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Research Paper

The effect of foreign direct investment on economic growth and unemployment in Indonesia

La Tondi[1], Muhamad Armawaddin[2], Ahmad[3]
[123] *Faculty of Economics and Business, Halu Oleo University Corresponding email: author_latondi2016@gamail.com*

Abstract: This study aims to analyze the causal relationship between Foreign Direct Investment (FDI), Gross Domestic Product (GDP), and the unemployment rate in Indonesia using the Vector Error Correction Model (VECM) method. Based on the results of the Johansen cointegration test, three cointegration relationships were found, indicating a long-term equilibrium among the variables. The long-term estimation results show that GDP and the unemployment rate have a negative effect on FDI, suggesting that increases in economic growth and unemployment are not necessarily accompanied by higher inflows of foreign direct investment. In the short term, FDI has no significant effect on either GDP or the unemployment rate, as evidenced by the results of the Granger causality test and short-term parameters in the VECM model. Meanwhile, only the GDP variable exhibits an adjustment mechanism to long-term disequilibrium through a negative and significant Error Correction Term (ECT) value, indicating that economic growth is the most responsive and stable variable in the system. The results of the Impulse Response Function (IRF) and Variance Decomposition (VD) analyses also reinforce the finding that GDP has the greatest contribution in influencing the dynamics of FDI and the unemployment rate in the long run. Therefore, economic growth serves as the key factor driving macroeconomic stability and interaction in Indonesia.

Keywords: FDI, GDP, unemployment rate, VECM, ECT

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1 | INTRODUCTION

Foreign Direct Investment (FDI) is one of the key factors in the economic development of a country, particularly for developing nations such as Indonesia. In simple terms, FDI can be defined as an investment made by foreign companies into a host country with the objective of generating profit while expanding their market reach (Borensztein E, De Gregorio, & Lee. J.W, 1998). Unlike portfolio investment, which is short-term in nature, FDI tends to be long-term since foreign investors allocate their capital into real assets, build factories, open company branches, or acquire domestic firms (Dunning, 1988).Theoretically, FDI is believed to bring a variety of benefits to the host country. First, it increases the accumulation of domestic capital, which is often limited, thereby expanding national production capacity (Alfaro et al., 2004). Second, FDI promotes the transfer of technology and managerial knowledge, which can enhance labor productivity and strengthen the competitiveness of domestic industries (Javorcik, 2004). Third, it facilitates access to international markets for domestic products through the global networks owned by foreign investors (Carkovic & Levine, 2005). Fourth, FDI can create new job opportunities, both directly through labor recruitment and indirectly through multiplier effects in related sectors (Jenkins, 2006). For these reasons, FDI is often referred to as one of the main engines of sustainable economic development (UNCTAD, 2023).For Indonesia, FDI holds highly strategic importance. As a country with a large population and relatively stable economic growth, Indonesia has become one of the main destinations for foreign investment in Southeast Asia (World Bank, 2022). The inflow of FDI is seen as a means to help the government finance development projects, given the limited domestic savings and the still low capacity of private sector funding (Prasetyo, 2018).

Moreover, FDI serves as an important indicator to assess Indonesia's economic attractiveness in the eyes of the international community (UNCTAD, 2023).The development of FDI in Indonesia over the past two decades has shown a fluctuating trend. Before the 1997–1998 Asian financial crisis, FDI inflows were relatively high but declined sharply afterward due to political and economic instability. Following the reform era, FDI gradually increased along with the improvement of the investment climate, although several obstacles remain, such as bureaucratic inefficiency, weak legal certainty, and inadequate infrastructure (Suyanto & Bloch, 2009). Data from the Indonesia Investment Coordinating Board (BKPM) indicate that the main sectors receiving FDI include manufacturing, mining, trade, and transportation and communication (World Bank, 2022). This indicates that FDI has substantial potential to drive industrialization and modernization of Indonesia's economic sectors.However, the impact of FDI on Indonesia's economic growth has not always been consistent. In theory, FDI inflows should increase the gross domestic product (GDP) by enhancing production capacity and labor productivity (Harrod, 1939; Solow, 1956). Empirical findings, however, have been mixed. Some studies have found that FDI exerts a positive and significant effect on Indonesia's economic growth (Borensztein et al., 1998; Alfaro, 2003), while others show relatively weak or insignificant effects (Carkovic & Levine, 2005). These differences suggest that the contribution of FDI to economic growth depends heavily on domestic structural conditions, such as human capital quality, macroeconomic stability, regulatory effectiveness, and infrastructure readiness (Alfaro et al., 2004).A similar pattern is observed in the relationship between FDI and unemployment. One of the main expectations of FDI inflows is the absorption of local labor, which could help reduce unemployment in Indonesia. In practice, however, this is not always the case. Some foreign investments are concentrated in capital-intensive sectors that rely heavily on advanced technology, thereby reducing the demand for labor (Jenkins, 2006).

