



THE IMPACT OF SELECTED MACROECONOMIC VARIABLES ON INFLATION RATES IN INDONESIA UNDER THE INFLATION TARGETING FRAMEWORK POLICY

Moh Adenan

Universitas Jember, Indonesia

e-mail: mohadenan.feb@unej.ac.id

ORCID: 0000-0001-5728-5164

Corresponding author

Lilis Yuliati

Universitas Jember, Indonesia

e-mail: lilisyuliati.feb@unej.ac.id

ORCID: 0000-0002-2224-2241

Mirza Irfania

Universitas Jember, Indonesia

e-mail: mirzairfania@gmail.com

ORCID: 0009-0003-1645-5931

Thomas Soseco

Universitas Negeri Malang, Indonesia

e-mail: thomas.soseco.fe@um.ac.id

ORCID: 0000-0003-0128-9654

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Abstract

Research background: The implementation of the Inflation Targeting Framework (ITF) in Indonesia in 2005 raises important questions about the extent to what extent the impact of the ITF can influence macroeconomic indicators, for instance, interest rates, exchange rates, and GDP growth, on inflation rates in Indonesia in the short term and long term.

Purpose: This research investigates the influence of interest rates, exchange rates, and GDP growth on the inflation rate in Indonesia under the ITF policy.

Research methodology: This research uses time series data from 2005 Q3 to 2023 Q3 and is analysed using the Error Correction Model (ECM).

Results: Our findings show a positive and significant effect of interest rates on inflation in the short term, but a positive and non-significant effect in the long term. Next, the exchange rate positively and significantly influences inflation in Indonesia in the long term, but it positively influences inflation in the short term. Lastly, in the short term, GDP growth positively affects inflation in Indonesia, while in the long term, GDP growth negatively and significantly affects inflation.

Novelty: This research examines the effects of macroeconomic variables on inflation in Indonesia in the period after the implementation of the Inflation Targeting Framework policy.

Keywords: Inflation Targeting Framework, inflation, interest rates, exchange rates, economic growth

JEL classification: E31, G21, O47

Introduction

Indonesia implemented the Inflation Targeting Framework (ITF) on 1 July 2005, which aligns with the repositioning of Bank Indonesia's function due to the implementation of Law Number 23/1999 about Bank Indonesia (BI). Unlike the previous Law Number 13/1968, the new law explicitly mentions the single objective of BI as the central bank of Indonesia to maintain the Indonesian Rupiah's stability, as shown by the fluctuation of prices of goods and services and the fluctuation in the Rupiah against other countries' currencies. This new regulation is also a response to the 1997/1998 Asian Financial Crisis, which hardly hit Indonesia and several Asian countries, leading to rising inflation which was accompanied by an overshooting of a floating exchange rate (Warjiyo, Juhro, 2019; Sugema, Bakhtiar, 2010; Adenan et al., 2025).

The experience from the 1997/1998 Asian Economic Crisis led BI to redirect its efforts toward managing inflation, recognising that if it were not controlled, it could escalate into hyperinflation (Pusriadi, Darma, 2018; Soseco et al., 2024). According to Setiawan (2012) and Lee (2010), the Inflation Targeting Framework (ITF) is used in the short term to respond to output problems, such as during times of crisis, where the ITF uses inflation as the main policy target to replace the money supply. Many studies have observed the positive impact of ITF policies on controlling inflation. Masyhuri et al. (2008) found that implementing ITF can reduce the volatility of output and encourage economic growth. Prijambodo (2016) and Hakim (2012) found that the inflation targeting programme has been widely adopted in various countries.

The implementation of ITF in Indonesia followed steps taken by other countries, as in 2007, this framework had been implemented by 26 countries. Research in other countries shows the effectiveness of ITF in controlling inflation (Cecchetti, Ehrmann, 1999; Lee, 2010) and provides transparency in the quantitative approach and better accountability in monetary policy management, pushing the expected inflation rate to the desired level (Han, Oh, 2019; Pham, Le, 2023). In monetary policy, the use of the ITF is expected to optimally achieve future inflation targets and encourage economic growth (Bank Indonesia, 2022; Pham, Le, 2023).

The effectiveness of ITF was tested when Indonesia experienced the 2008 Global Financial Crisis, which is linked to the subprime mortgage crisis in the United States, and which triggered a surge in global oil prices. Between 2008 Q3 and 2009 Q1, the Indonesian Rupiah experienced a depreciation from IDR 10,950 to IDR 11,575, and the inflation rate in Indonesia reached 11.06%. The inflation rate then decreased from 4.33% in 2008 Q4 to 1.29% in 2009 Q3. However, some studies show that the 2008 Global Financial Crisis did not significantly impact the economies of developing countries, including Indonesia, and its impact is not as significant as the 1997/1998 Asian Financial Crisis (Sugema, 2012; Tulcanaza Prieto, Lee, 2019; Karpes, Viverita, 2022).

Some factors affect the effectiveness of this policy, namely the rate of interest, exchange rates, and GDP growth (Warjiyo, 2017; Nguyen, Dang, 2024; Pham et al., 2024). Those components are important, especially for Indonesia as a developing country that requires economic stability to support its economic growth. Some studies show the importance of keeping the speed of economic growth to support fewer developing countries to become more developed ones (Spence, 2011; Lin, 2012).

