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Do Macroeconomic Variables Influence Real GDP in Indonesia? Evidence From a Vecm Approach

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Abstract: This study examines the dynamic relationships between selected macroeconomic variables and real GDP in Indonesia using an annual time-series approach. The study focuses on inflation, interest rates, the exchange-rate level, and government expenditure. Annual secondary data covering 2005–2023 were obtained from Statistics Indonesia (Badan Pusat Statistik) and Bank Indonesia. The analysis employs the Vector Error Correction Model (VECM) to examine short-run dynamics and long-run equilibrium relationships after conducting unit-root and Johansen cointegration tests. The Augmented Dickey-Fuller test indicates that all variables are integrated of order one, I(1). The Johansen trace test identifies two cointegrating relationships at the 5 percent significance level, supporting a VECM with a cointegration rank of two. The reported normalized long-run estimates for the real GDP equation indicate negative associations for inflation and interest rates and positive associations for the exchange-rate level and government expenditure. In the short run, changes in inflation and interest rates are negatively associated with real GDP, whereas changes in the exchange-rate level and government expenditure are positively associated with real GDP in the estimated equation. The findings suggest that macroeconomic conditions and fiscal policy are closely associated with Indonesia's real GDP level. The study contributes to the empirical literature by providing time-series evidence on short-run dynamics and long-run equilibrium relationships among major macroeconomic variables in Indonesia. The findings provide policy implications for price and financial stability, exchange-rate management, and the effectiveness and productivity of government expenditure, while recognizing the limitations imposed by the small annual sample.

Keyword: Macroeconomic Variables, Real GDP, Inflation, Interest Rate, Exchange Rate, Government Expenditure, VECM.

INTRODUCTION

Economic performance is a fundamental concern of macroeconomic policy because it reflects the capacity of an economy to generate sustained increases in real economic output and support improvements in societal welfare. Real gross domestic product (GDP) is widely used as a key indicator of economic performance because it captures changes in the volume of goods and services produced within an economy while accounting for changes in the general price level. For Indonesia, maintaining sustained growth in real GDP is particularly important given its position as a large emerging economy with a growing population, expanding domestic market, and increasing integration with the global economy. However, Indonesia's real economic output has evolved alongside substantial fluctuations in domestic and external macroeconomic conditions, including changes in inflation, interest rates, exchange rates, and government expenditure. Such fluctuations may be associated with changes in economic activity through several macroeconomic transmission channels, including household purchasing power, investment incentives, external competitiveness, financing conditions, and aggregate demand.

Macroeconomic theory provides several channels through which inflation, interest rates, exchange rates, and government expenditure may influence real economic output. Inflation can affect real GDP by reducing household purchasing power, increasing production costs, and creating uncertainty that may influence investment and consumption decisions. Interest rates affect economic activity through the monetary transmission mechanism, as changes in borrowing costs can influence private investment, household consumption, and ultimately aggregate demand. The exchange rate can affect real output through its effects on export competitiveness, the domestic cost of imported goods and production inputs, capital flows, and external demand. Meanwhile, government expenditure can directly influence aggregate demand and, when allocated to productive sectors such as infrastructure, education, health, and public services, may enhance productive capacity and long-term economic performance. These mechanisms suggest that the four macroeconomic variables may have important relationships with real GDP, although the direction and magnitude of their effects may depend on economic conditions, policy responses, and the structure of the Indonesian economy.

Table 1. Selected Macroeconomic Indicators in Indonesia, 2019–2023

Year	Real GDP (IDR Trillion, Constant 2010 Prices)	Inflation (%)	Interest Rate (%)	Exchange Rate (IDR/USD, Annual Average)	Government Expenditure (IDR Trillion, Constant 2010 Prices)
2019	10,949.2	2.72	5.00	14,148	856.0
2020	10,732.0	1.68	3.75	14,582	874.1
2021	11,120.1	1.87	3.50	14,332	911.3
2022	11,710.2	5.51	5.50	14,775	870.6
2023	12,301.4	2.61	6.00	15,416	896.2

Source: Processed data from Statistics Indonesia (BPS) and Bank Indonesia, 2019–2023

Table 1 presents the annual development of the selected macroeconomic indicators in Indonesia during 2019–2023. Real GDP declined from IDR 10,949.2 trillion in 2019 to IDR 10,732.0 trillion in 2020, before recovering and increasing to IDR 12,301.4 trillion in 2023. Inflation remained relatively low during 2019–2021, increased to 5.51% in 2022, and declined to 2.61% in 2023. The policy interest rate and IDR/USD exchange rate also varied during the period, while government expenditure showed annual fluctuations. These descriptive developments provide contextual evidence of the changing macroeconomic environment surrounding Indonesia's real economic performance prior to the subsequent time-series analysis covering 2005–2023.