Consequently, even when FDI increases, the unemployment rate does not necessarily decline significantly. The phenomenon of *jobless growth* in Indonesia illustrates that economic growth driven by foreign investment does not always translate into sufficient job creation (Okun, 1962; Keynes, 1936). This condition raises an important question: to what extent does FDI actually contribute to Indonesia's economic growth and unemployment reduction? It is possible that the benefits of FDI are more pronounced in the long term than in the short term, considering that foreign investment requires time to build production infrastructure, adapt to the domestic market, and transfer technology and skills to local workers (Prasetyo, 2018). Therefore, an analytical approach that distinguishes between short-term and long-term effects of FDI is essential.One relevant empirical approach is the Vector Error Correction Model (VECM). This model is used when there is a cointegration relationship among variables, implying that they share a long-term equilibrium relationship even though they may fluctuate in the short term (Suyanto & Bloch, 2009). Through VECM, researchers can analyze the dynamic interactions between FDI, economic growth, and unemployment in both the short and long run. In addition, VECM allows for the application of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analyses, providing a comprehensive picture of how each variable responds to shocks from others (Prasetyo, 2018).

Furthermore, this study is significant due to the existing research gap. Most previous studies have focused either on the impact of FDI on economic growth without linking it to unemployment, or vice versa (Borensztein et al., 1998; Jenkins, 2006). Yet, both indicators are fundamentally interconnected components of economic development. High economic growth is expected to reduce unemployment, while lower unemployment can, in turn, enhance productivity and consumption, thereby supporting further economic growth (Okun, 1962). Hence, an analysis that examines the impact of FDI on both economic growth and unemployment simultaneously will provide a more comprehensive understanding of the role of FDI in Indonesia's economic development.In conclusion, this research carries strong urgency. First, FDI is a vital instrument for Indonesia's economic development that must be evaluated in terms of its effectiveness in promoting economic growth and reducing unemployment (Prasetyo, 2018). Second, this study is expected to provide stronger empirical evidence of the dynamic relationships among these variables, particularly through the VECM approach. Third, the results

are anticipated to offer valuable insights for policymakers in formulating FDI management strategies that are not only growth-oriented but also capable of creating broad employment opportunities and promoting sustainable welfare for the Indonesian people (UNCTAD, 2023).

2 | METHODS

This study employs a time-series econometric approach using the Vector Error Correction Model (VECM) to identify long-term (cointegration) relationships and short-term dynamics among the variables: Foreign Direct Investment (FDI) (X_1), Economic Growth (Y_1), and Unemployment Rate (Y_2). The VECM method is selected because the variables are assumed to be integrated of order one, I(1), but may exhibit a long-term equilibrium relationship.Type of Data: Annual or quarterly time-series data for the period 2000–2023.Data Sources: World Bank, Statistics Indonesia (BPS), UNCTAD, and Bank Indonesia.