This research seeks to assess the effects of macroeconomic variables, including interest rates, exchange rates, and GDP growth, on inflation in Indonesia under the ITF policy. Indonesia's experience in managing macroeconomic indicators is important for other developing countries to prevent the hard impact of crises like those that occurred in Indonesia in 1997/1998. In those years, Indonesia received the influence of exchange rate fluctuation from neighbouring countries, which, unfortunately, due to relatively fragile macroeconomic indicators, led Indonesia to not only an economic crisis but also a social and political crisis.

Previous studies related to the implementation of ITF in Indonesia show conflicting results. Studies have examined the effect of Gross Domestic Product (GDP) on inflation; namely, Chowdhury and Siregar (2004) found that GDP negatively affects inflation, but Anggraeni and Dwiputri (2022) found a positive effect. In addition to GDP, the exchange rates have a positive impact on inflation as found by Adim (2021) and Susmiati et al. (2021), but a negative impact,

as found by Bugis et al. (2023) and Yanti and Soebagiyo (2022). Research related to interest rates found a negative impact on inflation, for example, Muhson (2003), but a positive impact, for example, Elvina et al. (2021) and Amaliyah and Aryanto (2022).

Previous research also did not specifically examine inflation in the period after the implementation of the Inflation Targeting Framework policy in Indonesia. Therefore, this research seeks to assess the effects of macroeconomic variables, including interest rates, exchange rates, and GDP growth, on inflation in Indonesia under the ITF policy.

1. Literature review

The Taylor Rule theory appeared in 1993 when Taylor recommended nominal interest rates to the US Central Bank (Orphanides, 2003; Judd, Rudebusch, 1998). The linkage between interest rates and their adjustments in reaction to fluctuations in output and inflation became apparent. The Taylor Rule explains determining the appropriate level of nominal interest rates to effectively manage inflation and achieve inflation targeting (Cochrane, 2007; Orphanides, 2003; Judd, Rudebusch, 1998).

The Taylor Rule model requires three main considerations. Initially, it employs the bank interest rate as the monetary policy instrument, with the Taylor Rule indirectly illustrating the policy's effectiveness by analysing the coefficients for output and inflation. Secondly, the Taylor Rule aims for a specific inflation rate. Lastly, it also targets national income or real GDP. Taylor (1999) posits that variations in actual output are impacted by real interest rates. An upsurge in real interest rates would result in an expansion of the output gap. This is evident in the substantial costs, such as inflation, incurred by the economy in pursuit of higher growth rates. Escalations in inflation are commonly observed in developing nations, where the government has direct control over prices (Murwani, 2007).

A commonly used monetary policy known as the inflation targeting framework (ITF) involves setting a specific range for the expected inflation rate over the upcoming periods. The central aim of the ITF policy is to openly and effectively communicate the monetary policy strategies and goals to the public (Bank Indonesia, 2005). This monetary policy strategy was first established in New Zealand in 1990 and has subsequently been implemented by Chile, Canada, Brazil, Australia, Korea, Thailand, South Africa, Poland, and Hungary (Warjiyo, Juhro, 2019).

The ITF's rise in popularity brought a change to the traditional approach to monetary policy, which previously relied on targeting the money supply and other monetary measures (Setiawan, 2012). The adoption of the ITF has fostered greater transparency and accountability, allowing stakeholders to scrutinise the central bank's success in achieving its main goal of stabilising prices and controlling inflation. This is supported by the regular release of performance assessments and financial statements from the central bank (Masyhuri et al., 2008). In Indonesia, the adoption of ITF policy frameworks involves economic implementation through transition mechanisms, strategy, operations, and monetary control mechanisms (Warjiyo, Juhro, 2019; Koksaka, 2015).

The relationship between interest rates and inflation has been widely discussed in different economic perspectives. Keynesian theory emphasises the role of monetary policy in managing aggregate demand and stabilising economic fluctuations. According to this view, changes in interest rates influence investment and consumption, which in turn affect overall economic activity and inflation (Arestis, Bittes, 2018; Galí, 2015). Lower interest rates can stimulate borrowing, investment, and consumption, thereby increasing aggregate demand and supporting economic growth. Consequently, monetary policy can be used as a countercyclical tool to manage demand pressures and maintain macroeconomic stability.

In contrast, market-oriented or neoliberal perspectives emphasise price stability, market efficiency, and the credibility of monetary institutions. These approaches argue that excessive monetary intervention may distort market signals and create inflationary pressures. Therefore, monetary policy should focus primarily on maintaining low and stable inflation through disciplined and credible policy frameworks, often supported by independent central banks (Nijs, 2016; Van Loo, 2022). While Keynesian perspectives stress the role of monetary policy in demand management, neoliberal approaches prioritise price stability and institutional credibility as the foundation for long-term economic efficiency.