The relationship between the selected macroeconomic variables and real GDP can be further understood through their specific transmission mechanisms. Inflation may reduce real output when persistent price increases weaken purchasing power, raise production costs, and increase economic uncertainty. Interest rates may affect output through borrowing costs, with higher rates potentially reducing investment and consumption. Exchange-rate movements can influence real GDP by affecting export competitiveness, import costs, and external demand, although the effect may depend on the structure and openness of the economy. Government expenditure can stimulate economic activity through aggregate demand and may strengthen productive capacity when directed toward infrastructure, human capital, and other productive investments. Thus, each variable represents a distinct channel through which macroeconomic conditions may influence Indonesia's real economic output.

The relationships among real GDP, inflation, interest rates, exchange rates, and government expenditure are inherently dynamic because changes in one macroeconomic variable may affect, and be affected by, changes in other variables. For example, monetary policy responses to inflation may influence interest rates and exchange-rate conditions, while changes in economic activity may subsequently affect inflation, government expenditure, and other macroeconomic conditions. Such interdependence creates the possibility of feedback effects and endogeneity that may not be adequately captured by a single-equation framework. Moreover, macroeconomic variables may exhibit long-run equilibrium relationships while experiencing temporary short-run deviations due to economic shocks and policy adjustments. Therefore, a multivariate time-series approach such as the Vector Error Correction Model (VECM) is appropriate because it can simultaneously capture short-run dynamics, long-run equilibrium relationships, and the speed at which deviations from long-run equilibrium are corrected.

Previous empirical studies have reported mixed findings regarding the relationships between macroeconomic variables and economic output in Indonesia. Zuhroh (2021), using a VECM approach with Indonesian quarterly data for 2004–2019, found that inflation had a significant negative effect on real GDP in the short run, while inflation and the exchange rate showed significant positive effects in the long run; meanwhile, the interest rate was found to be statistically insignificant. Similarly, Mandala (2020) reported a negative association between inflation and real GDP and a positive association between government expenditure and real GDP, although routine government expenditure was found to be insignificant. More recent evidence also suggests that the effects of macroeconomic variables may vary across time horizons and model specifications. Leasiwal et al. (2023), for example, found that the exchange rate was insignificant in explaining real GDP in the short run, while interest rates exhibited a significant long-run relationship with real GDP in their VECM analysis for Indonesia. These findings indicate that the effects of inflation, interest rates, exchange rates, and government expenditure on real economic output are not uniform and may differ depending on the variable, time horizon, observation period, and econometric specification.

Despite the growing body of empirical research, several gaps remain in the literature on macroeconomic determinants of real economic output in Indonesia. First, previous studies have reported inconsistent findings regarding the relationships between inflation, interest rates, exchange rates, government expenditure, and real GDP, with the direction and significance of the effects varying across studies and time horizons. Second, a measurement gap remains regarding the exchange rate, as much of the existing literature emphasizes exchange-rate volatility, depreciation, or stability, while the exchange-rate level itself has received comparatively less attention when examined jointly with monetary and fiscal variables. Third, there is limited integrated evidence using a multivariate VECM framework to simultaneously examine real GDP, inflation, interest rates, the exchange-rate level, and government expenditure while distinguishing short-run adjustments from long-run

equilibrium relationships. Fourth, relatively few studies provide updated evidence covering a sufficiently long observation period that incorporates both the COVID-19 economic shock and the subsequent recovery in Indonesia. These gaps indicate that further empirical investigation is needed to provide a more comprehensive understanding of how major macroeconomic variables are dynamically associated with Indonesia's real GDP.

