Using the linear regression method, Ningsih & Kristiyanti (2016) observe that money supply as

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a monetary phenomenon negatively and significantly affects inflation in Indonesia in 2014-2016. Lastly, Heru Perlambang (2010) employs the multiple linear regression method to indicate that money supply does not affect inflation. Based on prior studies, this study proposes the following hypothesis:
H1: Money supply affects inflation.

2.5. The relationship between interests and inflation

Interest rates affect inflation, including through the impact of interest rates on money demand. Keynes' theory argues that money demand is affected by income and interest rates. Interest rates negatively affect money demand. Higher interest rates reduce public preferences to hold cash and eventually household consumption. Lower household consumption will erode aggregate demand, further reducing prices or inflation.

This argument is supported by Heru Perlambang (2010), who utilizes the multiple linear regression method to indicate that Bank Indonesia Certificate's interest rates positively affect inflation. Meanwhile, Agusmianata *et al.* (2017) employ the Cobb-Douglas multiple regression method and document that interest rates positively and significantly affect inflation in Indonesia. Further, Langi et al. (2014) utilize Engle-Granger's Error Correction Model (EG-ECM) and reveal that BI interest rates positively and significantly affect inflation in Indonesia in 2005.3-2013.3. Sinay (2014) employs VECM, indicating that inflation and BI rate exhibit a long-term and significantly negative causal relationship with a more accurate structural analysis. However, Ningsih & Kristiyanti (2016) observe that interest rates do not affect inflation because the transmission of monetary policies towards aggregate demand through interest rates are less optimal. Based on prior studies, the following hypothesis is formulated:
H2: Interest rates affect inflation.

2.6. The relationship between budget deficits and inflation

Keynes' inflation theory mentions that inflation is not only a monetary phenomenon but also a fiscal one. Aggregate demands are also affected by the fiscal sides, such as government expenditures. Governments with budget deficits are more motivated to compensate for the deficits through debts or money printing. Both alternatives will increase money supply and eventually inflation rates (Trisdian et al., 2015). Thus, this study utilizes fiscal deficits as a variable to operationalize a fiscal phenomenon.

Rosyetti & Eriyati (2010) utilize the Error Correction Model (ECM) to demonstrate that inflation is affected by budget deficits in the long run. Ahmed

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(2007) employs the VECM method to indicate that inflation in Pakistan is a fiscal phenomenon (fiscal deficits positively and significantly affect inflation in the short and long run). Further, Candrono et al. (2015) utilize the Ordinary Least Square (OLS) method and observe that budget deficits negatively affected inflation in Indonesia in 2001.Q1 – 2013.Q4. De Grauwe & Polan (2005) employ the autoregressive distributed lag (ARDL) method and document that inflation in Nigeria is not always a monetary phenomenon. Lopez-Martin *et al.* (2018) utilize the baseline model to indicate that inflation in Mexico is affected by inflation-targeting fiscal policies (aggregate price behavior). Hashem (2017) utilizes the Structural Vector Auto-regression (SVAR) to establish that inflation in Egypt is a fiscal phenomenon while money supply only exhibits a limited impact on inflation. Meanwhile, Agusmianata et al. (2017) utilize the Cobb-Douglas multiple linear regression analysis and indicate that government expenditures negatively and significantly affect inflation. Based on prior studies, this study proposes the following hypothesis:
H3: Budget deficits affect inflation.

2.7. The relationship between Inflation Targeting Framework (ITF) and inflation

Low and stable inflation rates boost economic growth, thus motivating central banks to include inflation stability as the primary objective of the long-term policy setting. However, inflation stability will lead to excessive output fluctuation in the short run. Thus, central banks with inflation control as their long-term objective must control excessive output fluctuation in the short run (Mishkin, 2016). The implementation of inflation-targeting frameworks (ITFs), as indicated by inflation targeting at certain levels, will affect actual inflation.

This argument is supported by Rachman (2015), whose structural break approach indicates that the Inflation-Targeting Framework (ITF) significantly reduces inflation as the policy intervention in five countries implementing this policy and 21 non-ITF countries. Using the Vector Error Correction Model (VECM), Anggoro (2010) documents that inflation rates tend to fluctuate before the ITF implementation and be negative after the implementation. Further, the contribution of shocks to inflation is far greater than other variables. Hence, this study argues that it is crucial to analyze inflation in Indonesia using the ITF policy in controlling the impacts of money supply. Based on prior studies, this study proposes the following hypothesis:
H4: The Inflation-targeting framework (ITF) policy negatively affects inflation.