The cost of borrowing, or the interest rate, is influenced by the preferences and resources of various economies. According to Mishkin (2017), the interest rate represents the expense of borrowing funds or the cost of borrowed funds. It is mainly associated with the borrower and can also be seen as the price of utilising an investment. Many economists describe interest rates through the theory of time preference, which posits that interest emerges from individuals' preferences regarding time. However, this contradicts the Neoclassical viewpoint, which holds that interest rates are influenced by the marginal productivity of capital, time preferences, and income from capital (Ghani, Hossain, 2023; Epstein, Hynes, 1983).

According to Keynesian economics, the interest rate is viewed as the cost of money, established by individuals' preferences for liquidity (Hagedorn, 2017). Interest rates are influenced by shifts in economic actors' preferences for borrowing and lending, as well as variations in the purchasing power of money. As interest rates fluctuate over time and long-term bond rates are set at issuance, share prices adjust accordingly to these changes in interest rates (Kuswanto, 2015). A succinct definition of the interest rate is that it represents the returns investors can earn on their capital and the expenses incurred by companies when using funds from investors. In his 2017 paper, Mishkin noted that interest rates are closely watched economic indicators due to their significant influence on a nation's economy.

The exchange rate, as defined by Salvatore (2014), is the value of one currency compared to another. Dornbusch et al. (2008) identified three distinct types of exchange rate systems: fixed, flexible, and freely floating with controls. In a fixed exchange rate system, a foreign central bank commits to buying and selling its currency at a set price. Conversely, in a flexible exchange rate system, the central bank adjusts the rate to balance the demand and supply of foreign exchange. Lastly, the freely floating exchange rate operates with some level of control.

In a freely floating exchange rate system, the foreign exchange market ultimately dictates the exchange rate, with the central bank allowing this process to occur. In contrast, a controlled floating exchange rate system involves the central bank actively buying or selling foreign currency to influence the exchange rate. Sari and Yewiwati (2019) and Juhro and Rummel (2022) indicate that adopting a freely floating exchange rate system is consistent with the ITF policy framework, which mandates its use. Additionally, fluctuations in currency value, whether depreciation or appreciation, will affect inflation.

In a study conducted by Supartoyo et al. (2013), economic growth is highlighted as a key measure for assessing an economy's progress. To evaluate economic advancement, tools such as Gross Domestic Product (GDP) are essential, as they measure the annual value of goods and services produced at market prices. Classical economics, following Adam Smith's principles, asserts that economic growth is driven by two main factors: the expansion of overall output and population growth. In contrast, neo-classical growth theory suggests that output growth results from improvements in labour quality and quantity, increased capital through savings and investment, and technological advancements.

In Keynes' economic growth theory, when someone spends money, they are essentially distributing their income to others within the same economy, thereby contributing to increasing overall income. This process perpetuates and sustains normal economic operations. However, during times of severe economic downturns, individuals tend to curb their spending and opt

to save money instead. According to Keynes' theory, this behaviour disrupts the circulation of money and ultimately leads to the paralysis of the economy. Nonetheless, Keynes' theory proposes a remedy for this situation: increasing the role of the public sector and government intervention (Mariati et al., 2022; Pelsa, Balina, 2022). Keynes's theory suggests that equal distribution of wealth serves a practical purpose because when poor people are given money, they tend to spend it on consumption rather than saving, which in turn stimulates economic growth. Keynes's growth theory, which is a government initiative, has faced criticism from certain classical economic schools in the past (Lipton, 2023; Ribaj, Mexhuani, 2021; Fitra, 2020).

2. Data and methods

2.1. Data

The analysis uses quarterly time series data from Q3 2005 to Q3 2023, marking the period since the official implementation of the ITF policy in Indonesia, which began in July 2005. The research utilised data from the Bank Indonesia website, the Central Statistics Agency (BPS), the Organisation for Economic Cooperation and Development (OECD), and the International Monetary Fund (IMF).

The dependent variable is inflation, measured by the Consumer Price Index (CPI). The CPI was traditionally based on the concept of measuring the change in a household's cost of purchasing a fixed basket of goods and services in the face of a change in prices between two periods. The independent variables include nominal interest rates, exchange rates, and real Gross Domestic Product (GDP). The nominal interest rate is the sum of the expected rate of inflation and the real rate of interest. The exchange rate is a decisive link between the internal economy of a country and the international economy. The nominal exchange rate is key to determining the real exchange rate in the short and medium terms. In contrast, real exchange rates are key to determining macroeconomic stability and the incentive to engage in trade (Williamson, 2009).

Gross Domestic Product (GDP) is the market value of the final goods and services produced in a country in each period at market prices. GDP refers to goods and services produced within the country by factors of production owned by residents and non-residents alike. In GDP, the value of goods and services is counted as final goods, which are prices paid by the buyers and not commodities sold to other producers (Rycroft, 2017). Even though GDP is a useful concept in economics, it is important to be aware of its limitations in economic, social, and

ethical terms (Argandoña, 2016): First, GDP only includes goods and services that have market value and does not include unpaid goods and services like housework, childcare and care for the elderly (when not carried out as paid work) and voluntary work. Second, GDP does not include illegal activities (drug trafficking, smuggling, prostitution) or undeclared activities (the underground economy). Third, it does not include activities of money and assets transfers, such as the sale of a house or a company's shares, the increase in value of works of art, and donations, because they do not represent the new production of goods and services. Fourth, GDP does not measure a country's accumulated wealth, but only the value of the goods and services produced in one period. Fifth, it does not include the value of leisure and spiritual, moral, or cultural values, unless they are reflected in the production of goods and services. Sixth, market prices do not reflect all the opportunity costs of production, nor do they account for the harm (or the benefits) caused by economic activity outside the market, such as environmental damage or traffic congestion.