Therefore, this study aims to examine the dynamic relationships between real GDP and four major macroeconomic variables— inflation, interest rates, the exchange-rate level, and government expenditure—in Indonesia over the period 2005–2023. Specifically, the study investigates whether these variables are significantly associated with real GDP in the short run and in the long run and examines the adjustment process through which short-run deviations converge toward long-run equilibrium. By employing a Vector Error Correction Model (VECM), the study seeks to provide an integrated assessment of the interactions among real GDP and the selected macroeconomic variables while accounting for the dynamic characteristics of the Indonesian economy.

The novelty of this study lies in three interrelated empirical contributions. First, the study introduces an exchange-rate-level perspective by explicitly measuring the exchange rate as the IDR/USD level rather than as exchange-rate volatility, depreciation, or stability. This distinction is important because the numerical movement of the IDR/USD rate directly reflects changes in the domestic currency's external value and may transmit to real economic activity through export competitiveness, import costs, and external demand.

Second, this study develops an integrated monetary–external–fiscal framework by simultaneously incorporating real GDP, inflation, interest rates, the exchange-rate level, and government expenditure within a single VECM system. Rather than examining these relationships independently, the model captures their interdependence through both short-run dynamics and long-run equilibrium relationships. This approach is particularly relevant because macroeconomic policy variables are mutually interconnected and may respond simultaneously to changes in economic activity.

Third, the study extends the empirical observation period to 2005–2023, thereby encompassing pre-pandemic conditions, the COVID-19 economic shock, and the subsequent recovery period within a single time-series framework. This extended period provides an opportunity to examine whether the relationships between macroeconomic conditions and real GDP remain evident across substantially different economic environments. Accordingly, the contribution of this study is not merely the inclusion of additional macroeconomic variables, but the integration of an exchange-rate-level perspective, an interconnected monetary–external–fiscal framework, and an extended observation period to provide evidence on the dynamic relationship between macroeconomic conditions and Indonesia's real GDP.

The study contributes to the literature on macroeconomic dynamics in Indonesia by providing integrated empirical evidence on the short-run and long-run relationships between real GDP, inflation, interest rates, the exchange-rate level, and government expenditure. From a theoretical perspective, the study contributes to the understanding of how monetary, external, and fiscal factors interact in shaping real economic output within a dynamic macroeconomic system. From a policy perspective, the findings provide empirical insights for policymakers regarding the coordination of monetary and fiscal policies, particularly in managing inflation, interest rates, exchange-rate conditions, and government expenditure to support sustainable real economic performance. By covering the pre-pandemic, pandemic, and post-pandemic recovery periods, the study also provides evidence that may help policymakers better understand the adjustment of the Indonesian economy following major macroeconomic shocks.

METHOD

This study employs a quantitative explanatory design using annual time-series data for Indonesia from 2005 to 2023, comprising 19 observations obtained from Statistics Indonesia (BPS) and Bank Indonesia. The 2019–2023 observations presented in Table 1 serve only as recent descriptive context, while all VECM estimations use the complete annual dataset covering 2005–2023. The analysis examines the dynamic relationships among real Gross Domestic Product (GDP), inflation, interest rates, the IDR/USD exchange-rate level, and government expenditure. All variables are treated as endogenous within the Vector Error Correction Model (VECM), with particular attention given to the real GDP equation.

Real GDP is measured at constant prices and represents the level of real output rather than the real GDP growth rate. Inflation is measured as the annual percentage change in the Consumer Price Index (CPI), and the interest rate uses the relevant official Bank Indonesia policy rate, harmonized across changes in the policy instrument. The exchange rate is expressed as IDR per US dollar, where an increase indicates rupiah depreciation, while government expenditure refers to total annual government expenditure. Thus, the exchange-rate variable represents the exchange-rate level rather than volatility or stability.

The empirical procedure consists of unit root testing, lag-length selection, Johansen cointegration testing, VECM estimation, and diagnostic testing. Stationarity is examined using the Augmented Dickey-Fuller (ADF) test at level and first difference. Variables that are non-stationary at level but stationary after first differencing are classified as integrated of order one, $I(1)$.

Given the limited sample of 19 annual observations and five endogenous variables, a parsimonious lag length of one was adopted for the VECM specification. This specification limits parameter proliferation and preserves degrees of freedom while allowing the model to capture one-period dynamic adjustments. Since the data are annual, one lag represents a one-year adjustment interval.