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3. Research methods

The secondary data in the form of annual time series consist of consumer price index, budget deficits, quantity of money supply (M2), and real interest rates from 1990-2020 state budgets, Bank Indonesia, Statistics Indonesia, and World Bank Open Data. The 1990-2020 period is selected as the observation years because this period includes the 1997-1998 Indonesian economic crisis exhibiting highly fluctuating economic conditions, including price level changes. This period also enables us to investigate the impact of ITF on inflation stability because ITF has been effective since 2005.

This study utilizes Engle-Granger's Error Correction Model (EG-ECM) to answer the research questions. According to Gujarati & Porter (2013), the Error Correction Model is a model to correct regression equations between individual variables that are not stationary to return to long-term equilibrium values or to correct short-term inequilibrium, given that the variables exhibit co-integration relationships. ECM is used to find short-term equilibrium or correct long-term imbalances.

Error Correction Mechanism as a technique to correct short-term equilibrium towards a long-term equilibrium was introduced by Engle and Granger. ECM requires co-integration among variables (Gujarati & Porter, 2013). The Engle-Granger Error Correction Model explains long-term relationships or equilibrium between the dependent and independent variables. This model was initially introduced by Sargan, developed further by Hendry, and repopulated by Engle-Granger. The EG-ECM is used to overcome spurious regression and non-stationary time-series data problems.

3.1. EG-ECM (Engle-Granger's Error Correction Model)

Engle-Granger's Error Correction Model (EG-ECM) seeks to determine the estimates of structural changes in the long and short term or equilibrium that may arise from the impacts of the quantity of money supply and interest rates as monetary phenomena and fiscal deficits as a fiscal phenomenon on inflation. The data is analyzed to determine the relationship between long-term and short-term variables or the equilibrium between dependent and independent variables. The following is the long-run EG-ECM model:

$$IHK_t = \beta_0 + \beta_1 LM2_t + \beta_2 IRR_t + \beta_3 G\_APBN_t + \beta_4 Dummy_t + e_t \ldots\ldots\ldots 2$$

where:

$LM2_t$: the quantity of money supply (M2);

IRR_t: real interest rates;

G_APBN_t: budget deficits

$Dummy_t$: ITF policy

EC_t: error corrections; e_t is a residual value.

Further, the following is the short-run EG-ECM model:

$$\Delta IHK_t = a_0 + a_1 \Delta LM2_t + a_2 \Delta IRR_t + \alpha_3 \Delta G_{APBN_t} + a_4 Dummy_t +$$
$$a_5(EC_t) + e_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.3$$

where a is the short-run coefficient.

EC_t: error corrections;

e_t is a residual value.

The EC_t difference value above is labeled as the inequilibrium error. If ϵ_t is equal to IHK and M2, IRR and G are in an equilibrium condition because dependent and independent variables rarely find a state of equilibrium. The following are the estimation steps derived from the EG-ECM (Engle Granger's Error Correction Model):

The following is the EG-ECM (Engle Granger's Error Correction Model) estimation model:

Unit Root Test

This study utilizes the unit root test to evaluate the stationary of time-series data. The time-series data exhibits unit-root problems when they are not stationary. The unit root test identifies unit root problems by comparing t-statistics values with the Augmented Dicky Fuller test values. The following is the unit root test equation:

$$\Delta IHK_t = a_1 + a_2 T + \Delta IHK_{t-1} + \alpha_i \sum_{i=1}^{m} IHK_{t-1} + e_t \qquad \ldots\ldots\ldots\ldots.4$$

Note:

$\Delta IHK_t = (\Delta IHK_{t-1} - \Delta IHK_{t-2})$, m = lag length.

Stationary tests are performed on inflation, the quantity of money supply, real interest rate, and fiscal deficit variables.