2.2. Methods

This study uses the Error Correction Model (ECM) to examine both the short-run dynamics and the long-run equilibrium relationship among the variables. The ECM framework is particularly suitable for non-stationary time series data that are cointegrated, as it allows the model to capture short-term deviations from long-run equilibrium and the speed at which the system returns to equilibrium. All econometric estimations and statistical tests in this study are conducted using Eviews software. The ECM estimation in this study follows the standard procedures of a time-series econometric analysis, employing the Johansen cointegration approach to identify the long-run equilibrium relationship among the variables (Wardhono, 2004; Indarti et al., 2023; Hervino et al., 2023).

The analysis begins by specifying the long-run relationship between inflation and its macroeconomic determinants. The model specifications for this research equation are outlined in the works of Indarti et al. (2023) and Hervino et al. (2023). The long-run equilibrium model is mathematically:

$$INF = \alpha + \beta_1 i_t + \beta_2 ER_t + \beta_3 GDP_t + e_t \quad (1)$$

where:

INF – inflation on the consumer price index (%),

i – interest rate (%),

ER – exchange rate (Rupiah),

GDP – Gross Domestic Product (Billions of Rupiah),

α – constant,

$\beta_1, \beta_2, \beta_3$ – Regression coefficient,

e_t – error term.

Equation (1) represents the long-run relationship between inflation and its determinants, including the interest rate, exchange rate, and economic growth. Since macroeconomic time series often exhibit non-stationarity, several econometric procedures must be conducted before estimating the ECM. First, the stationarity properties of each variable are examined using the Augmented Dickey-Fuller (ADF) unit root test. The ADF test is used to determine whether the variables are stationary at the level or become stationary after first difference. The hypotheses of the ADF test are as follows:

H0: The variable contains a unit root (non-stationary).

H1: The variable is stationary.

If the variables are integrated of the same order, the Johansen cointegration test is conducted to examine whether a long-run equilibrium relationship exists among the variables. The Johansen cointegration test is employed to examine the existence of a long-run equilibrium relationship among the variables. The hypotheses tested are:

H0: there is no cointegration among the variables ($r = 0$).

H1: there is at least one cointegrating relationship ($r \geq 1$).

The number of cointegrating vectors is determined by comparing the trace statistics and maximum eigenvalue statistics with their critical values sequentially to identify the rank of cointegration (r). If cointegration is confirmed, it indicates the existence of a long-run equilibrium relationship among the variables. Therefore, the Error Correction Model (ECM) can be estimated to capture the short-run dynamics while maintaining the long-run equilibrium. The ECM incorporates an Error Correction Term (ECT) derived from the long-run cointegration equation obtained from the Johansen cointegration test. This term captures the speed of adjustment toward the long-run equilibrium following short-term shocks. The short-run ECM specification can be expressed as follows:

$$\Delta INF_t = \alpha + \beta_1 \Delta i_t + \beta_2 \Delta ER_t + \beta_3 \Delta GDP_t + \gamma ECT_{t-1} + \mu_t \quad (2)$$

where ECT_{t-1} represents the lagged error correction term obtained from the long-run equation, and Δ denotes the first-difference operator. The significance of the ECT coefficient verifies the existence of a long-run equilibrium relationship and indicates the speed at which short-

run disequilibria are corrected toward the long-run equilibrium. A statistically significant and negative coefficient indicates that short-run disequilibria are corrected toward the long-run equilibrium.

3. Result and discussion

3.1. Descriptive results

This section presents the statistical properties of the variables used in the study to provide an insight into the dynamics of the Indonesian economy from Q3 2005 to Q3 2023.

Table 1. Descriptive Statistics

Variable	Inflation (%)	Interest rate (%)	Exchange rate (USD/IDR)	GDP (IDR Trillion)
Mean	5.400	2.270	11,951.000	2,157.000
Median	4.500	2.100	12,212.000	2,154.000
Max	17.800	4.330	16,367.000	3,073.000
Min	1.200	0.480	8,597.000	1,301.000
Std. dev.	3.400	1.070	2,403.000	528.000
Skewness	1.818	0.358	-0.003	0.011
Kurtosis	3.752	-0.816	-1.620	-1.297
Jarque-Bera	83.032	3.582	7.984	5.121
p-value	0.000	0.167	0.018	0.077
Observations	73	73	73	73

Source: Bank Indonesia, the Central Statistics Agency, the Organisation for Economic Cooperation and Development (OECD), and the International Monetary Fund (IMF).

Throughout the study period, the standard deviation of the interest rate is smaller than that of the inflation rate, which indicates that the interest rate variable exhibits lower variability compared to the inflation rate. The interest rate tends to fluctuate less around its mean, while inflation shows greater dispersion from its average value. The analysis of Jarque-Bera statistics reveals that not all variables in the study follow a normal distribution. Specifically, the inflation, exchange rate, and GDP growth variables do not conform to a normal distribution.