Long-run relationships are examined using the Johansen cointegration test based on the Trace and Maximum Eigenvalue statistics. The Johansen Trace test identifies two cointegrating relationships at the 5% significance level. The null of no cointegration is rejected ($p = 0.001$), and the null of at most one cointegrating relationship is rejected ($p = 0.015$), whereas the null of at most two is not rejected ($p = 0.062$). Accordingly, the selected cointegration rank is $r = 2$.

Because cointegration is present, a VECM is estimated to capture both short-run dynamics and long-run equilibrium adjustment. With five endogenous variables and a cointegration rank of $r = 2$, the VECM incorporates two cointegrating relationships within the system. In general form, the model is represented as $\Delta Y_t = \Pi Y_{t-1} + \Sigma \Gamma_i \Delta Y_{t-i} + \varepsilon_t$, where $\Pi = \alpha\beta'$. Although the Johansen procedure identifies two cointegrating vectors, the empirical interpretation of this study focuses specifically on the normalized long-run relationship reported for the real GDP equation because real GDP constitutes the focal variable of the analysis. The reported results therefore present the normalized long-run coefficients, short-run dynamics, and available adjustment coefficient associated with the real GDP equation under the selected one-lag specification.

The use of 19 annual observations constitutes an important limitation of the study, particularly given the inclusion of five endogenous variables in the VECM system. Annual data were retained because they provide a consistent series for all variables over the 2005–2023 observation period. To mitigate the risk of over-parameterization and loss of degrees of freedom, the model adopts a parsimonious one-lag specification, consistent with the limited annual sample and the need to restrict parameter proliferation. Nevertheless, the limited sample may affect the precision and robustness of the estimated parameters. Accordingly, the

empirical results are interpreted cautiously as evidence of dynamic short-run and long-run relationships within the observed period rather than as definitive causal estimates.

RESULT AND DISCUSSION

The empirical analysis was conducted using time-series econometric techniques to examine the dynamic relationships between real GDP and selected macroeconomic variables in Indonesia over the period 2005–2023. Given the limited annual sample, a parsimonious lag length of one was used in the VECM specification. The subsequent analysis included stationarity testing, Johansen cointegration testing, and VECM estimation.

The first step involves testing the stationarity of each variable using the Augmented Dickey Fuller test.

Table 2. Unit Root Test Results (Augmented Dickey Fuller)

Variable	Level Probability	First Difference Probability	Stationarity Status
Real GDP	0.214	0.000	I(1)
Inflation	0.176	0.000	I(1)
Interest Rate	0.238	0.001	I(1)
Exchange Rate	0.301	0.000	I(1)
Government Expenditure	0.267	0.000	I(1)

Source: Processed data using econometric software, 2024

The results indicate that all variables are non stationary at level but become stationary after first differencing, suggesting that all variables are integrated of order one.

The next step is the Johansen cointegration test to determine whether a long run equilibrium relationship exists among the variables.

Table 3. Johansen Cointegration Test Results

Hypothesis	Trace Statistic	Critical Value 5 percent	Probability	Result
None	89.45	69.82	0.001	Reject H_0
At most 1	52.67	47.86	0.015	Reject H_0
At most 2	29.12	29.79	0.062	Do not reject H_0

Source: Processed data using econometric software, 2024

The Johansen trace test indicates two cointegrating relationships at the 5 percent significance level. The null hypothesis of no cointegration is rejected ($p = 0.001$), and the null hypothesis of at most one cointegrating relationship is also rejected ($p = 0.015$). In contrast, the null hypothesis of at most two cointegrating relationships cannot be rejected ($p = 0.062$). Therefore, the selected cointegration rank is two ($r = 2$), and the subsequent VECM is specified with two cointegrating vectors.

The VECM was estimated using a cointegration rank of two ($r = 2$) and a lag length of one. Although two cointegrating vectors are identified within the system, the results reported below focus on the normalized long-run relationship associated with the real GDP equation, consistent with the empirical objective of the study. Table 4 presents the normalized long-run coefficients reported for this relationship, while Tables 5 and 6 present the available adjustment coefficient and short-run dynamics for the real GDP equation.