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Table 1. The results of Stationary Tests with the Augmented Dicky-Fuller (ADF)

Variable	Unit Root Test	Mac-Kinon Critical Value (5%)	ADF	Note
IHK	Level	-4.294469	0.0021	Stationary
LM2	Level	-3.341697	0.0217	Stationary
IRR	Level	-5.577839	0.0001	Stationary
G_APBN	Level	-0.153152	0.9343	Not Stationary
	First Difference	-5.701813	0.0001	Stationary

Source: Authors' calculation using gathered data

Table 1 shows the stationarity test results using the Augmented Dicky-Fuller indicator (ADF). The above test results indicate that inflation, the quantity of money supply, and real interest rates are stationary at the data level, whereas budget deficits are stationary at the first difference data.

Lag-length test

This study runs the lag-length test to determine the optimal lag length before conducting the co-integration test. Particularly, the lag-length test aims to identify the number of optimal lags in the estimation. AIC (Akaike Information Criteria) and SIC (Schwarz Information Criteria) inform the optimal lag length used in the co-integration test.

Table 2 demonstrates the results of the lag-length test with the least LR, FPE, AIC, SC, and HG values indicating the optimum lag. Accordingly, this study uses lag three as the optimum lag in further analysis.

Table 2. The results of the Lag-length Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-573.8130	NA	6.21e+11	41.34378	41.58168	41.41651
1	-437.4413	214.2984*	2.25e+08	33.38866	34.81602*	33.82502
2	-406.9162	37.06612	1.84e+08	32.99402	35.61085	33.79401
3	-370.9954	30.78932	1.47e+08*	32.21395*	36.02025	33.37758*

Source: Authors' calculation using gathered data

Co-integration Test

Co-integration tests detect the stability of long-term relationships between two or more variables. Cointegrated variables exhibit long-term relationships between them. Co-integration tests of two or more time-series data indicate a long-term relationship between the independent and dependent variables (Gujarati & Porter, 2013). Time-series data are considered cointegrated when

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the stationary regression levels exhibit regression levels that accurately estimate long-term relationships (Maggi & Saraswati, 2013).

Table 3 demonstrates the results of Johansen's co-integration tests. The probability values are lower than the significance value of 0.05 (5%), implying a long-term relationship or co-integration between the independent and dependent variables.

Table 3. The Results of the Johansen's Co-Integration Tests
Unrestricted Co-Integration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.969632	195.2769	69.81889	0.0000
At most 1 *	0.877840	100.9287	47.85613	0.0000
At most 2 *	0.667715	44.16329	29.79707	0.0006
Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
None *	0.969632	94.34820	33.87687	0.0000
At most 1 *	0.877840	56.76537	27.58434	0.0000
At most 2 *	0.667715	29.74757	21.13162	0.0024

Source: Authors' calculation using gathered data

4. Results and discussion

The Engle-Granger's Error Correction Model (EG-ECM) estimation is used to identify whether inflation is a monetary phenomenon represented by the quantity of money supply and real interest rates or a fiscal phenomenon as operationalized with budget deficits and the long and short-term impacts of ITF implementation on inflation rates in Indonesia. Table 4 demonstrates the EC coefficient is negative (-1.033104) and significant (0.0000 < 0.05), implying that the EG-ECM is valid. Further, the equilibrium is -1.033104, suggesting that the adjustment process of short-run equilibrium towards long-run equilibrium is relatively slow.

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Table 4. The Results of the Short-run ECM Estimation Model

Dependent Variable: D(IHK)
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM2)	8.152601	8.159565	0.999147	0.3273
D(IRR)	-0.846436	0.117540	-7.201278	0.0000
D(G_APBN)	4.96E-05	3.53E-05	1.406445	0.1719
DUMMY	-2.241351	1.828222	-1.225973	0.2316
EC(-1)	-1.033104	0.187090	-5.521970	0.0000
R-squared	0.810169	Mean dependent var		-0.196607
Adjusted R-squared	0.779796	S.D. dependent var		12.72013
S.E. of regression	5.969036	Akaike info criterion		6.562060
Sum squared resid	890.7348	Schwarz criterion		6.795593
Log-likelihood	-93.43090	Hannan-Quinn criter.		6.636769
Durbin-Watson stat	1.784827			

Source: Authors' calculation using gathered data

In the short run, real interest rates affect the inflation variable with a probability value of 0.0000 < the significance value (0.005), while the quantity of money supply does not affect inflation with a probability value of 0.3273 > the significance value (0.005). Further, budget deficits do not affect inflation with a probability value of 0.1719 > the significance value (0.05). Lastly, the dummy variable of ITF policy does not affect inflation in the short run with a probability value of 0.2316 > the significance value (0.05).