Figure 1 shows a fluctuation in inflation in Indonesia. The highest inflation occurred in the 2005 Q4 at 17.78% due to the weakening of global economic performance, as indicated by the increase in world crude oil prices. In Indonesia, increased fuel prices on 1 October 2005 resulted in an increase in food prices, which reduced people's purchasing power and

reduced the value of production. Inflation rose again and peaked at 11.89% in 2008 Q3, which was caused by the unstable economic situation and increased fuel prices. From 2009 to 2021, the average inflation rate was 4.5% and was relatively stable. The lowest inflation rate was in 2020 Q3 due to decreased market demand and purchasing power because of the COVID-19 pandemic.

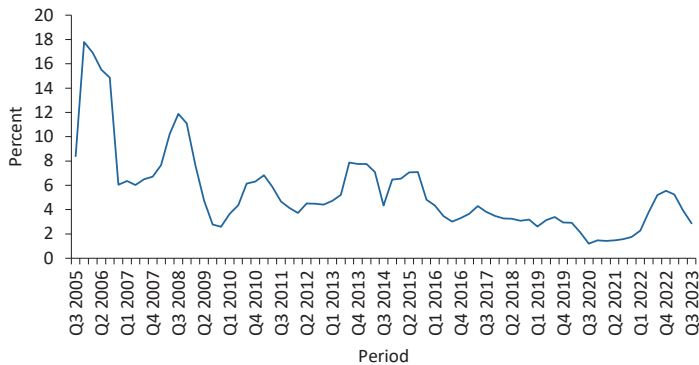


Figure 1. Inflation in Indonesia 2005–2023

Source: Bank Indonesia (2024a).

Figure 2 illustrates the variations in nominal interest rates in Indonesia from 2005 to 2023. The nominal interest rate fell to below 0.5% in Q1 2022, its lowest point during this period. Conversely, it peaked at 4.5% in Q4 2008 due to tighter bank liquidity, increased credit risk, and higher credit demand. Between Q1 2019 and Q1 2022, the interest rate dropped from 2.8% to 0.51%, reflecting the economic downturn triggered by the COVID-19 pandemic, which resulted in reduced economic activity.

Figure 3 illustrates the variations in the rupiah exchange rate against the US Dollar from 2005 to 2023. The exchange rate peaked in Q1 2020, reaching IDR 16,367 per US Dollar, driven by heightened demand for foreign exchange due to import needs and export restrictions. Conversely, the rupiah was strongest in Q1 and Q2 of 2011, with the exchange rate falling to IDR 8,709 and IDR 8,597, respectively.

Figure 4 illustrates the variability in Indonesia's economic growth from 2005 to 2023. The lowest growth rate, 5.32%, was recorded in Q2 2020, attributed to reduced economic activity and heightened social needs amid the COVID-19 pandemic.

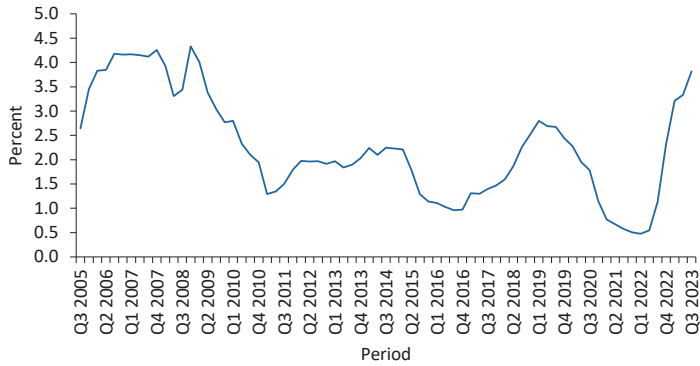


Figure 2. Nominal interest rates in Indonesia, 2005–2023

Source: Bank Indonesia (2024b).

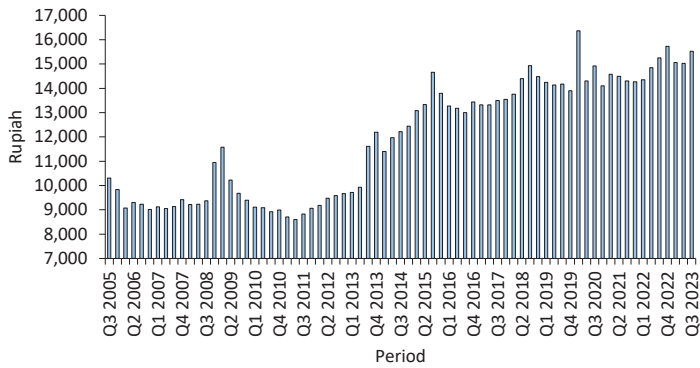


Figure 3. Rupiah against US Dollar, 2005–2023

Source: World Bank (2024a).

