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The Impact of Monetary Policy on Fiscal Policy Effectiveness During Recession: A Study of Triplet Recessions in Indonesia

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Abstract

The main objective of this research is to examine how monetary policy contributed to the effectiveness of fiscal policy throughout Indonesia's triplet recession. The recession brought on by the Global Financial Crisis (GFC) from 2008Q2 to 2009Q2, exchange rate volatility (ERC) from 2012Q4 to 2015Q2, and the COVID-19 pandemic from 2019Q4 to 2021Q4 are all included in the triplet recession. Another goal is to examine how the crisis affected the efficacy of fiscal policy. The System Equation Full Information Maximum Likelihood (FIML) is used to estimate using quarterly data from 2005Q3 to 2021Q4. According to the results, fiscal effectiveness significantly decreased during the COVID-19 pandemic but not during the GFC or the ERC. The paper also concludes that, unlike during the GFC and ERC, monetary policy significantly preserved the efficacy of fiscal policy throughout the COVID-19 pandemic. We recommend that, in a crisis, fiscal and monetary policies be closely aligned to support each other. They should be flexible in adjusting the balance between fiscal and monetary policies based on the type of crisis.

Keywords: fiscal policy, monetary policy, output gap, crisis.

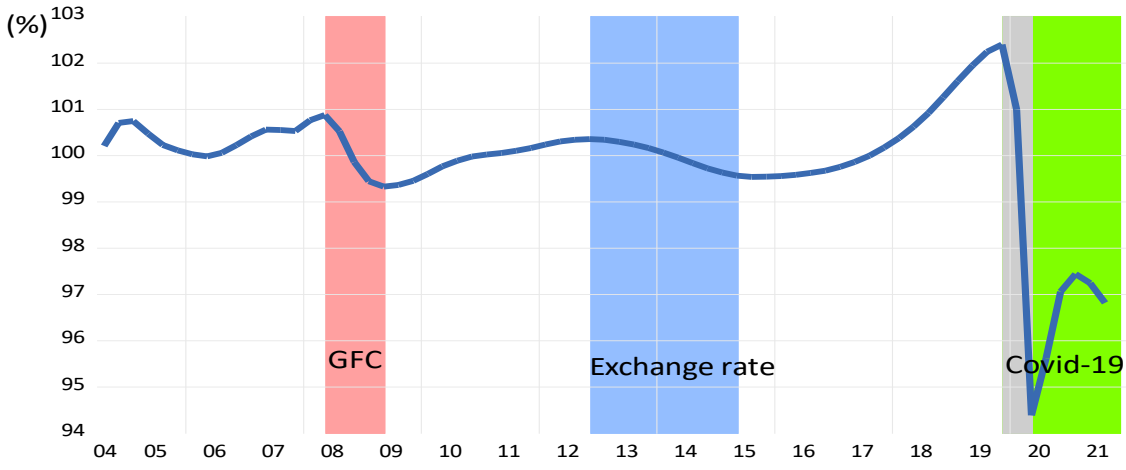
1. Introduction

Fiscal and monetary policies represent two primary macroeconomic strategies employed to regulate economic activity. Fiscal policy primarily aims to attain elevated output and reduced unemployment, whereas monetary policy is concerned with maintaining price stability. In numerous countries, while both policies pursue distinct objectives and are overseen by separate authorities, existing literature indicates that their implementation is characterized by significant coordination. The two policies mutually reinforce one another and are identified as complementary. Research on policy coordination across various nations, including Indonesia, indicates that coordination yields superior outcomes compared to isolation (Hall & Mankiw, 1994; Woodford, 2001; Favero & Monacelli, 2005; see also Mochtar, 2004; Simorangkir, 2007; Simorangkir & Adamanti, 2010; Rahutami, 2011; Santoso, 2011; Kuncoro et al., 2013; Yunanto & Medyawati, 2013; Utama, 2020; Utama et al., 2022). Numerous studies, including those by Sukamdi et al. (2024), Ćorić et al. (2015), Tadesse and Melaku (2019), Silalahi and Chawwa (2011), Simorangkir and Adamanti (2010), Hutchison et al. (2010), and Olasehinde et al. (2019), indicate that insufficient coordination among these policies may lead to a decrease in economic performance.

Many studies indicate that fiscal and monetary policies are employed to address a crisis (Abubakar et al., 2020; Silalahi & Chawwa, 2011; Fetai, 2013). In a recession, fiscal policy must be prioritized for economic recovery (Bianchi & Melosi, 2021; Leeper, 1991). Monetary policy contributes to the effectiveness of fiscal policy. This study examines data spanning from the third quarter of 2005 to the fourth quarter of 2021, which includes three recessions in the Indonesian economy: the recession induced by the Global Financial Crisis (GFC) from the second quarter of 2008 to the second quarter of 2009, the Exchange Rate Crisis (ERC) recession from the fourth quarter of 2012 to the second quarter of 2015, and the recession caused by the COVID-19 pandemic from the fourth quarter of 2019 to

the fourth quarter of 2021. Triplet recessions are classified into two categories. The first category encompasses recessions induced by external factors such as the GFC and fluctuations in exchange rates. The second type involves recessions induced by pandemics. This article utilizes the OECD-Based Recession Indicator for Indonesia to identify periods of recession, termed crises or recessions.

Figure 1. Gross Domestic Product (GDP): Ratio to trend for Indonesia



Source: Calculated from BPS, 2023.

Figure 1 illustrates the recession periods identified by the OECD's Recession Indicator. The OECD delineates a recession using time series data, commencing on the 15th day of the month at the top and terminating on the 15th day at the trough. Nonetheless, modifications were implemented to address the recession induced by the COVID-19 pandemic. The OECD index indicates that the recession officially concluded in the second quarter of 2020. However, the data reveals that the recession continued until the fourth quarter of 2021.

The data indicates that a recession is defined by a downturn in economic performance, shifting from a positive output gap to a notable decline until it reaches the lowest point of the output gap, after which it begins to recover. Figure 1 illustrates recession periods, which are denoted in pink, blue, and green. Figure 1 also presents the output gap, using seasonally adjusted data to corroborate the OECD's recession index.

Referring to Figure 1, it becomes evident that eleven quarters after Bank Indonesia implemented inflation targeting, Indonesia experienced a recession triggered by the GFC. Subsequently, after recovering from the recession induced by the GFC, another recession occurred fourteen quarters later due to a decline in the exchange rate. Finally, a recession induced by the pandemic followed a recovery period of seventeen quarters from the recession caused by exchange rate fluctuations. Over the past 16 years, the economic trajectory has revealed a significant recession, highlighting the necessity for coordinated fiscal and monetary policies. Furthermore, both policies must exhibit efficacy in influencing the economy. Despite varying objectives, the coordination between fiscal and monetary policy is necessary in the economy following the implementation of the Inflation Targeting Framework (Tanzi, 2015).