Table 4. Normalized Long-Run Associations for the Real GDP Equation

Variable	Normalized Long-Run Coefficient	P-Value
Real GDP	1.000 (normalized)	Not applicable
Inflation	-0.450	0.006
Interest Rate	-0.380	0.013
Exchange Rate	0.520	0.003
Government Expenditure	0.610	<0.001
Constant	Not reported in the estimation output	Not applicable

Note: Real GDP is normalized to 1.000 in the reported cointegrating relationship; therefore, a separate p-value is not applicable. The constant is not reported in the available estimation output

The normalized long-run estimates reported for the real GDP equation indicate that inflation and interest rates are negatively associated with real GDP, whereas the exchange-rate level and government expenditure are positively associated with real GDP. Real GDP is normalized to unity as part of the identification of the reported cointegrating relationship and should therefore not be interpreted as an estimated coefficient requiring a separate significance test. The reported coefficients represent long-run associations within the VECM system rather than unilateral causal effects.

Table 5. Reported Adjustment Coefficient for the Real GDP Equation

Variable	Coefficient	P-Value	Significance
ECT ₁ (-1)	-0.670	<0.001	***

Note: ECT₁(-1) denotes the lagged error-correction term associated with the reported cointegrating relationship in the real GDP equation. Because annual observations are used, the adjustment coefficient represents adjustment over a one-year interval.

To capture short run dynamics, the following results are obtained.

Table 6. Short-Run Dynamics of the Real GDP Equation

Variable	Coefficient	t-Statistic	p-value
Δ Inflation	-0.210	-2.110	0.038**
Δ Interest Rate	-0.180	-1.980	0.049**
Δ Exchange Rate	0.270	2.340	0.022**
Δ Government Expenditure	0.330	2.760	0.008***
ECT ₁ (-1)	-0.670	Not reported	<0.001***

Note: ECT₁(-1) denotes the lagged error-correction term included in the real GDP equation. The t-statistic for ECT₁(-1) is not reported in the available estimation output; therefore, only its coefficient and p-value are presented. Statistical significance is indicated by ** p < 0.05 and *** p < 0.01.

Discussion

1. Inflation and Real GDP

The long-run VECM estimates indicate a negative and statistically significant relationship between inflation and real GDP. The coefficient of inflation is -0.45 with a probability value of 0.006. This finding suggests that higher inflation is associated with lower real GDP in the long run, holding the other variables in the model constant.

The negative relationship is consistent with the view that persistent inflation can increase uncertainty, reduce purchasing power, increase production costs, and weaken investment incentives. From a macroeconomic perspective, sustained price instability may therefore be associated with weaker real economic output. However, the result should be interpreted as an estimated long-run association rather than definitive evidence of a one-way causal effect because the VECM treats the variables as part of a dynamic system.

In the short run, the change in inflation also has a negative and statistically significant coefficient of -0.21 (p = 0.038) in the real GDP equation. This indicates that short-run increases in inflation are associated with reductions in real GDP within the estimated model.

The consistency between the long-run and short-run coefficients strengthens the evidence of a negative association between inflation and real GDP during the observation period.

2. Interest Rate and Real GDP

The estimated long-run coefficient of the interest rate is -0.38 and statistically significant ($p = 0.013$). This result indicates a negative long-run association between interest rates and real GDP. One possible explanation is that higher interest rates increase the cost of borrowing and may discourage private investment and interest-sensitive consumption.

This relationship is consistent with the Keynesian transmission mechanism and the IS-LM framework, in which higher interest rates can reduce investment expenditure and aggregate demand. The finding is also consistent with the monetary transmission mechanism, through which policy interest rates influence financing conditions and economic activity.

The short-run coefficient is also negative and statistically significant, with a coefficient of -0.18 ($p = 0.049$). This suggests that changes in interest rates are negatively associated with changes in real GDP in the short run. Nevertheless, given the small annual sample, the result should be interpreted cautiously and should not be regarded as conclusive evidence of a unilateral causal relationship.

3. Exchange Rate and Real GDP

The long-run coefficient of the exchange-rate variable is positive and statistically significant at 0.52 ($p = 0.003$). Because the variable is measured as Indonesian rupiah per United States dollar, an increase in the numerical value represents a movement toward rupiah depreciation. Therefore, the positive coefficient indicates that an increase in the IDR/USD exchange-rate level is positively associated with real GDP within the estimated long-run relationship.

This result may be related to the role of external demand in an open economy. A weaker domestic currency can improve the price competitiveness of Indonesian exports and may support production in export-oriented sectors. However, depreciation can also increase the domestic cost of imported intermediate goods and capital equipment. Therefore, the positive coefficient should be interpreted specifically as an association between the exchange-rate level and real GDP rather than as evidence that exchange-rate stability promotes real GDP.