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Table 5. The Results of the Long-run ECM Estimation Model

Dependent Variable: IHK
Method: Fully Modified Least Squares (FMOLS)
Cointegrating equation deterministic: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth
    = 4.0000)

| Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM2	-1.621937	1.661285	-0.976315	0.3383
IRR	-1.058454	0.122406	-8.647096	0.0000
G_APBN	1.74E-05	1.45E-05	1.196575	0.2427
DUMMY	-9.102441	2.977359	-3.057220	0.0053
C	39.87649	21.43383	1.860447	0.0746
R-squared	0.634653	Mean dependent var.		9.053722
Adjusted R-squared	0.576197	S.D. dependent var.		10.07096
S.E. of regression	6.556208	Sum squared resid.		1074.597
Long-run variance	19.07507			

Source: Authors' calculation using gathered data

Table 5 presents the results of the long-term estimates using Engle-Granger's co-integration model. In the long run, the R-squared value is 0.634653, suggesting that the independent variables can explain 63.46 percent of the variation of the inflation variable while other variables explain the rest. The quantity of money negatively affects inflation with a coefficient value of -1.621937. However, the effect is insignificant, with a probability value of 0.3383 (> 0.05). Thus, the quantity of money supply does not affect inflation in the long run. Further, real interest rates negatively and significantly affect inflation with a coefficient value of -1.058454 and a probability value of 0.0000 (< 0.05). In the long term, a one percent increase in real interest rate will reduce inflation by -1.058454 percent. Budget deficits positively affect inflation with a coefficient value of 0.0000174, although the effect is insignificant with a probability value of 0.2427 (> 0.05). As for the dummy variable, the implementation of the Inflation-Targeting Framework (ITF) policy significantly affects inflation with a coefficient value of -9.102441 and a probability value of 0.0053.

4.1. Discussions

Engle-Granger's ECM analysis indicates that the quantity of money supply does not affect inflation both in the short and long runs. The findings support

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Heru Perlambang (2010) and Yanti & Soebagyo (2022), who demonstrate that the quantity of money supply does not affect inflation in Indonesia, likely because the central bank's decision to increase money supply is not accompanied by increased outputs in the economy, except in 1998 and 2020 when the national outputs decreased significantly due to economic crisis and the Covid-19 pandemic.

Figure 2. Growth of Money Supply and GDP in Indonesia, 1990-2020
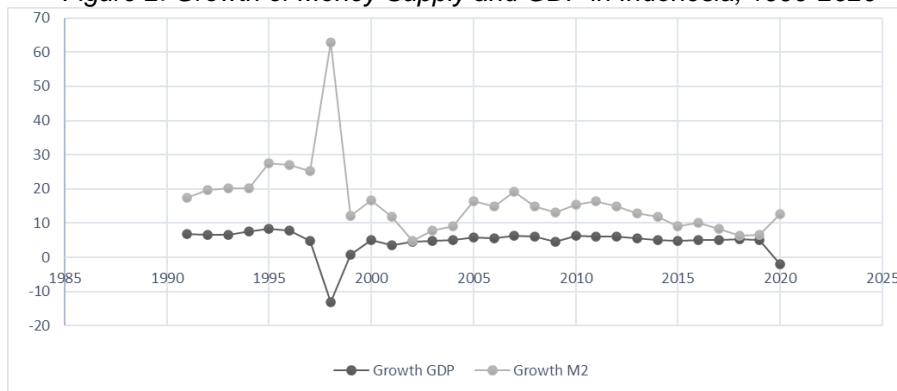
Source: World Bank Open Data (2023), processed

The growth of money supply accompanied by increased outputs will not increase inflation. The growth of money supply will increase aggregate demand. However, increased outputs in the economy will satisfy the increased aggregate demands. Hence, prices will not generally increase. The findings thus support Krisnaldy (2017), who documents that money supply does not affect inflation.

Real interest rates significantly and negatively affect inflation in Indonesia in the short run and long runs in 1990-2020. The findings are consistent with Ananta & Widodo (2021), who observe that interest rates negatively and significantly affect inflation. The results are also in line with Sinay (2014), who utilizes accurate structural analysis to document that inflation and BI rates exhibit short-run and long-run negative relationships. Further, this study supports the classical theory that higher interest rates motivate people to reduce expenditures and increase their savings, leading to lower inflation. The results are also consistent with the classical consumption theory, establishing that interest rates affect household consumption.