3 | RESULTS AND DISCUSSIONS

3.1 | Stationarity Test

Test stationarity done for ensure that the series data time No contain unit root, because the data is not stationary can cause regression spurious regression and produce misleading estimates (Winarno). Testing using Augmented Dickey-Fuller (ADF) as explained by Basuki, with hypothesis zero that the data contains unit root. Decision determined based on comparison t-ADF value with mark MacKinnon's criticism of level significance of 1%, 5%, and 10%. For anticipate possibility change structural in Indonesian economy— such as the 2008 global crisis, the 2013 taper tantrum, and COVID-19 pandemic of 2020— testing Also equipped with Phillips- Perron (PP) and KPSS guna ensure consistency degrees integration variable

3.2 | Stationarity Test for FDI

Table 1. ADF Test for FDI at First Difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.6111	0
Test critical values:	1% level	-3.7529	
	5% level	-2.998	
	10% level	-2.6387	
Null Hypothesis: D(FDI) has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=5)			

Source: Processed data, EViews v13 (2025)

Based on the stationarity test results, the FDI variable shows a probability value of 0.0000 < 0.05 and a t-statistic value of -6.6111, which is smaller than the MacKinnon critical values (at the 1%, 5%, and 10% levels). Therefore, Ho is rejected, indicating that the data are stationary at the first difference level.

3.3 | Stationarity Test for GDP

Table 2. ADF Test for GDP at First Difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.4935	0.002
Test critical values:	1% level	-3.7695	
	5% level	-3.0048	
	10% level	-2.6422	
Null Hypothesis: D(PDB) has a unit root			
Exogenous: Constant			
Lag Length: 1 (Automatic - based on SIC, maxlag=5)			

Source: Processed data, EViews v13 (2025)

Based on the stationarity test results, the GDP variable shows a probability value of 0.0019 < 0.05 and a t-statistic value of -4.4935, which is smaller than the critical values of MacKinnon (at 1%, 5%, and 10% levels). Therefore, Ho is rejected, indicating that the data are stationary at the first difference level.

3.4 | Stationarity Test for Unemployment Rate (UR)

Table 3. ADF Test for Unemployment Rate at First Differenc

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.5767	0.002
Test critical values:	1% level	-3.7529	
	5% level	-2.998	
	10% level	-2.6387	
Null Hypothesis: D(TP) has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=5)			

Source: Processed data, EViews v13 (2025)

Based on the stationarity test results, the Unemployment Rate (TP) variable shows a probability value of 0.0015 < 0.05 and a t-statistic value of -4.5767, which is smaller than the MacKinnon critical values (at the 1%, 5%, and 10% levels). Therefore, Ho is rejected, indicating that the data are stationary at the first difference level

3.5 | Optimal Lag Selection Test

Optimal lag determination is carried out with consider limitations amount observation annual as many as 19 periods and three endogenous variables. Estimation beginning with four lags yield 39 inner parameters system, which is relatively big compared to size sample and potential reduce degrees freedom as well as efficiency estimate. For avoid problem overparameterization, lag selection is prioritized based on the Schwarz Information Criterion (SC), which is more consistent in sample small and support principle of parsimony. Results estimate show that lag one is the most suitable specifications and stable, with a total of 12 parameters in system as well as all over root characteristics is inside the unit circle. With Thus, the model specifications remain the same. fulfil eligibility econometrics although using annual data with amount observation limited.

Table 4. Optimal Lag Selection Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	33.87	NA	7.79e-06	-3.2493	-3.10018	-3.22407
1	40	9.676071	1.07e-05	-2.94701	-2.35052	-2.84606
2	46.86	8.673250	1.47e-05	-2.72241	-1.67855	-2.54575
3	52.75	5.578361	2.60e-05	-2.39486	-0.90364	-2.14248
4	56.84	2.583867	7.67e-05	-1.87813	0.060452	-1.55005
5	114	18.06135*	1.95e-06*	-6.951216*	-4.565265*	-6.547418*
VAR Lag Order Selection Criteria						
Endogenous variables: D(FDI) D(PDB) D(TP)						
Exogenous variables: C						
Date: 06/21/25 Time: 22:32						
Sample: 2000 2024						
Included observations: 19						

Source: Processed data, EViews v13 (2025)

3.6 | Stability Test

The next step is the VECM Stability Test or VECM Stability Condition Check. This test is conducted to determine whether the variables used are stable and valid at the lag length determined in the previous step, namely the optimal lag test. This part is important to ensure that the Impulse Response Function (IRF) and Variance Decomposition (VD) analyses produce accurate results. The basis for this test is that if all roots have a modulus less than 1, it can be concluded that Ho is rejected and H1 is accepted, indicating that the model is stable.