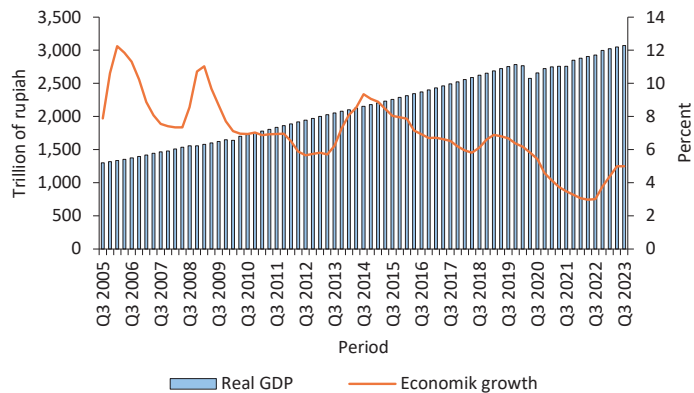


Figure 4. Indonesia's economic growth and real GDP, 2005–2023

Source: World Bank (2024b).

In contrast, Indonesia experienced its highest growth rate in Q2 2021, at 7.08%, driven by increased mobility and enhanced purchasing power (Bank Indonesia, 2022)

3.2. Regression results

Table 2 shows the linearity test, where the value of the F-statistic is 0.584. This value reflects that the assumption in the linearity test is significant and fulfilled because it is greater than 0.05.

Table 2. Linearity test result

Variable	Value	Df	Probability
t-statistic	0.549	68	0.584
F-statistic	0.301	(1, 68)	0.584
Likelihood ratio	0.322	1	0.569

Source: authors' calculation.

We tested the stationarity using the Augmented Dickey-Fuller (ADF) to observe the probability value. It shows that all variables are not stationary at a level because the ADF has a statistical value greater than the ADF value requirement of 5%. At the level 1st differences, all variables in the study were stationary with a value smaller than the ADF value of 5%. This concludes that all variables are stationary at the same level 1st difference (see Table 3).

Table 3. Stationary test result

Variable	Level	1 st difference	2 nd difference
	probability	probability	probability
Inflation	0.0855	0.0000	0.0000
Interest rate	0.1783	0.0001	0.0000
Exchange rate	0.8503	0.0000	0.0000
GDP growth	0.3739	0.0001	0.0000

Source: authors' calculation.

Table 4 shows cointegration using the Johansen test, which requires the variables in the equation to have the same degree of integration. The test shows that the value of the t-statistics is higher than the critical value ($\alpha = 1\%$, $\alpha = 5\%$, and $\alpha = 10\%$), meaning data can be cointegrated. Hence, there is a long-term relationship between the dependent and independent variables.

Table 4. Cointegration test result

α	t-statistic	Critical Value	Cointegration
1%	71.619	54.681	cointegrated
5%	71.619	47.856	cointegrated
10%	71.619	44.493	cointegrated

Source: authors' calculation.

Cointegration test results using the Johansen Cointegration Test in Table 4 show that the t-statistics are higher than the critical value ($\alpha = 1\%$, $\alpha = 5\%$, and $\alpha = 10\%$), meaning data can be cointegrated. It can be concluded that there is a long-term relationship between the dependent and independent variables in this research. Cointegration testing can also be done by testing the stationarity of whether the value of the Error Correction Term (ECT) is at the level or not in the research, as a condition for meeting the criteria that the variables studied have been cointegrated by looking at the residual behaviour of the regression equation used.

Table 5. ECT Stationarity test result

		t-Statistic	Probability
Augmented Dickey-Fuller test statistic		-5.071	0.000
Test critical values	1% level	-3.525	
	5% level	-2.902	
	10% level	-2.588	

Source: authors' calculation.

The ECT stationarity test has been stationary at the level because the probability is 0.0001 and below 5%. From the cointegration test, error terms (ET) or ADF value of -5.071, which is greater than the ADF critical value at a confidence level of α : $1\% = -3.525$; α : $5\% = -2.902$; α : $10\% = -2.588$. These results conclude that ECT does not contain a unit root, ECT can be considered stationary at the level, and there is a cointegration or long-term relationship between variables in the research.

Table 6 shows the estimation from the Error Correction Model with the imbalanced short-term estimates, with the ECM will make corrections in the next period.

Table 6. ECM result

Variable	Short Term		Long term	
	coefficient	t-Statistic	coefficient	t-Statistic
C	4.676*** (0.184)	25.402	–	–
D(i)	0.030** (0.044)	0.067	–	–
D(ER)	27.691*** (7.008)	3.951	–	–
D(GDP)	22.255 (22.194)	1.002	–	–
ECT	0.949*** (0.075)	12.586	–	–
C	–	–	26.855*** (11.111)	2.686
i	–	–	0.277 (0.268)	1.033
ER	–	–	17.088** (7.242)	2.359
GDP	–	–	–20.279*** (6.258)	–3.240
R-squared	0.744	–	0.500	–
Prob(F-statistic)	0.000	–	0.000	–

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses.

Source: authors' calculation.