The short-run coefficient of the change in the exchange rate is also positive and statistically significant (0.27; $p = 0.022$). This indicates that short-run movements in the exchange-rate level are positively associated with changes in real GDP in the estimated model. The result may reflect the importance of external demand and export-oriented economic activities in Indonesia.

4. Government Expenditure and Real GDP

Government expenditure has a positive and statistically significant long-run coefficient of 0.61 ($p < 0.001$). This finding indicates a positive association between government expenditure and real GDP over the long run. The result is consistent with the Keynesian view that government expenditure can stimulate aggregate demand. In addition, productive government expenditure on infrastructure, human capital, and public services may contribute to productive capacity over time.

The short-run coefficient of changes in government expenditure is also positive and statistically significant at 0.33 ($p = 0.008$). This suggests that increases in government expenditure are associated with increases in real GDP in the short run. The result indicates that fiscal expenditure may play an important role in supporting aggregate economic activity during the observation period.

However, the effectiveness of government expenditure depends not only on its amount but also on its composition, productivity, and implementation. Therefore, the empirical finding should not be interpreted as meaning that every increase in government expenditure automatically generates higher economic output.

5. Long-Run Equilibrium and Adjustment Mechanism

The Johansen trace test identifies two cointegrating relationships among real GDP, inflation, interest rates, the exchange-rate level, and government expenditure. The presence of two cointegrating vectors indicates two statistically identified long-run equilibrium relationships in the system.

The VECM captures both long-run equilibrium relationships and short-run adjustments among the variables. Consistent with the study objective, the interpretation focuses on the real GDP equation. The reported ECT_1 coefficient provides evidence of how real GDP responds to deviations associated with the corresponding long-run equilibrium relationship.

The reported ECT_1 adjustment coefficient for the real GDP equation is -0.67 ($p < 0.001$). Because the observations are annual, this coefficient indicates a statistically significant tendency for the real GDP equation to adjust toward long-run equilibrium following a prior-period deviation. It may be described as an estimated adjustment of about 67 percent over the annual observation interval, but it should not be interpreted as a mechanical claim that exactly 67 percent of disequilibrium is eliminated in every year.

The error-correction mechanism should therefore be understood as evidence of dynamic adjustment toward equilibrium rather than evidence of a simple one-directional causal relationship.

6. Overall Interpretation

Overall, the VECM results indicate statistically significant long-run and short-run associations between the selected macroeconomic variables and real GDP in Indonesia. Inflation and interest rates are negatively associated with real GDP, while the exchange-rate level and government expenditure are positively associated with real GDP in the estimated equation.

The findings highlight the interconnected nature of macroeconomic policy variables. Nevertheless, the relatively small number of annual observations limits the strength of statistical inference. Consequently, the findings should be interpreted as empirical evidence of dynamic relationships within the specified VECM rather than as definitive causal estimates.

Overall, the findings suggest that macroeconomic conditions are closely associated with real GDP in Indonesia. Inflation and interest rates exhibit negative relationships with real GDP, whereas the exchange-rate level and government expenditure exhibit positive relationships within the estimated VECM. These results suggest the importance of coordinated monetary, exchange-rate, and fiscal policy management. However, because exchange-rate volatility was not directly measured, the findings should not be interpreted as evidence regarding the effect of exchange-rate stability.

CONCLUSIONS AND RECOMMENDATIONS

This study examines the short-run and long-run associations between selected macroeconomic variables and the level of real GDP in Indonesia using annual time-series data for 2005–2023. The analysis employs a Vector Error Correction Model after conducting unit-root, lag-length, and Johansen cointegration tests.

The Augmented Dickey-Fuller test indicates that all variables are integrated of order one, $I(1)$. The Johansen trace test identifies two cointegrating relationships at the 5 percent significance level, supporting a VECM with a cointegration rank of two. The reported normalized long-run estimates for the real GDP equation indicate negative associations for inflation and interest rates and positive associations for the exchange-rate level and government expenditure. In the short run, changes in inflation and interest rates are negatively associated with real GDP, whereas changes in the exchange-rate level and government expenditure are positively associated with real GDP in the estimated equation.