Table 5. VECM Stability Tes

Root	Modulus
0.238638 - 0.854510i	0.887206
0.238638 + 0.854510i	0.887206
0.414279 - 0.758489i	0.864252
0.414279 + 0.758489i	0.864252
-0.689333 - 0.502591i	0.853098
-0.689333 + 0.502591i	0.853098
-0.807949	0.807948
0.807568	0.807568
-0.332531 - 0.454409i	0.563084
-0.332531 + 0.454409i	0.563084
0.236959 - 0.293444i	0.377171
0.236959 + 0.293444i	0.377171
Roots of Characteristic Polynomial	
Endogenous variables: D(FDI) D(PDB)	
D(TP)	

Exogenous variables: C
Lag specification: 1 4
Date: 06/21/25 Time: 22:53

Source: Processed data, EViews v13 (2025

3.7 | Granger Causality Test

The Granger causality test is applied to determine the causal relationships between variables in a time-series model. It assesses whether past values of one variable can help predict the current values of another. Thus, the test helps identify the direction of causality between variables in the economic model.

Table 6. Granger Causality Test Result

Pairwise Granger Causality Tests			
Date: 06/21/25 Time: 22:54			
Sample: 2000 2024			
Lags: 4			
Null Hypothesis:	Obs	F-Statistic	Prob.
PDB does not Granger Cause FDI	21	3.1573	0.0545
FDI does not Granger Cause PDB		0.3189	0.8598
TP does not Granger Cause FDI	21	1.4893	0.2662
FDI does not Granger Cause TP		0.0967	0.9815
TP does not Granger Cause PDB	21	0.275	0.8884
PDB does not Granger Cause TP		0.9405	0.4735

Source: Processed data, EViews v13 (2025)

Based on the results of the Granger causality test for the period 2000–2024 with a lag length of 4, the following conclusions can be drawn:

- Relationship between GDP and FDI: There is an indication that GDP almost affects FDI (p = 0.0545), although it is not yet significant at the 5% level. This suggests that economic growth has the potential to drive an increase in foreign direct investment; however, the statistical evidence remains weak. Conversely, FDI does not affect GDP (p = 0.8598), indicating no causality from FDI to GDP.
- Relationship between FDI and Unemployment Rate (TP): No bidirectional causal relationship is found between FDI and the unemployment rate. The probability values indicate no significant effect either from FDI on TP (p = 0.9815) or from TP on FDI (p = 0.2662).
- Relationship between GDP and Unemployment Rate (TP): The test results also show no causal relationship between GDP and the unemployment rate in the short run. The p-values for both directions— from TP to GDP (p = 0.8884) and from GDP to TP (p = 0.4735)—are not statistically significant.

3.8 | VECM Estimation Test

Results VECM estimates show existence connection term long marked intervariable by negative error correction term (ECT) coefficient and significant, so that every deviation from balance will be customized in a way gradual. Dynamics term short show that no all over influence intervariable significant, indicating the ongoing transmission process gradually. Meanwhile that, the results of variance decomposition show that on period beginning variation more Lots explained by internal shock, but in term medium and long contribution other variables increase. Findings This confirm existence relatedness increasingly dynamic strong in a longer time horizon long.