The equation for the short-term regression model from Table 6 is as follows:

$$\Delta INF_t = 4.676 + 0.030\Delta i_{it} + 27.691\Delta ER_{it} + 22.255\Delta GDP_{it} + 0.949ECT_{it} \quad (4)$$

The short-run estimation results indicate that both the interest rate and the exchange rate have a positive and statistically significant effect on inflation. The Error Correction Term (ECT) coefficient is positive and significant. While a negative sign is theoretically expected to show a return to equilibrium, this positive value indicates a divergent adjustment in the short run. This suggests that short-term shocks to inflation are not immediately corrected but tend to be amplified or persist, reflecting high volatility or an “overshooting” effect in the Indonesian economy during the study period. Approximately 94.9% of the disequilibrium from the previous period is carried over, indicating that short-term imbalances move the system further away from its steady state before long-term forces take effect. The value of R-squared in the estimation is 0.744, meaning that 74.4% of the variability in the dependent variable is explained by the model.

After confirming the existence of cointegration among the variables, the long-run relationship can be estimated. In the ECM framework, the long-run equation is estimated using variables in their level form, reflecting the equilibrium relationship among the variables. In contrast, the short-run ECM model employs first-differenced variables to capture short-term dynamics and deviations from the long-run equilibrium. Table 6 above presents the results of the long-term regression model analysis with the following regression equation:

$$INF_t = 26.855 + 0.277i_{it} + 17.088ER_{it} - 20.279GDP_{it} \quad (5)$$

The interest rate (*i*) variable has a positive but statistically insignificant effect on inflation in the long run. The coefficient of 0.277 indicates that a 1 per cent increase in the interest rate is associated with an increase in inflation of approximately 0.27 per cent, *ceteris paribus*. The exchange rate (*ER*) has a positive and statistically significant effect on inflation. The coefficient of 17.088 suggests that an increase in the exchange rate (depreciation of the rupiah) leads to an increase in inflation. Since the exchange rate is measured in rupiah, the coefficient reflects the sensitivity of inflation to changes in the exchange rate rather than the percentage change. GDP growth has a negative and statistically significant effect on inflation in the long run. The coefficient of -20.279 implies that a 1 per cent increase in GDP growth is associated with a decrease in inflation of approximately 20.27 per cent.

The R-squared value of 0.500 indicates that approximately 50% of the variation in inflation can be explained by the independent variables included in the model, while the remaining 50% is influenced by other factors not included in the model.

4. Discussion

The findings from the Error Correction Model (ECM) reveal that short-term interest rates have a significant effect on inflation. Sari and Yewiwati (2019) and Firdaus et al. (2022) report a significant positive relationship between interest rates and inflation in Indonesia, especially following the adoption of the Inflation Targeting Framework (ITF) policy. This positive correlation implies that rising interest rates tend to drive up inflation. Aligning with Keynes' view on the direct connection between interest rates and the demand for money for speculative reasons, interest rates are crucial in influencing inflation. Consequently, central banks must carefully consider interest rates when adjusting monetary policy to control inflation, as highlighted by Boediono (2015).

The p-value from the long-term regression analysis of the interest rate variable exceeds the significance level, indicating that interest rates do not have a significant impact on inflation. This finding aligns with Gibson's Paradox theory, which posits that interest rates and price trends generally move together. According to this theory, if price changes are fully anticipated, high interest rates are associated with a swift rise in inflation (Yulianto, 2011; Pratiwi, Prasetyia, 2013).

The ECM results reveal that the exchange rate positively affects inflation. It is not significant in the short term, but significant in the long term, particularly after the introduction of the ITF policy in Indonesia. Langi (2014) supports this observation, noting that the exchange rate's substantial role in driving inflation is consistent with Irving Fisher's theory. Fisher's theory asserts that an increase in the money supply will lead to a proportional rise in the inflation rate (Mankiw, 2013).

Hady (2001) observed that when evaluating the exchange rate between domestic and foreign currencies, an increase in the exchange rate, signifying a depreciation of the domestic currency, can lead to inflation. This depreciation results in a rise in the amount of money circulating within the economy. To manage this effect, monetary authorities use an inflation-targeting policy framework to control fluctuations in inflation driven by changes in demand and supply. Essentially, inflation can arise from an increase in the money supply managed by the central bank, aimed at stimulating the economy and influencing public expectations regarding future price increases.

Additionally, the increase in inflation resulting from the devaluation of the domestic currency is due to the relatively inelastic demand for imported goods. As a result, changes in the exchange rate may have a limited effect on consumption or prices over a long period. In countries with low import dependence or significant domestic industries, exchange rate fluctuations tend to have a smaller impact on inflation, which, however, is not achieved in Indonesia. Furthermore, government interventions in price regulation or subsidies can dampen the long-term effects of exchange rate variations on inflation, leading to either a minimal or negligible direct impact of exchange rate changes on long-term inflation (Budiasih, 2011).

Estimation from the ECM indicates that, in the short term, GDP growth does not significantly affect inflation in Indonesia. This finding contradicts the initial research hypothesis, which anticipated that GDP growth would have a substantial and negative impact on inflation following the implementation of the ITF policy. The observed lack of significance might be due to variations in output that depend on changes in raw production factors (Andrianus, Niko, 2006; Kurniawan et al., 2021), as well as rising commodity prices leading to reduced demand (Gokal, Hanif, 2004).