This study investigates the degree to which the effectiveness of fiscal policy diminishes in a recession and examines the role of monetary policy in enhancing fiscal policy effectiveness during such periods. Although studies on the interaction of fiscal and monetary policies have been widely conducted in Indonesia (see Mochtar, 2004; Simorangkir, 2007; Simorangkir & Adamanti, 2010; Rahutami, 2011; Santoso, 2011; Kuncoro et al., 2013; Yunanto & Medyawati, 2013; Utama, 2020; Utama et al., 2022), studies on policy interactions, especially in dealing with consecutive recessions, are still rare. This study examines the complementary integration of fiscal and monetary policies in alleviating the adverse effects of the crisis as well as the structuring of fiscal and monetary policies in response to three concurrent crises from 2005 to 2021. This study employs the dynamic IS-MP-PC framework.

2. Literature Review and Model

2.1 Literature Review

Numerous studies have demonstrated the impact of fiscal and monetary policy effectiveness on economic outcomes. Chowdhury and Afzal (2015) conducted a study on Bangladesh from 1980 to 2012, revealing that both fiscal and monetary policies positively affected economic growth. Ozer and Karagol (2018) provide additional evidence for the complementarity between these two policy types, based on observations of Turkey from 1998 to 2016. Their findings indicate that monetary policy positively affects economic growth in the short term. In contrast, fiscal policy positively impacts economic growth in the long term. Tadesse and Melaku (2019) corroborated earlier findings. Furthermore, Ćorić et al. (2015) indicated that coordination between the two policy types can yield beneficial outcomes. Abubakar et al. (2020) confirm Ćorić et al. (2015) in the crisis period by conducting a meta-analysis of 72 studies, revealing that fiscal and monetary policies are integral components of crisis mitigation strategies employed by various countries.

Silalahi and Chawwa (2011) demonstrated that during a recession, monetary and fiscal policy significantly impacted economic output in Indonesia from 1990 to 2010. Furthermore, Li (2013) concluded that fiscal policy should remain neutral while monetary policy should be expansionary in times of crisis. Li used data from 57 developing countries from 1977 to 2010. On the other hand, Fetai (2013) also examined the effectiveness of monetary policy and fiscal policy on economic growth during the financial crisis in 66 developing countries based on 83 financial crisis episodes, finding that implementing expansionary fiscal and monetary policies was neutral. Bianchi and Melosi (2019) validate the findings of Li (2013) and Fetai (2013), indicating that in fiscal and monetary coordination, one policy must take the lead while the others adjust accordingly.

In contrast to Li (2013) and Fetai (2013), who examined the financial crisis, Bianchi and Melosi (2019) were engaged in the real economy. They assert that monetary policy will be implemented when output exceeds the potential level and inflation is elevated. Conversely, fiscal policy is more effective as a guiding tool when output falls below potential levels and inflation remains low. Bianchi and Melosi (2019) assert that a recession characterized by a decline in output necessitates alignment with proactive fiscal and supportive monetary policies.

2.2 Model

2.2.1 Basic Model

Like Alavi et al. (2016) and Hsing (2005, 2006), this research utilizes the dynamic IS-MP-PC model.[1] Following Hubbard et al. (2012), the goods market balance (IS), monetary reaction function (MP), and the Phillips Curve (PC) are expressed as follows:

$$\hat{y} = (\hat{C}).\left(\widehat{y-T},\ R\ - E(\pi)\right) + \hat{I}(E(\hat{y}), R\ - E(\pi)) + \hat{g} + \widehat{NX}(\widehat{er}) \quad (1)$$

$$R = R(R^{US}, \pi - \pi^{t}, \widehat{er}, \hat{y}) \quad (2)$$

$$\hat{\pi} = \hat{\pi}(E(\hat{\pi}), \ell\hat{\pi}, \hat{y}) \quad (3)$$

Equation (1) represents the equilibrium in the goods market (IS), where $(\hat{y})$ denotes the output gap.[2] This gap encompasses the consumption gap $(\hat{C})$, investment gap $(\hat{I})$, government expenditure gap $(\hat{g})$, and net export gap $(\widehat{NX})$.[3] The relationship between $\hat{y}$ and $(\hat{C})$, $(\hat{I})$, $(\hat{g})$, and $\widehat{NX}$ is positive. The consumption gap is influenced by two key factors: the size of the disposable income gap (disposable income is income minus taxes) and real interest rates that are calculated

[1] The example simple dynamic IS-MP-PC model found in Giese and Wagner (2006).

[2] Output gap is measured using $\hat{Y}_t = \frac{Y_t - Y_t^*}{Y_t^*}$, where $\hat{Y}_t$ is output gap, Y_t is actual GDP real, and Y_t^* is potential output. We employ the Hordrick- Prescott (HP) Filter to estimate potential output. The positive output gap means the actual output is above potential output; the negative output gap means the actual output is below potential output.

[3] It is same as output gap. $(\hat{C})$, $(\hat{I})$, $(\hat{g})$, and $\widehat{NX}$ are measured using the equation $\hat{x}_t = \frac{x_t - x_t^*}{x_t^*}$, where x is consumption (C), investment (I), government expenditure (g), and net export (NX). The value of trend x_t^* is the steady state condition of C, I, g, or NX, which is estimated using the Hordrick-Prescott (HP) Filter.

as the nominal interest rate (R) minus the inflation rate expectation $E(\pi)$. The impact of disposable income on consumption is positive. It is important to note that the real interest rate functions as a monetary variable in the goods market equilibrium. Wealth consists of real assets W_R and financial assets W_F. In the real asset model, the value of real assets increases with the price rise (π), while the value of financial assets increases when the interest rate (R) falls. Due to the real interest rate being defined as $R - E(\pi)$, its effect on consumption is negative.

Interest rates have a negative impact on investment, but yield expectations have a positive impact. Spending by the government is presumed to be independent. An expansionary policy is indicated by a positive government spending gap ($\hat{g} > 0$), whereas a contractionary strategy is shown by a negative gap ($\hat{g} < 0$). The output gap is positively impacted by the government spending gap.