Higher interest rates reduce households' current preferences for consumption and increase their savings, thus decreasing consumption expenditures,

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aggregate demands, and inflation. The short-run and long-run effect of interest rates on inflation indicates that inflation is a monetary phenomenon because higher interest rates control liquidity and money supply.

Regarding budget deficits as the proxy of fiscal phenomenon, budget deficits do not affect inflation in the short and long runs. The findings are consistent with Rosyetti & Eriyati (2010), who indicate that budget deficits do not affect inflation in the short run. The pump-primming theory explains that budget deficits are necessary to support national economic activities.

Table 6. Percentage of Budget Deficits on Nominal GDP in Indonesia 1990-2020

Year	Percentage of Budget Deficits on Nominal GDP
2000	2.14
2001	3.32
2002	2.22
2003	1.71
2004	1.14
2005	0.90
2006	1.20
2007	1.48
2008	1.91
2009	2.32
2010	1.95
2011	1.93
2012	2.21
2013	2.35
2014	2.28
2015	1.93
2016	2.39
2017	2.92
2018	2.20
2019	1.87
2020	1.99

Source: World Bank Open Data (2023), processed

Budget deficits do not affect inflation likely because budget deficits are not compensated by printing money. Indonesia's budget deficits in the observation years are relatively controlled, as indicated by the percentage of fiscal deficits to the country's GDP. The findings also imply that the primary cause of inflation in Indonesia is not from the fiscal side.

The dummy variable of the Inflation-Targeting Framework policy does not exhibit a short-run effect on inflation. However, the findings suggest that it exerts a long-run effect on inflation. In the short run, implementing the ITF policy

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will reduce inflation rates. The results are consistent with Rachman (2015) and Setiawan (2012), who observe that ITF policies negatively affect inflation. Specifically, implementing the ITF policy reduces inflation by 9.102441 percent compared to the pre-ITF period.

Table 7. The Development of Inflation in Indonesia, 1990-2020 (percentage)

Year	Inflation (%)
2000	20.45
2001	14.30
2002	5.90
2003	5.49
2004	8.55
2005	14.33
2006	14.09
2007	11.26
2008	18.15
2009	8.27
2010	15.26
2011	7.47
2012	3.75
2013	4.97
2014	5.44
2015	3.98
2016	2.44
2017	4.29
2018	3.82
2019	1.60
2020	-0.44

Source: World Bank Open Data (2023)

Table 7 suggests that inflation rates in Indonesia tend to decline in the post-ITF period since 2005. Inflation even remained stable at the single-digit positions. Thus, the implementation of the ITF policy in 2005-2020 likely controls inflation in the long run because it can mitigate economic actors' inflation expectations. Controlled inflation expectations will affect aggregate demands and supply in the economy and eventually actual inflation.

5. Conclusions

Inflation in Indonesia is a monetary phenomenon, as indicated by the short-run and long-run effects of interest rates on inflation. However, the quantity of money supply does not affect inflation. Inflation in Indonesia is not a fiscal phenomenon because fiscal deficits do not affect inflation both in the short and long runs. ITF policies likely control inflation in the long run. Lastly, the

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implementation of the ITF policy can control economic actors' inflation expectations.

The findings suggest that interest rates affect inflation rates in Indonesia both in short and long runs. Hence, the study suggests that selecting the interest rate variable as the intermediary objective in Indonesia's monetary policy framework is suitable. Interest rates are used as a success signal in achieving inflation targets. Besides, the effectiveness of the ITF policy in affecting inflation rates in Indonesia implies that the inflation-targeting monetary policy framework remains effective in maintaining price stability in Indonesia. The current flexible ITF policy can control public inflation expectations since the ITF implementation in 2005, leading to relatively stable inflation rates in Indonesia.