The results from the long-term regression analysis reveal that, in Indonesia, GDP growth significantly negatively affects inflation. This effect occurs because rising demand for goods and services encourages producers to increase output, which in turn reduces demand and lowers prices (Christianingrum, Syafri, 2019). Consistent with Keynes' theory, periods of high inflation are followed by slower economic growth. Furthermore, a decline in economic growth is likely to result in higher inflation in the long run, whereas an increase in economic growth is expected to reduce the inflation rate (Fischer, 1993).

Considering the findings above, some efforts should be taken by the Indonesian government to control inflation by maintaining macroeconomic indicators as observed above. First, the positive correlation between interest rates and inflation means the central bank should maintain interest rates at a low level by increasing efficiency in the banking industry and increasing public trust in the banking sector. A study by Widiarti et al. (2015) shows by using Data Envelopment Analysis (DEA) on quarterly data of 108 conventional banks in Indonesia during the period of 2012Q1 to 2014Q4, the Indonesian banking industry is inefficient in its intermediation function as indicated by their financial indicators namely the total increasing asset, stable ROA of around 2–3%, and their Operating to Income Cost ratio of about 66–83%.

Second, due to the significant impact of the fluctuation of the exchange rate, the government should increase the dependency of the economy on domestic products, which are resilient to the dynamics of the exchange rate. Indonesia's experience of the economic crisis that brought the fluctuation in exchange rate and inflation led Indonesia to have a better response to the crisis (Figure 5–6).

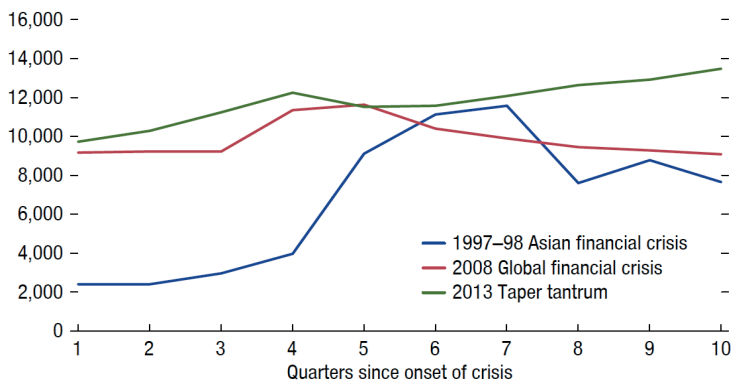


Figure 5. Indonesian Rupiah/Dollar Exchange Rate, Quarterly

Source: Breuer et al. (2018).

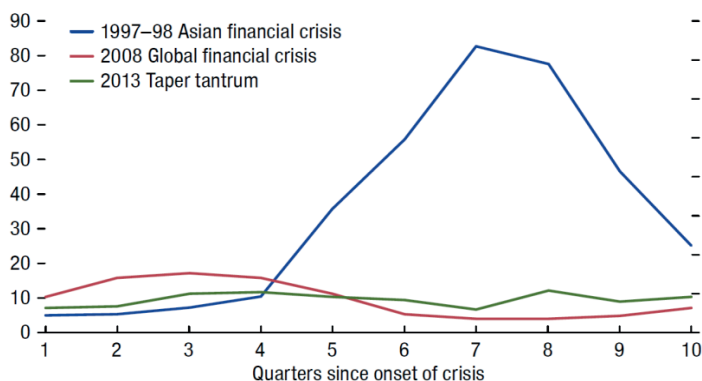


Figure 6. Indonesian Inflation, Quarterly

Source: Breuer et al. (2018)

Figures 5–6 show that the AFC had a significant impact on the Indonesian economy. Economic growth declined deeply, the exchange rate against the US dollar collapsed, and inflation rose sharply. In contrast, the 2008 global financial crisis and 2013 taper tantrum had practically no effect on economic growth or inflation, and they had only a limited impact on the exchange rate.

Conclusions

This study examines the relationship between interest rates, exchange rates, economic growth, and inflation within the context of the Inflation Targeting Framework in Indonesia. Using the Error Correction Model (ECM), the analysis investigates both the short-run dynamics and the long-run equilibrium relationship among these variables. The results confirm the existence of a long-run equilibrium relationship among the variables. In the short run, interest rates and exchange rates have a positive and significant effect on inflation, while economic growth does not significantly influence inflation. In the long run, the exchange rate has a positive and significant effect on inflation, indicating that rupiah depreciation tends to increase domestic prices. Meanwhile, economic growth has a significant negative effect on inflation, suggesting that higher economic growth may contribute to price stability. Interest rates, however, show a positive but statistically insignificant relationship with inflation in the long term. The findings indicate that exchange rate stability plays an important role in controlling inflation in Indonesia, while the effect of interest rates is more evident in the short term.

These findings are broadly consistent with the theoretical perspectives discussed in the study. From a Keynesian perspective, interest rate adjustments can influence aggregate demand and thereby affect inflation dynamics. At the same time, the results also support the importance of maintaining monetary credibility and price stability, which is emphasised in the market-oriented perspectives of monetary policy.

The findings provide empirical support for the importance of effective monetary policy management under the Inflation Targeting Framework (ITF). In this context, Bank Indonesia plays a crucial role in maintaining price stability through the appropriate interest rate policy and careful monitoring of exchange rate movements and economic growth conditions.

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