The expected return and investment costs determine investment. The expected return is expressed as the expected output gap in the future ($E(\hat{y})$), while the real interest rate represents the cost. Interest rates have a negative impact on investment, but yield expectations have a positive impact. Spending by the government is presumed to be independent. A positive government spending gap, $\hat{g} > 0$, indicates an expansionary policy, while a negative gap, $\hat{g} < 0$, indicates a contractionary policy. The government spending gap positively affects the output gap.

The increase in the net export gap is influenced by the gap in the rupiah exchange rate $\widehat{er}$. A positive $\widehat{er}$ has a favourable impact on the output gap. When $\widehat{er} > 0$, the rupiah value is below the expectation, and net exports increase as domestic goods become cheaper than foreign goods. This results in higher exports and lower imports. The net export gap is determined by the deviation of the actual exchange rate from the trend or exchange rate gap, $\widehat{er}$.

Equation (2) delineates the reaction function of the central bank. Interest rates are influenced by foreign interest rates R^F, the disparity between actual inflation and

the inflation target, $\pi - \pi^T$, and the exchange rate gap, $\widehat{er}$. The central bank must monitor foreign interest rates, exemplified in this study by the interest rate of the United States Central Bank (FED), to ensure stable financial flows. If the Federal Reserve increases interest rates, Bank Indonesia (BI) will similarly increase its interest rates. If the FED reduces interest rates, BI will similarly decrease its interest rates. The impact of foreign interest rates on the interest rates set by BI is positive. The beneficial impact of the disparity between actual inflation and the inflation target is significant. Should inflation surpass the target, BI will raise the policy interest rate. The exchange rate gap of the rupiah positively affects the determination of interest rates. BI will increase the policy interest rate if the rupiah value falls below the target ($\widehat{er} > 0$).

The inflation gap, $\hat{\pi}$, as described by equation (3), is both backward and forward-looking. The influence of the forward-looking and backward-looking inflation expectations gap are $E(\hat{\pi})$ and $\ell\,\hat{\pi}$, respectively. The expectation of inflation positively influences actual inflation rates. The output gap has a positive effect on inflation. An increase in the output gap leads to a reduction in unemployment, which subsequently enhances demand for goods and elevates prices. We can rewrite the equations (1) – (3) as follows:

$$\hat{y}_t = b_{10} + b_{11}\,\widehat{yd}_t + b_{12}\,(r_t) + b_{13}\,E(\hat{y}_t) + b_{14}\,\hat{g}_t + b_{15}\,\widehat{er}_t + \varepsilon 1_t \quad (4)$$

$$R_t = b_{20} + b_{21}R^F_{t-1} + b_{22}(\pi^\tau_t) + b_{23}\widehat{er}_t + \varepsilon 2_t \quad (5)$$

$$\hat{\pi}_t = b_{31}E(\hat{\pi}_t) + b_{32}\,\hat{\pi}_{t-1} + b_{33}\,\hat{y}_t + \varepsilon 3_t \quad (6)$$

where $r = R_t - E(\pi) = R_t - \pi_{t+1}$, $\pi^\tau_t = \pi_t - \pi^T_t$, and π is inflation. Based on the IS-MP-PC model, we can expect $b_{11} > 0$, $b_{12} < 0$, $b_{13} > 0$, $b_{15} > 0$, $b_{21} > 0$, $b_{22} > 0$, $b_{23} > 0$, $b_{31} > 0$, $b_{32} > 0$, and $b_{33} > 0$. The model is empirically verified if at least the sign of the coefficients follows the theory's prediction.

2.2.2. Model with triplet recession and policy interactions

According to Bilgili (2001), there are two phases in the business cycle, i.e., recession and expansion, as well as two turning points, i.e., peak and trough. The expansion phase denotes a period characterized by heightened economic activity, an increase in aggregate demand (AD), and an expansion of the production sector's capacity, leading to greater employment opportunities. A recession is marked by a slowdown indicated by a reduction in aggregate demand, leading the production sector to reduce its capacity and resulting in a rise in the unemployment rate.

Throughout the research period, the economy experienced three prolonged recessions, specifically, those resulting from the GFC, the ERC, and the COVID-19 pandemic. This research examines the effects of the three recessions on the Indonesian economy and analyzes the effectiveness of fiscal policies in recessionary and non-recessionary periods, as well as the interaction between fiscal and monetary policies in the Indonesian economy during these distinct phases. Based on Leeper (1991) and Bianchi and Melosi (2019), we assume that fiscal policy is dominant in periods of crisis. Crisis variables were incorporated into the IS-MP-PC model. This variable is further categorized into two groups. The first comprises recessions attributed to the GFC and ERC. In contrast, the second group focuses on the recession caused by the pandemic. These three recessions are represented by dummy variables, namely D1 and D2.

The model development can be written as follows:

$$\hat{y}_t = \beta_{10} + \beta_{11}\,\widehat{yd}_t + \beta_{12}\,(r_t) + \beta_{13}\,E(\hat{y}_t) + \beta_{14}\,\hat{g}_t + +\beta_{15}\,\widehat{er}_t + \delta_{11}\,\hat{g}_t\,.D1_t + \delta_{12}\,\hat{g}_t\,.D2_t + \gamma_{11}\,g_t.R_t\,.D1_t + \gamma_{12}\,g_t.R_t\,.D2_t + \varepsilon 4_t \quad (7)$$

$$R_t = \beta_{20} + \beta_{21}R^F_{t-1} + \beta_{22}(\pi^\tau_t) + \beta_{23}\widehat{er}_t + \delta_{20}\;G_{t-1} + \delta_{21}\;G_{t-1}D1_t + \delta_{22}\;G_{t-1}.D2_t + \varepsilon 5_t \quad (8)$$

$$\pi_t = \beta_{31}E(\pi_t) + \beta_{32}\,\pi_{t-1} + \beta_{33}\,\hat{y}_t + \varepsilon 6_t \quad (9)$$

IS Equation (7) introduces interaction variables $\widehat{g_t}D1_t$ and $\widehat{g_t}D2_t$. The coefficients δ_{11} and δ_{12} illustrate the different impact or effectiveness of fiscal policy on the

output gap in recession attributed to the GFC, ERC, and pandemic, compared to when there is no recession. The strategy allows observation of any changes in the effectiveness of fiscal policy during recessionary periods. Furthermore, the effect of the government expenditure gap, $\hat{g}_t$, in the non-crisis period is measured by β_{14}.