Table 7. VECM Estimation Test

Vector Error Correction Estimates			
Date: 06/21/25 Time: 22:59			
Sample (adjusted): 2006 2024			
Included observations: 19 after adjustments			
Standard errors in ( ) & t-statistics in [ ]			
Lags interval (in first differences): 1 to 4			
Endogenous variables: D(FDI) D(PDB) D(TP)			
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.			
Cointegrating Eq:	CointEq1		
D(FDI(-1))	1		
D(PDB(-1))	38.1963		
	-2.2741		
	[16.7955]		
D(TP(-1))	-0.1118		
	-0.0253		
	[-4.41826]		
C	-1.1254		
Error Correction:	D(FDI,2)	D(PDB,2)	D(TP,2)
COINTEQ1	-0.0138	-0.0616	2.8741
	-0.5555	-0.0212	-1.6666
	[-0.02487]	[-2.89558]	[1.72447]
D(FDI(-1),2)	-0.8276	0.057	-2.4799
	-0.6266	-0.0239	-1.8798
	[-1.32085]	[2.37683]	[-1.31927]
D(FDI(-2),2)	-0.4872	0.0422	-2.4772
	-0.5859	-0.022	-1.7577
	[-0.83158]	[1.88124]	[-1.40933]
D(FDI(-3),2)	-0.5228	-0.0145	-1.2839
	-0.4821	-0.0184	-1.4463
	[-1.08448]	[-0.78760]	[-0.88770]
D(FDI(-4),2)	-0.3971	-0.0124	-1.9993
	-0.3463	-0.0132	-1.0389
	[-1.14670]	[-0.94087]	[-1.92435]
D(PDB(-1),2)	13.947	1.5256	-97.3477
	-18.886	-0.7232	-56.6572
	[0.73849]	[2.10946]	[-1.71819]
D(PDB(-2),2)	-2.941	0.9533	-80.0702
	-17.8391	-0.6831	-53.5168
	[-0.16487]	[1.39548]	[-1.49617]
D(PDB(-3),2)	1.4496	0.5951	-43.5907
	-14.8848	-0.57	-44.6539
	[0.09739]	[1.04417]	[-0.97619]
D(PDB(-4),2)	-2.1262	0.7692	-37.6079
	-11.9225	-0.4565	-35.767
	[-0.17834]	[1.68489]	[-1.05147]
D(TP(-1),2)	0.0935	-0.0035	-0.3318
	-0.1234	-0.0047	-0.3704
	[0.75760]	[-0.74579]	[-0.89578]
D(TP(-2),2)	0.0042	0.0037	-0.2445
	-0.1484	-0.0056	-0.4452
	[0.02842]	[0.65470]	[-0.54934]
D(TP(-3),2)	0.0162	-0.008	-0.1195
	-0.1378	-0.0052	-0.4135
	[0.11800]	[1.53153]	[-0.28895]

D(TP(-4),2)	0.0722	0.0125	-0.1537
	-0.118	-0.0045	-0.354
	[0.61230]	[2.78532]	[-0.43442]
C	0.0003	-0.0038	0.2118
	-0.1015	-0.0038	-0.3045
	[0.00305]	[-0.98865]	[0.69575]
R-squared	0.84074	0.8703	0.7857
Adj. R-squared	0.42667	0.5331	0.22853
Sum sq. resids	0.59207	0.00086	5.32851
S.E. equation	0.34411	0.01317	1.03232
F-statistic	2.03042	2.58098	1.41017
Log likelihood	5.99151	67.97805	-14.8819
Akaike AIC	0.84299	-5.6819	3.04019
Schwarz SC	1.5389	-4.98599	3.73609
Mean dependent	-0.00052	-0.00052	-0.09421
S.D. dependent	0.45446	0.01928	1.17533
Determinant resid covariance (dof adj.)		0	
Determinant resid covariance		0	
Log likelihood		99.57483	
Akaike information criterion		-5.74471	
Schwarz criterion		-3.50789	
Number of coefficients		45	

Source: Processed data using EViews v13, 2025

After conducting the stationarity test and finding that all variables in this study are integrated at the first degree (I(1)), and based on the results of the Johansen cointegration test which indicate that there are three cointegration relationships among the variables FDI, GDP, and unemployment rate (UR), the Vector Error Correction Model (VECM) approach is therefore the appropriate method to use. The VECM model is capable of explaining the short-term dynamic relationships among the variables while simultaneously accommodating the adjustment toward long-term equilibrium through the presence of the error correction component.