References

Agusmianata, N., Militina, T., & Lestari, D. (2017). Pengaruh jumlah uang beredar dan tingkat suku bunga serta pengeluaran pemerintah terhadap inflasi di Indonesia. *Journal FEB Unmul*, *19*(2), 188–200. https://www.researchgate.net/publication/322688192_Pengaruh_Jumlah_Uang_Beredar_dan_Tingkat_Suku_Bunga_serta_Pengeluaran_Pemerintah_terhadap_Inflasi_di_Indonesia

Ahmed, H. (2007). *Is inflation a fiscal phenomenon in Pakistan?* 1–46. https://www.ukdataservice.ac.uk/media/263190/ahmad-paper.pdf

Amaliyah, F., & Aryanto, A. (2022). Pengaruh Jumlah Uang Beredar dan Suku Bunga Terhadap Inflasi di Indonesia. *Owner*, *6*(2), 1342–1349. https://doi.org/10.33395/owner.v6i2.737

Ananta, A. D., & Widodo, P. (2021). Analisis determinasi inflasi di Indonesia tahun 2015-2019. *Prosiding Seminar Nasional & Call for Paper STIE AAS*, *September*, 189–200.

Anggoro, D. A. (2010). Analisis Hubungan Variabel Moneter di Indonesia Sebelum dan Sesudah Penerapan Kebijakan Inflation-targeting framework (ITF) Periode (1991.1-2014.4). *Director*, *15*(40), 6–13. http://awsassets.wwfnz.panda.org/downloads/earth_summit_2012_v3.pdf%0Ahttp://hdl.handle.net/10239/131%0Ahttps://www.uam.es/gruposinv/meva/publicaciones jesus/capitulos_espanyol_jesus/2005_motivacion para el aprendizaje Perspectiva alumnos.pdf%0Ahttps://ww

Bank Indonesia. (2023). *Tujuan Kebijakan Moneter*. Website. https://www.bi.go.id/id/fungsi-utama/moneter/default.aspx

Biro Analisa Anggaran dan Pelaksanaan APBN-SETJEN DPR RI. (2019). Peran Positif Defisit Anggaran Dalam Mendorong Pertumbuhan Ekonomi. *Biro Analisa Anggaran Dan Pelaksanaan APBN-SETJEN DPR RI*, *53*(9), 1–3. https://www.dpr.go.id/doksetjen/dokumen/apbn_Peran_Positif_Defisit_Anggaran_Dalam_Mendorong_Pertumbuhan_Ekonomi20150130084913.pdf

Candrono, P., Sarwedi, & Yuliati, L. (2015). *Pengaruh defisit anggaran terhadap inflasi di Indonesia tahun 2001 . Q1-2013 . Q4 : Pendekatan fiscal theory of price level (The effect of budget deficit on inflation in Indonesia 2001 . Q1- 2013 . Q4 : Fiscal*

24

theory of price level approach). 41–52. http://repository.unej.ac.id/ bitstream/handle/123456789/75095/Judul-04.pdf?sequence=1&isAllowed=y

Databank World Bank. (2021). *Real interest rate (%)-Indonesia.* World Bank. https://data.worldbank.org/indicator/FR.INR.RINR?locations=ID&view=chart

Don Sama Lelo, Y., Dwi Astuti, R., & Suharsih, S. (2018). The determinant of inflation in Indonesia: Partial adjustment model approach. *Jurnal Ekonomi & Studi Pembangunan, 19*(2), 157–166. https://doi.org/10.18196/jesp.19.2.5007

Doyin, S., & Ikechukwu, K. (2005). Is inflation always and everywhere a monetary phenomenon? *Scandinavian Journal of Economics, 107*(2), 239–259. https://doi.org/10.1111/j.1467-9442.2005.00406.x

Gujarati, D. N., & Porter, D. C. (2013). Basic econometrics. In N. Fox (Ed.), *Introductory Econometrics: A Practical Approach* (fifth Edition). Douglas Reiner.

Hashem, H. Y. M. (2017). Inflation in Egypt: A fiscal or monetary phenomenon? *Business and Economic Horizons, 13*(4), 522–535. https://doi.org/10.15208/beh.2017.36

Heru Perlambang. (2010). Analisis pengaruh jumlah uang beredar, suku bunga Sbi, nilai tukar terhadap tingkat inflasi. *Media Ekonomi, 19*(2), 49–69. https://media.neliti.com/media/publications/224598-none-f4d91019.pdf

Hussain, M. I., & Zafar, T. (2018). The interrelationship between money supply, inflation, public expenditure, and economic growth. *European Online Journal of Natural and Social Sciences, 7*(1), 1–24. https://core.ac.uk/download/pdf/296307338.pdf