Additionally, equation (7) includes the fiscal and monetary policy interaction variable, $\widehat{g_t}R_t$. Moreover, terms like $\widehat{g_t}R_t\,D1_t$ and $\widehat{g_t}R_t\,D2_t$ depict policy interactions during recessionary periods. If $\gamma_{11} > 0$, then the monetary policy increases the effectiveness of fiscal policy during GFC-ERC, and if $\gamma_{12} > 0$, the monetary policy increases the effectiveness of fiscal policy during the pandemic.

In the MP equation, we introduce the variables government expenditure (G_t), G_tD1, and G_tD2. Monetary policy is considered accommodative during the non-crisis period if $\delta_{20} < 0$, meaning an increase in government spending (fiscal expansion) is followed by a decrease in policy interest rates (expansionary). Furthermore, the increase of accommodative monetary policy during the GFC and the ERC is indicated by $\delta_{21} < 0$ and during the COVID-19 pandemic by $\delta_{22} < 0$.

3. Data and Methodology

This study uses quarterly data from the Central Statistics Agency (BPS), the Ministry of Finance (MOF), and Bank Indonesia (BI) for the period 2005Q3 to 2021Q4. The start of the period was based on implementing the Inflation Targeting Framework (ITF) by BI in 2005Q3. Three recessions occurred throughout the research period, as seen in Figure 1; these recessions were caused by the GFC, the Rp/USD ERC, and the COVID-19 pandemic. Table 1 presents the definitions of the variables.

Table 1. Definition of variables

Variable	**Sign**	**Value**	**Explanation**	**Sources**
Real output	y_t	Billion Rp	Constant price 2010=100	BPS
Output gap	$\hat{y}_t$	Percent		
Real tax revenue	t_t	Billion Rp	Constant price 2010=100	MOF
Disposable income	yd_t	Billion Rp	$y - t$	
Disposable income gap	$\widehat{yd}_t$			
Policy interest rate	R_t	Percent		BI
Foreign policy interest rate	R_t^F	Percent	Federal fund rate of United States	FED
Inflation rate	π_t	Percent	Year on year	BPS
Target inflation rate	π_t^T	Percent	Central bank inflation target	BI
Actual inflation to target	π_t^τ		$\pi_t^\tau = \pi_t - \pi_t^T$	
Real interest rate	r_t	Percent	$(R_t - \pi_{t+1})$	
Expected inflation	$E(\pi)_t$	Percent	π_{t+1}	
Expected inflation gap	$E(\hat{\pi})_t$	Percent	$\hat{\pi}_{t+1}$	
Expected output gap	$E(\hat{y})_t$	Percent	$\hat{y}_{t+1}$	
Government expenditure	G_t	Billion Rp		MOF
Real government expenditure	g_t	Billion Rp	Constant price 2010=100	
Government expenditure gap	$\hat{g}_t$	Percent		
Exchange rate	er_t		Rp/USD	BI
Exchange rate gap	$\widehat{er}_t$	Percent		
Dummy recession caused by GFC and ERC	$D1$		$D1$= 1, period recession caused by GFC or ERC $D1$= 0, Other	
Dummy recession caused by COVID-19	$D2$		$D2$= 1, period recession caused by COVID-19 pandemic $D2$=0, Other	

Note: We measure gap of *x* using the following equation: $\hat{x}_t = \left(\frac{x_t - x_t^*}{x_t^*}\right) \times 100\%$, where $\hat{x}_t$ is gap of *x*, x_t is value of *x*, and x_t^* is the long run trend (or long run equilibrium) of *x*. Furthermore, *x* could be real GDP (*y*), real disposable income (*yd*), exchange rate (*er*), and inflation (π). We estimate the long run trend or equilibrium using the Hodrick-Prescott filter method (HP filter). The long-run trend or equilibrium for GDP (output) is usually called potential output.

A dummy variable, D1 or D2, is employed to denote the temporal frame of the recession. This approach allows us to utilize the complete observed duration in the estimation. It is unnecessary to segment the duration into shorter intervals for the assessment of each crisis incident.

The Triplet Recession Model (equations 7, 8, and 9) and Basic Model (equations 4, 5, and 6) are calculated simultaneously using multivariate methodologies interrelated in a system of equations. The Full Information Maximum Likelihood (FIML) approach is used to estimate the system of equations. A stationarity or unit root test is run on the variables before model estimation to verify the stability of the time series data and reduce the possibility of false regressions. Engle and Granger (1987) stated that the use of non-stationary regression in a model can produce spurious regression. After estimation, the residuals are subjected to a normality test; the efficacy of the FIML depends on the joint residuals of the system of equations being normal. The residuals are also subjected to a stationarity test.

Reduced-form approaches, such as VAR and SVAR, are frequently insufficient in empirical reviews of the New Keynesian (NK) framework since they inadequately integrate the NK model's forward-looking expectations. Gali and Gertler (1999) asserted that the Generalized Method of Moments (GMM) is better for New Keynesian estimating, particularly in their New Keynesian Phillips Curve (NKPC) discourse. GMM can be employed to estimate unobserved expectations and structural models of New Keynesian economics directly. Foundational research by Gali and Gertler (1999) and Gali et al. (2005) supports the utilization of the GMM, as it enables structural parameter estimation via moment conditions while mitigating endogeneity and unobservable expectations.

On the other hand, Lindé (2005) stated that the FIML method, especially within a Bayesian framework, has proven superior to GMM. FIML employs the comprehensive model framework and the entire dataset, enabling more accurate and

reliable parameter estimations while offering a uniform method for addressing uncertainty. Bayesian estimation enables the integration of economic priors, improving identification in data-deficient or noisy contexts. Thus, our study concurs with Lindé (2005) that FIML provides a more robust and theoretically consistent approach for estimating the parameters of NK than GMM or reduced-form methodologies like VAR or SVAR.

In this study, the robustness of the model is assessed through a consistency check, examining the direction of the estimated coefficients vis-à-vis theoretical predictions. This step serves as an empirical validation of the foundational theory. Furthermore, consideration is given to the consistency of coefficient directions, as the model's robustness is contingent upon the estimated coefficients aligning with theoretical expectations and exhibiting consistency.

4. Results

4.1 Statistical Feature of the Data

This study employs the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods to assess whether a variable has a unit root. If the variable has no unit root, it is stationary. If the variable has no unit root, it means the variable has stationarity. If the probability or P-value of the test is less than 10%, it can be concluded that the variable has no unit root. The tests were conducted on the following variables: output gap ($\hat{y}$), disposable income gap ($\widehat{yd}_t$), real interest rate (r_t), inflation gap ($\hat{\pi}_t$), the difference between actual inflation and the central bank target (π_t^{τ}), government expenditure (G), Rp/USD exchange rate gap ($\widehat{er}$), Bank Indonesia's policy interest rate (R_t), and the Federal Fund Rate (R_t^F). The test results indicate that all the variables used are stationary. Based on the results of the ADF and PP tests in Table 2, at least one test indicates that the data has no unit root. The result implies that all the variables are stationary.