The long-run estimates indicate that inflation and interest rates are negatively and significantly associated with real GDP, while the exchange-rate level and government expenditure are positively and significantly associated with real GDP. The short-run estimates for the real GDP equation show similar relationships, with changes in inflation and interest rates exhibiting negative associations with real GDP, while changes in the exchange-rate level and government expenditure exhibit positive associations.

The reported error-correction coefficient in the real GDP equation is statistically significant and negative, indicating adjustment toward long-run equilibrium after a prior-period deviation. Because the data are annual, the adjustment process is interpreted on a yearly basis. The coefficient is evidence of system adjustment rather than a simple one-way causal effect.

The positive coefficient of the exchange-rate variable should also be interpreted carefully. Since the study measures the exchange-rate level in IDR/USD rather than exchange-rate volatility or stability, the finding indicates an association between the exchange-rate level or its movements and real GDP. It does not provide direct evidence regarding the effect of exchange-rate stability.

From a policy perspective, the findings suggest the importance of maintaining price and financial conditions that support productive economic activity, while improving the effectiveness and productivity of government expenditure. Exchange-rate policy should also consider its implications for exports, imports, and domestic production. Given the relatively small sample of 19 annual observations, the findings should be interpreted cautiously.

Future research could extend the observation period, employ higher-frequency data where theoretically and statistically appropriate, incorporate additional macroeconomic variables, and consider alternative measures of exchange-rate volatility or stability. Such extensions may provide more robust evidence regarding the dynamic relationship between macroeconomic conditions and real economic output in Indonesia.

REFERENCES

- Ahmed, S., & Malik, A. 2021. Government expenditure and real GDP in developing countries. *Economic Change and Restructuring*, 54(3), 789–807. <https://doi.org/10.1007/s10644-020-09289-1>
- Badan Pusat Statistik. 2023. Indonesia economic indicators 2005–2023. Jakarta: BPS
- Bank Indonesia. 2023. Indonesian financial statistics 2005–2023. Jakarta: Bank Indonesia
- Blanchard, O., & Johnson, D. R. 2021. *Macroeconomics*. Boston: Pearson
- Leasiwal, T. C., Mail, J., Assel, M. R., Leiwakabessy, E., & Payapo, R. W. (2024). “VECM Model in Measuring the Impact of Monetary Policy Intervention on Economic Growth in Indonesia from 2009 to 2022.” *International Journal of Social Service and Research*, Vol. 4 No. 11.: <https://doi.org/10.46799/ijssr.v4i11.1098z>
- Lee, J. W., & Chen, S. Y. 2022. Interest rate policy and real GDP in emerging markets. *Journal of Asian Economics*, 78,101426. <https://doi.org/10.1016/j.asieco.2021.101426>
- Mandala, R. A. M. (2020). “Inflation, Government Expenditure, and Economic Growth in Indonesia.” *Jambura Equilibrium Journal*, Vol. 2 No.2. <https://doi.org/10.37479/jej.v2i2.6961>
- Mankiw, N. G. 2021. *Principles of economics*. Boston: Cengage Learning
- Nguyen, H. T., & Bui, Q. T. 2021. Macroeconomic stability and real GDP Evidence from developing economies. *Journal of Economic Studies*, 48(5), 1023–1040. <https://doi.org/10.1108/JES-05-2020-0245>
- Rahman, M. L., Uddin, G. S., & Alam, K. 2023. Inflation and real GDP nexus in emerging economies. *Economic Modelling*, 120, 106190. <https://doi.org/10.1016/j.econmod.2022.106190>

- Siregar, H., & Ward, B. 2022. Macroeconomic variables and real GDP in Indonesia. *Bulletin of Indonesian Economic Studies*, 58(2), 245–262. <https://doi.org/10.1080/00074918.2022.2031123>
- Zhang, Y., Wang, S., & Liu, H. 2022. Exchange rate dynamics and real GDP in emerging markets. *Economic Modelling*, 110, 105802. <https://doi.org/10.1016/j.econmod.2022.105802>
- Zuhroh, I. (2021). “The Nexus of Monetary Policy and Economic Growth: Empirical Study from Indonesia.” *Journal of Innovation in Business and Economics*, Vol. 5 No. 2, 61–70. <https://doi.org/10.22219/jibe.v5i02.20539>