Kementerian Keuangan Republik Indonesia. (2022). *Defisit APBD.* https://djpk.kemenkeu.go.id/?ufaq=apa-yang-dimaksud-dengan-defisit-apbd-dan-bagaimana-tindak-lanjutnya

Krisnaldy. (2017). Pengaruh Jumlah Uang Beredar, Produk Domestik Bruto, Kurs Dan Tingkat Bunga Terhadap Inflasi Di Indonesia Pendekatan Error Corection Model. *Media Ekonomi, 19*(2), 43. http://openjournal.unpam.ac.id/ index.php/kreatif/ article/view/708%0Ahttps://media.neliti.com/media/publications/224598-none-f4d91019.pdf

Langi, T. M., Masinambow, V., & Siwu, H. (2014). *Analisis Pengaruh Suku Bunga BI, Jumlah Uang Beredar, dan Tingkat Kurs Terhadap Tingkat Inflasi di Indonesia. 14*(2). https://ejournal.unsrat.ac.id/index.php/jbie/article/view/4184/3713

Lim, Y. C., & Sek, S. K. (2015). An examination on the determinants of inflation. *Journal of Economics, Business and Management, 3*(7), 678–682. https://doi.org/10.7763/joebm.2015.v3.265

Lissovolik, B. (2003). Determinants of inflation in a transition Economy: The case of Ukraine. In *IMF Working Papers* (Vol. 03, Issue 126, p. 1). https://doi.org/10.5089/9781451854923.001

Lopez-Martin, B., Ramírez de Aguilar, A., & Sámano, D. (2018). Fiscal policy and inflation: Understanding the role of expectations in Mexico. *Fiscal Policy and Inflation: Understanding the Role of Expectations in Mexico, August.* https://doi.org/10.36095/banxico/di.2018.18

Luwihadi, N. L. G. A., & Arka, S. (2017). Determinan jumlah uang beredar dan tingkat inflasi di Indonesia periode 1984-2014. In *Fakultas Ekonomi dan Bisnis* (Vol. 6, Issue 4). https://www.google.com/url?sa=t&source=web&rct=j&url=https:// ojs.unud.ac.id/index.php/eep/article/view/28323&ved=2ahUKEwi21_Ox87_uAhU q8HMBHasEBYQQFjAAegQIARAB&usg=AOvVaw2U6dOPFKFJoNh5wfBrHvTl

25

Maggi, R., & Saraswati, B. D. (2013). Faktor-faktor yang mempengaruhi inflasi di Indonesia: Model demand pull inflation. In *Jurnal Ekonomi Kuantitatif Terapan* (Vol. 6, Issue 2). http://download.garuda.ristekdikti.go.id/ article.php?article= 1353587&val=953&title=FAKTOR-FAKTOR YANG MEMPENGARUHI INFLASI DI INDONESIA MODEL DEMAND PULL INFLATION

Mishkin, F. S. (2015). *The Economics of Money, Banking, and Financial Markets* (D. Clinton (ed.); Seventh Ed).

Mishkin, F. S. (2016). *The Economics of Money, Banking, and Financial Markets* (Eleventh e, Issue September).

Mishkin, F. S. (2019). *The Economics of Money, Banking, and Financial Markets*.

Ningsih, S., & Kristiyanti, L. (2016). Analisis Pengaruh Jumlah Uang Beredar, Suku Bunga, dan Nilai Tukar Terhadap Inflasi di Indonesia Periode 2014-2016. *Jurnal Ekonomi Manajemen Sumber Daya*, *20*(1), 8. http://journals.ums.ac.id/ index.php/dayasaing/article/view/7258

Panjaitan, M. N. Y., & Wardoyo. (2014). *Faktor-faktor yang mempengaruhi inflasi di Indonesia*. *21*(3), 182–193. https://media.neliti.com/media/publications/97274-ID-none.pdf

Putri, V. K. M. (2021). *Penyebab inflasi setelah proklamasi kemerdekaan*. Kompas.Com. https://www.kompas.com/skola/read/2021/02/23/215632069/penyebab-inflasi-setelah-proklamasi-kemerdekaan

Rachman, F. (2015). "Does Inflation-targeting framework Make a Significant Difference in Lowering Price Level?" What is Its Implication to Indonesia's Inflation Rate? *Economics and Finance in Indonesia*, *61*(2), 131. https://doi.org/10.7454/efi.v61i2.508