Table 2. Unit root test

Variable		ADF		PP	
		Intercept	Intercept and trend	Intercept	Intercept and trend
$\widehat{y}_t$	Coefficient	-3.1149*	-3.2244*	-6.2767*	-6.2180*
	P-value	(0.0309)	(0.0898)	(0.0000)	(0.0000)
$\widehat{yd}_t$		-2.8792*	-2.8677	-16.6002*	-26.3297*
		(0.0536)	(0.1800)	(0.0000)	(0.0001)
r_t		-10.4057*	-10.2190*	-10.0459*	-9.9283*
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
G_t		-0.2625	-1.9761	-8.3952*	-18.6305*
		(0.9239)	(0.6026)	(0.0000)	(0.0001)
$\widehat{g}_t$		-3.0095*	-3.0200	-21.5966*	-21.9239*
		(0.0395)	(0.1352)	(0.0001)	(0.0001)
$\widehat{er}_t$		-3.5229*	-3.4948*	-3.5229*	-3.4948*
		(0.0103)	(0.0483)	(0.0103)	(0.0483)
R_t		-3.6944*	-4.4869*	-1.3407	-2.3498
		(0.0064)	(0.0033)	(0.6056)	(0.4018)
R_t^F		-4.0489*	-3.7151*	-1.7229	-1.7156
		(0.0022)	(0.0285)	(0.4152)	(0.7331)
$\widehat{\pi}_t$		-2.2832	-4.5870*	-2.5212	-3.8534*
		(0.1805)	(0.0024)	(0.1149)	(0.0194)
π_t^τ		-3.4165*	-4.5477*	-3.40326*	-4.21399*
		0.0137	0.0027	0.0141	0.0072

Note: * = stationary.

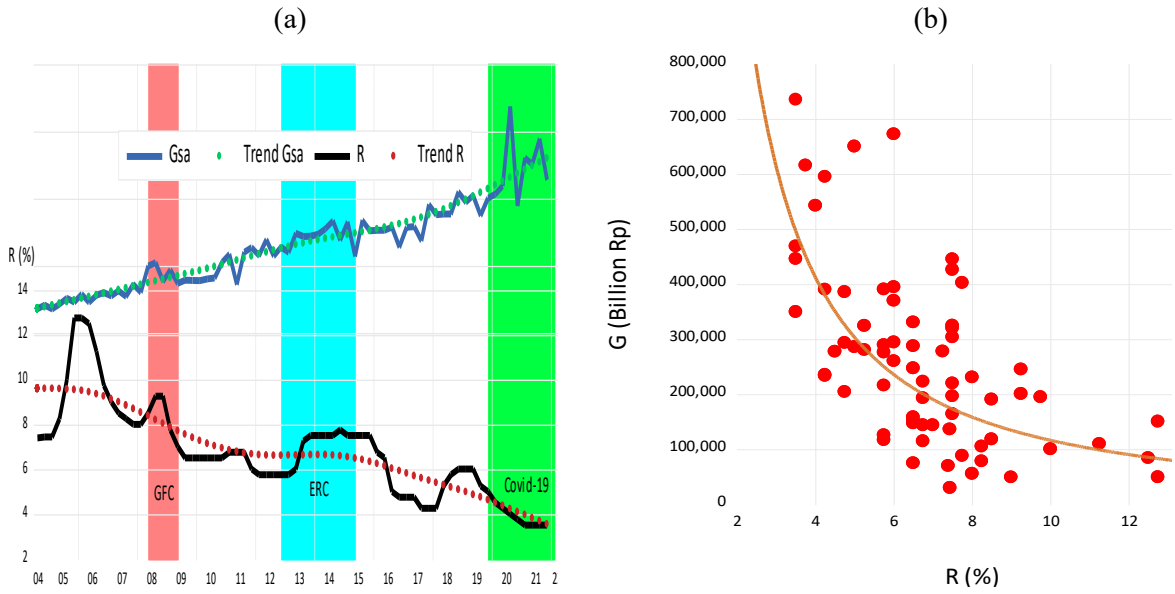
4.2 Preliminary Findings

Figure 1 shows the three recessions: the GFC from 2008Q2 to 2009Q2, the ERC from 2012Q4 to 2015Q2, and the COVID-19 pandemic from 2019Q4 to 2021Q4. During this period, output declined below the Indonesian output trend.

Figure 2(a) illustrates Indonesia's fiscal and monetary policies from 2005 to 2021. Throughout this period, government expenditure (seasonally adjusted), Gsa, displayed an increasing trend, while policy interest rates exhibited a consistent downward trajectory. In times of recession, Gsa generally exceeded the trend, with the COVID-19 period experiencing exceptionally high levels above the trend. These findings suggest that government spending is a policy tool for recovery during economic downturns.

Interest rates were elevated beyond the trend during the GFC and the ERC. The monetary authority implemented this high-interest-rate policy to mitigate negative external consequences and prevent capital flight. Unlike previous crises, the downturn induced by the pandemic responded to lower interest rates. Furthermore, the reduction permitted an increase in government spending. The COVID-19 crisis is unique because it stems from domestic shocks and is not immediately linked to capital flows.

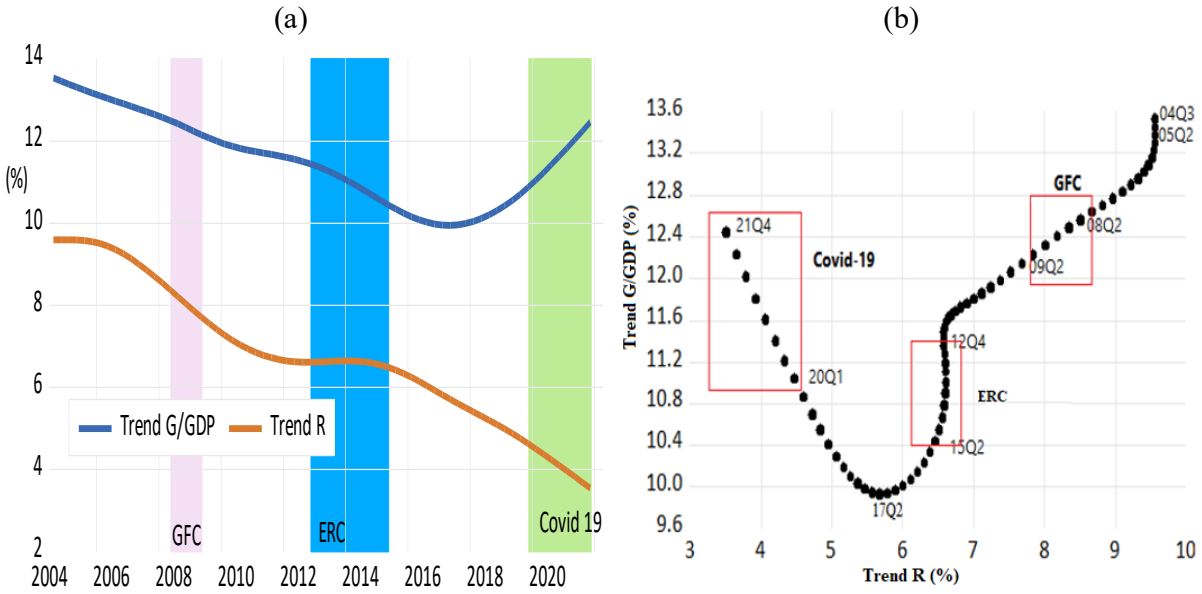
Figure 2. Government expenditure-seasonally adjusted (Gsa) and interest rates (R)



Source: Calculated from BPS, BI, MOF, 2023.

Figure 2(b) depicts the interaction between fiscal and monetary policies. Within this illustration, a discernible pattern of collaboration emerges between the fiscal and monetary authorities, revealing a negative correlation between interest rates and government spending in the economy.

Figure 3. The trend of policy



Source: Calculated from BI, MOF, 2023, modified.

Furthermore, Figure 3 illustrates government spending trends as a percentage of GDP (G/GDP) and policy interest rates. This policy trajectory describes the long-term policy direction. Figure 3(a) shows that the fiscal policy trend before 2017 was contractionary, marked by a decline in G/GDP. This reduction in G/GDP coincided with a downward trend in the policy interest rate (R), indicative of an expansionary stance. Post-2017, fiscal policy shifted toward expansion, as demonstrated by the increase in the G/GDP ratio. Additionally, monetary policy trends show a propensity to reduce interest rates further. The policies implemented after 2017 exhibit a higher level of fiscal-monetary coordination than before 2017, during which both policies pursued expansionary measures.

Figure 3(b) illustrates the dynamics of policy interactions in response to the crisis. During the GFC, there was a reduction in interest rates and government expenditure. An increasingly restrictive interest rate environment was evident during the ERC period, as the monetary authority upheld interest rates despite declining G/GDP. Evidence suggested a misalignment between interest rates and fiscal policy in both periods. These findings support the conclusions of Utama et al. (2022), indicating that during this period, monetary policy was more dominant and

functioned as the primary tool in the policy mix. The characteristics of policy coordination vary greatly when comparing the two previous crises to the crisis arising from the COVID-19 pandemic. During this period, monetary policy demonstrated significant accommodation to fiscal policy. The rise in G/GDP was facilitated by monetary policy, which reduced interest rates.

4.3 Main Results

4.3.1 The Empirical Verification of the Model

The estimation results of the Basic Model provide empirical validation for the model. A one-tailed test is employed to assess the significance of the coefficient. Table 3(a) shows that the impact of the disposable income gap, $\widehat{yd}_t$, on the output gap, $\hat{y}$, is positive. Real interest rates r exhibit a negative effect on the output gap. The expected future output gap, $\hat{y}_{t+1}$ or $E(\hat{y}_t)$, positively influences the current output gap. The government spending gap, $\hat{g}_t$, also contributes positively to the output gap. Finally, the expected exchange rate gap, $\widehat{er}_{t+1}$, has a positive impact on the output gap.

Furthermore, Table 3(c), PC equation, confirms that forward-looking inflation expectations, $\hat{\pi}_{t+1}$ or $E(\pi)$, backward-looking expectations π_{t-1} or $\ell\pi$, and the output gap all positively affect inflation gap ($\hat{\pi}$). Finally, Table 3(b) shows the central bank reacts positively to increasing foreign interest rates, R_t^F, increasing the difference between actual inflation and target inflation, π_t^τ, and increasing the exchange rate gap, $\widehat{er}_{t-1}$. The result in Table 3 verifies that all coefficients show the direction in accordance with the theory. These results verify that the model used can be applied in Indonesia.

Table 3. Estimation Basic Model

Variable	Coefficient		Independent Variable	Coefficient	
	Symbol	Value (Z-Stat.)		Symbol	Value (Z-Stat.)
(a) Dependent variable: $\hat{Y}_t$					
c	b_{10}	0.020	$\hat{y}_{t+1}$	b_{13}	0.145***
		(0.146)			(2.472)
$\widehat{yd}_t$	b_{11}	0.559***	$\hat{g}_t$	b_{14}	0.026***
		(9.769)			(4.628)
r_t	b_{12}	-0.071	$\widehat{er}_{t+1}$	b_{15}	0.025
		(-0.986)			(1.107)
Adj. R^2 : 0.642					
(b) Dependent variable: $\hat{R}_t$					
c	b_{20}	0.025	π_t^{τ}	b_{22}	0.512***
		(1.107)			(11.295)
R_{t-1}^F	b_{21}	5.623***	$\widehat{er}_{t-1}$	b_{23}	0.046***
		(38.128)			(2.780)
Adj. R^2 :0.758					
(c) Dependent variable: $\hat{\pi}_t$					
$\hat{\pi}_{t+1}$	b_{31}	0.476***	$\hat{y}_t$	b_{33}	0.007
		(4.140)			(0.607)
$\hat{\pi}_{t-1}$	b_{32}	0.491**			
		(6.065)			
Adj. R^2 :0.611					
Log likelihood		-180.208	Schwarz criterion		6.380
Avg. log likelihood		-0.924	Hannan-Quinn criterion		6.116
Determinant residual covariance		0.025	Akaike info criterion		5.945

Note: Significant at * α=0.10; ** α =0.05; *** α =0.01 and confirm theory.

z_α for 1-Tailed Tests: α=0.10 is − 1.28 or 1.28; α =0.05 is − 1.645 or 1.645; α =0.01 is − 2.33 or 2.33 (sources: https://www.sciencedirect.com/topics/mathematics/tailed-test).