Rosyetti, & Eriyati. (2010). *Pengaruh defisit anggaran terhadap inflasi di Indonesia tahun 1981-2010*. *69*. https://media.neliti.com/media/publications/8863-ID-pengaruh-defisit-anggaran-terhadap-inflasi-di-indonesia-tahun-1981-2010.pdf

Setiawan, A. (2012). Inflation-targeting framework Dan Perubahan Respon Kebijakan Moneter. *Jurnal BPPK*, *5*, 65–76. https://jurnal.bppk.kemenkeu.go.id/ jurnalbppk/article/view/92

Sholikhin, M. Y., & Cahyono, H. (2016). Pengaruh Kebijakan Moneter Terhadap Inflasi dan Produk Domestik Bruto (PDB) di Indonesia. *Jurnal Pendidikan Ekonomi (JUPE)*, *4*(3), 1–7. https://ejournal.unesa.ac.id/index.php/jupe/article/view/16315

Sinay, L. J. (2014). *Pendekatan vector error correction model untuk analisis hubungan inflasi, BI rate, dan kurs dolar Amerika Serikat*. *8*(2), 9–18. https://media.neliti.com/media/publications/277542-pendekatan-vector-error-correction-model-742a4389.pdf

Statistik Ekonomi dan Keuangan Indonesia (SEKI). (2021). *Jumlah uang beredar (M1)*. Bank Indonesia. https://www.bi.go.id/seki/tabel/TABEL1_1.xls

Statistik Ekonomi dan Keuangan Indonesia (SEKI). (2023). *Suku Bunga, Diskonto, Imbalan*. Bank Indonesia. https://www.bi.go.id/SEKI/tabel/TABEL1_25_2.xls

Sukirno, S. (2000). *Makroekonomi modern perkembangan perkiraan dari klasik hingga keynesian baru* (I). PT RajaGrafindo Persada.

Suseno, & Astiyah, S. (2010). Seri kebanksentralan no. 22 - Inflasi. In *Bank Indonesia* (Vol. 22, Issue 22, pp. 1–68). Pusat Pendidikan dan Studi Kebanksentralan (PPSK) BI. http://ipief.umy.ac.id/wp-content/uploads/2020/02/22.-Inflasi.pdf

Susmiati, S., Giri, N. P. R., & Senimantara, N. (2021). Pengaruh Jumlah Uang Beredar

26

dan Nilai Tukar Rupiah (Kurs) Terhadap Tingkat Inflasi di Indonesia Tahun 2011-2018. *Warmadewa Economic Development Journal (WEDJ)*, *4*(2), 68–74. https://doi.org/10.22225/wedj.4.2.2021.68-74

Tim Kajian Pusat Kebijakan Ekonomi Makro. (2012). *Tim kajian pola krisis ekonomi.* https://fiskal.kemenkeu.go.id/data/document/2013/kajian/pkem/Pola Krisis Ekonomi.pdf

Trisdian, P. A., Pratomo, Y., & Saraswati, B. D. (2015). Volatilitas Inflasi Daerah di Indonesia: Fenomena Moneter atau Fiskal? *Studi Pembangunan Interdisiplin*, *24*, 76–89. https://doi.org/https://doi.org/10.24246/kritis.v24i1p76-89

World Bank Open Data. (2023a). *Consumer price index (2010 = 100)*. World Bank. https://data.worldbank.org/indicator/FP.CPI.TOTL

World Bank Open Data. (2023b). *Inflation, GDP deflator (annual %)*. World Bank. https://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG

World Bank Open Data. (2023c). *Persentase defisit anggaran terhadap PDB nominal di Indonesia tahun 1990-2020.* World Bank. https://data.worldbank.org/country/indonesia

World Bank Open Data. (2023d). *Pertumbuhan jumlah uang beredar dan pertumbuhan PDB di Indonesia tahun 1990-2020.* World Bank. https://data.worldbank.org/country/indonesia

Yanti, Y. W. T. F., & Soebagyo, D. (2022). Analisis pengaruh jub, suku bunga, dan nilai tukar terhadap inflasi di Indonesia tahun 2005-2021. *Jurnal Ekonomi Pembangunan STIE Muhammadiyah Palopo*, *8*(2), 249. https://doi.org/10.35906/jep.v8i2.1256

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