4.3.2 The Estimation of the Triplet Recession Model

The estimation results of the initial equation in Table 4 indicate that the coefficients for the disposable income gap, expected output gap, and exchange rate gap are positive. The coefficient of the real interest rate is negative. The outcome of the second model aligns with that of the Basic Model. The monetary authority adjusts its policy interest rates in response to increases by the foreign monetary authority. The monetary authority raises policy interest rates when actual inflation exceeds the target and the exchange rate gap widens. The Phillips curve aligns with the fundamental model, as the positive coefficients of both forward and backward-looking expectations and the output gap support the theory's predictions.

Table 4 illustrates the efficacy of fiscal policy during non-recessionary and recessionary periods. In periods without a recession, fiscal policy significantly influences the output gap or the economy, as demonstrated by the positively significant coefficient β_{14}. However, during recessions induced by the GFC and the ERC, the effectiveness of fiscal policy decreases, but not statistically significant, as indicated by the negative value of δ_{11}. Conversely, during the recession triggered by the COVID-19 pandemic, there was a significant decline in the effectiveness of fiscal policy on the economy, as evidenced by the negative and significant value of the coefficient δ_{12}.

Additionally, Table 4(a) clarifies how monetary policy supports fiscal policy. The coefficient γ_{11} reflects the impact of monetary policy on the effectiveness of fiscal policy during the GFC and the ERC. Although the coefficient value is positive, it is not statistically significant, suggesting that monetary policy accommodation has a favorable impact on fiscal policy effectiveness without substantially increasing it. Since the efficiency of fiscal policy did not significantly decline throughout the recessions brought on by the GFC or the ERC, this lack of statistical significance is not problematic. These results are consistent with Utama et al. (2022), who indicate that monetary policy was more important during the GFC-induced recession, with

fiscal policy supporting monetary policy. Amidst the economic downturn triggered by the COVID-19 pandemic, the efficacy of fiscal policy experienced a notable decline. In this context, monetary policy accommodation emerged as an effective complement to fiscal measures. The observed positive and significant coefficient value γ_{12} attests to the affirmative impact of monetary policy in augmenting the effectiveness of fiscal policy on the broader economy.

The outcomes presented in Table 4(a) find affirmation in the corresponding Table 4(b). Specifically, the negative and significant value of δ_{20} in Table 4(b) indicates that in non-recessionary periods, monetary policy accommodates fiscal policy. Notably, expansionary fiscal measures were supported by a reduction in the central bank's policy interest rate. Additionally, during the recessions induced by the GFC and the ERC, we find a significant reduction in monetary policy accommodation since coefficient δ_{21} is positive. These consistent findings reinforce the observations in Table 4(a), indicating that monetary policy accommodation did not play a significant role in augmenting the effectiveness of fiscal policy during the GFC or the ERC.

Amid the COVID-19-induced recession, there was a notable surge in monetary policy accommodation toward fiscal policy. This observation is substantiated by the significantly negative coefficient value of δ_{22} . These outcomes further corroborate the earlier findings presented in Table 4(a), emphasizing the constructive impact of monetary policy in enhancing the effectiveness of fiscal measures on the economy.

The findings corroborate earlier research indicating the coordination of fiscal and monetary policies in Indonesia (Mochtar, 2004; Simorangkir, 2007; Simorangkir & Adamanti, 2010; Rahutami, 2011; Santoso, 2011; Kuncoro et al., 2013; Yunanto & Medyawati, 2013; Utama, 2020; Utama et al., 2022). This study extends previous research by confirming the flexibility in the policy mix, rather than solely focusing on policy coordination. The interaction of the two policies is

calibrated to meet the demands of the economy, particularly during a recession. The findings support the findings of Bianchi and Melosi (2019).

Table 4. Estimation Triplet Recession Model

Variable	Coefficient		Independent Variable	Coefficient	
	Symbol	Value (Z-Stat.)		Symbol	Value (Z-Stat.)
(a) Dependent variable: $\hat{y}_t$					
c	β_{10}	0.063	$\widehat{er}_{t+1}$	β_{15}	0.011
		(0.467)			(0.611)
yd_t	β_{11}	0.593***	$\widehat{g_t}.D1_t$	δ_{11}	-0.030
		(11.904)			(-0.945)
r_t	β_{12}	-0.069	$\widehat{g_t}.D2_t$	δ_{12}	-0.246**
		(-1.256)			(-1.922)
$\hat{y}_{t+1}$	β_{13}	0.103*	$\hat{g}_t R_t.D1_t$	γ_{11}	0.003
		(1.595)			(0.729)
$\hat{g}_t$	β_{14}	0.027***	$\hat{g}_t R_t.D2_t$	γ_{12}	0.061***
		(4.722)			(2.234)
Adj. R^2 : 0.666					
(b) Dependent variable: $\hat{R}_t$					
c	β_{20}	6.563***	G_t	δ_{20}	-3.07E-06***
		(26.322)			(-3.412)
R_{t-1}^F	β_{21}	0.440	$G_t.D1_t$	δ_{21}	1.57E-06**
		(5.957)***			(1.929)
π_t^τ	β_{22}	0.408***	$G_t.D2_t$	δ_{22}	-1.77E-06***
		(8.210)			(-2.429)
$\widehat{er}_{t-1}$	β_{23}	0.046***			
		(3.437)			
Adj. R^2 :0.833					
(c) Dependent variable: $\hat{\pi}_t$					
$\hat{\pi}_{t+1}$	β_{31}	0.476***	$\hat{y}_t$	β_{33}	0.007
		(4.142)			(0.612)
$\hat{\pi}_{t-1}$	β_{32}	0.491***			
		(6.069)			
Adj. R^2 :0.611					

Log likelihood	-161.921	Schwarz criterion	5.598
Avg. log likelihood	-0.830	Hannan-Quinn criterion	6.267
Determinant residual covariance	0.025	Akaike info criterion	5.862

Note: Significant at * α=0.10; ** α =0.05; *** α =0.01 and confirm theory.
z_α for 1-Tailed Tests: α=0.10 is − 1.28 or 1.28; α =0.05 is − 1.645 or 1.645; α =0.01 is − 2.33 or 2.33
z_α for 2-Tailed Tests: α=0.10 is − 1.645 and 1.645; α =0.05 is − 1.96 and 1.96; α =0.01 is − 2.58 and 2.58. (sources: https://www.sciencedirect.com/topics/mathematics/tailed-test).
We use 1-Tail Test for all β and 2-Tail Test for δ and γ.

4.3.3 Residual Test and Robustness Check

We assess the robustness through two distinct approaches. First, we scrutinize whether the application of the theory aligns with the observed coefficients in Indonesia or if the coefficient direction is consistent with theoretical predictions. We examine the consistency of coefficient directions across the Basic Model and the Triplet Recession Model. The findings in Tables 3 and 4 reveal that the coefficient signs align with the theoretical predictions in both models, confirming the model's applicability in the Indonesian context. These results show empirical validation of the IS-MP-PC model used in Indonesia.

Table 5. Residual test

System residual normality test				
	Basic Model		Triplet Recession Model	
Component	Jarque-Bera (JB)	JB-Prob.	Jarque-Bera (JB)	JB-Prob.
1	4.102	0.129	1.281	0.527
2	1.243	0.537	0.450	0.799
3	4.103	0.129	6.720	0.035
Joint	9.449	0.150	8.450	0.207
The Augmented Dickey-Fuller (ADF) unit root test				
	t-statistic	*P*-value	*t*-statistic	*P*-value
Equation 1	-4.718	0.000	-8.818	0.000
Equation 2	-3.245	0.002	-4.436	0.000
Equation 3	-6.483	0.000	-6.483	0.000

Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationary test

	LM-Stat.	LM-Stat.
Equation 1	0.180	0.080
Equation 2	0.677	0.032
Equation 3	0.075	0.075

Auto-correlation test: $\varepsilon_t = \alpha\varepsilon_{t-1} + u_t$

	Coef.	*t*-statistic	*P*-value	Coef.	*t*-statistic	*P*-value
Equation 1	-0.071	-0.551	0.584	-0.132	-1.028	0.308
Equation 2	0.712	8.030	0.000	0.534	5.092	0.000
Equation 3	0.534	5.092	0.000	-0.532	-5.161	0.000

Note: System residual normality tests: Orthogonalization method: Cholesky of covariance (Lutkepohl). Null hypothesis: residuals are multivariate normal.
The ADF unit root test: null hypothesis: residual has a unit root. We assume no intercept and trend (none).
The KPSS stationary test: null hypothesis: residual has stationarity. We assume no trend (intercept). Critical value: 0.739 (1%), 0.463 (5%), and 0.347 (10%).
We estimate the equation $\varepsilon_t = \alpha\varepsilon_{t-1} + u_t$ as a simple technique to test for autocorrelation. The null hypothesis is α=0. There is autocorrelation if α is significantly different from zero.

Second, we conducted several residual tests, including normality tests, i.e., the Augmented Dickey-Fuller (ADF) unit root test, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test for the residuals, and an autocorrelation test that is presented in Table 5. The Jarque-Bera (JB) test results indicate that the residuals, both for the Basic and the Triplet Recession Model, are jointly normal distributions. The joint-normal distribution signifies that the likelihood function is specified correctly; therefore, the FIML is fully efficient. Based on the normality test, we find that the estimated system, the basic model, and the Triplet Recession Model are efficient. Furthermore, the ADF and KPSS test results indicate that all residual equations have no unit root or are stationary. The stationarity of residuals signifies the presence of a long-term equilibrium or cointegration among the variables (Engle & Granger, 1987). The presence of cointegration indicates that the estimation results are not spurious.

Furthermore, the test findings suggest that the goods market equation (IS) in the Basic and Triplet Recession Models lacks autocorrelation. This finding shows that estimating the goods market equation is free of the adverse effects of

autocorrelation, which can lead to inconsistent and inefficient coefficients. The absence of autocorrelation in this equation is critical since it leads to the conclusion about the impact of monetary policy on fiscal policy effectiveness.

However, the autocorrelation problem is visible in the monetary reaction function (MP) and the Phillips Curve (PC). This condition makes sense because the MP equation describes a relatively consistent and credible monetary policy. In addition, inflation is persistent, as shown by many studies. This finding is in accordance with various studies that have been conducted on the persistence of inflation and monetary policy (Kurozumi & Zandweghe, 2023; Park, 2018; Lovcha & Perez-Laborda, 2018; Coenen, 2007; Erceg & Levin, 2003; Steinsson, 2003; Westelius, 2005). In addition, this result is also in line with previous studies that identified the persistence of inflation in Indonesia (Aginta, 2023, 2024; Wimanda et al., 2011).

5. Conclusion

This study contributes valuable insights into the dynamics of fiscal and monetary policy effectiveness during non-crisis and crisis periods in Indonesia. Notably, the research reveals that fiscal policy exerts a significant positive influence on increasing the output gap in non-crisis periods, demonstrating its effectiveness in influencing the economy. Furthermore, monetary policy is observed to accommodate fiscal policy.

During recessions triggered by external upheavals, such as the GFC and the ERC, fiscal policy maintains its effectiveness without a significant reduction. In crises like the GFC and ERC, monetary policy scales back its accommodation of fiscal policy, resulting in a limited impact on enhancing the effectiveness of fiscal measures. This period also suggests that monetary policy plays an active role in interest rate control to mitigate the economic impact of the recession.

However, a substantial decline in fiscal policy effectiveness was noted during the recession induced by the COVID-19 pandemic. Monetary policy significantly increases its accommodation compared to non-crisis periods. Moreover, monetary policy proved to be a significant factor in sustaining fiscal policy's effectiveness on the economy during this crisis. These nuanced findings underscore the importance of understanding the intricate interplay between fiscal and monetary policies in different crisis contexts, providing policymakers with valuable insights for navigating economic challenges.

Based on the conclusion, several suggestions for fiscal and monetary policy in Indonesia can be provided. First, fiscal and monetary policies should be flexible in adjusting the balance between fiscal and monetary policies based on the type of crisis. For example, during external turmoil, such as the GFC, fiscal policy should focus more on maintaining high aggregate demand, and monetary policy should focus on controlling inflation and interest rates. In a severe crisis, such as the COVID-19 pandemic, fiscal and monetary policies should be closely aligned to support each other, with monetary policy becoming more accommodative to support fiscal measures.

Despite this study being good in studying the effects of monetary policy on the efficiency of fiscal policy, there are still some drawbacks. Although the model generated the observed parameters accurately using the NK framework, it cannot create a solid dynamic analysis. The SVAR model can be used for future research, incorporating dynamic analysis. However, the challenge in compiling the SVAR model is the need to adjust the character of the NK model into the SVAR estimation model, such as including NK restrictions based on the micro approach to the SVAR model, forward-looking expectations, policy rule interpretation, data stationarity, lag length, and others. Another option worth considering is the hybrid DSGE-SVAR model.

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