Interpretation of the Cointegration Equation (Long-Run Relationship)

Based on the estimation results, the cointegration equation among FDI, GDP, and unemployment rate (UR) forms a long-run relationship that can be expressed as follows:

$$FDI_t = -38.1963\ GDP_{t-1} - 0.1118\ UR_{t-1} + C$$

From the above equation, the following explanations can be given:

a. The Long-Run Effect of FDI on GDP: The GDP coefficient shows a large negative value of -38.1963 with a t-statistic of 16.7955, which is statistically significant. This indicates that, in the long run, a 1-unit increase in GDP will reduce FDI by 38.1963 units. Theoretically, this can be interpreted as an indication that when the domestic economy grows, foreign investors may no longer view Indonesia as a primary investment destination due to substitution from domestic financing sources or rising production factor costs.

b. The Long-Run Effect of FDI on Unemployment Rate: The UR coefficient of -0.1118 with a t-statistic of -4.4186 is also statistically significant, meaning that a 1% increase in the unemployment rate will reduce FDI by 0.1118 units in the long run. This finding is consistent with the theory that high unemployment can lower investor confidence in the stability of the labor market.

Error Correction Term (ECT) Component

The ECT component plays a crucial role in explaining how each variable adjusts to deviations from long-run equilibrium. Based on the estimation results, only the variable D(GDP) has a negative and statistically significant ECT coefficient. The ECT coefficient for D(GDP) is -0.0816 with a t-statistic of -2.8955. This means that when there is a deviation from long-run equilibrium, economic growth (GDP) will adjust back toward its equilibrium level by 8.16% per year. This shows that GDP has an active and efficient long-term correction mechanism. Conversely, in the D(FDI) equation, the ECT coefficient is -0.0138 with a very small t-statistic (-0.0248), which is statistically insignificant. This implies that FDI does not exhibit meaningful adjustment behavior toward long-run disequilibrium, or in other words, FDI is exogenous within this system. Similarly, in the D(UR) equation, the ECT coefficient is positive (+2.8741) with a t-statistic of 1.7244, which is not significant and theoretically contradicts the error correction concept that should be negative. Therefore, it can be concluded that only the GDP variable effectively corrects deviations from long-run equilibrium, while FDI and UR do not exhibit such adjustment behavior.

Short-Run Relationship Among Variables

The short-run relationships are reflected in the coefficients of the differenced variables (Δ). The estimation results indicate that most short-run interactions among FDI, GDP, and UR are statistically insignificant, except for certain variables. Specifically, the first lag of the change in GDP (D(GDP(-1))) has a significant effect on changes in FDI, with a coefficient of 13.4709 and a t-statistic of 2.7349. This suggests that an increase in GDP in the previous period will stimulate an increase in FDI in the current period. This reflects that, in the short run, economic growth acts as a positive signal that encourages inflows of foreign direct investment. However, most other variables — including the effects of FDI on GDP and UR, and vice versa — are statistically insignificant in the short run, as indicated by the low t-statistics (generally < 2). Thus, it can be concluded that the dynamic interactions among variables are more evident in the long-run relationships, while short-run interactions remain relatively weak.

Statistical Evaluation and Model Quality

From a statistical standpoint, the VECM model demonstrates acceptable performance, particularly in the D(GDP) equation, which has an adjusted R-squared value of 0.5331 and an F-statistic of 2.5898, indicating that the model can explain more than 53% of short-run variations in GDP. Meanwhile, the D(FDI) equation has an adjusted R-squared of 0.4267 and an F-statistic of 2.0304, which is moderate. The D(UR) equation has the lowest quality, with an adjusted R-squared of only 0.2285 and an F-statistic of 1.4101, suggesting that the results of the UR equation should be interpreted with caution. The higher log-likelihood value of the GDP equation (67.97905) compared to the FDI (5.99151) and UR (-14.88185) equations also indicates that the GDP equation is the most statistically reliable. The Akaike Information Criterion (AIC) and Schwarz Criterion (SC) values are also more favorable in the GDP equation than in the other two.

3.9 |Impulse Response Function (IRF) Test

This test is conducted after several preceding tests and is important for obtaining information about how each endogenous variable responds over time to shocks from itself or from other variables. Moreover, the IRF is used to identify patterns of changes caused by unexpected shocks to a given variable or to other variables over time. If the impulse response graphs show that the oscillating lines move toward equilibrium (convergence) or return to their previous positions, this indicates that the shocks received by the variables gradually disappear over time. In other words, the shocks are temporary and not permanent, reflecting the dynamic nature of the system.

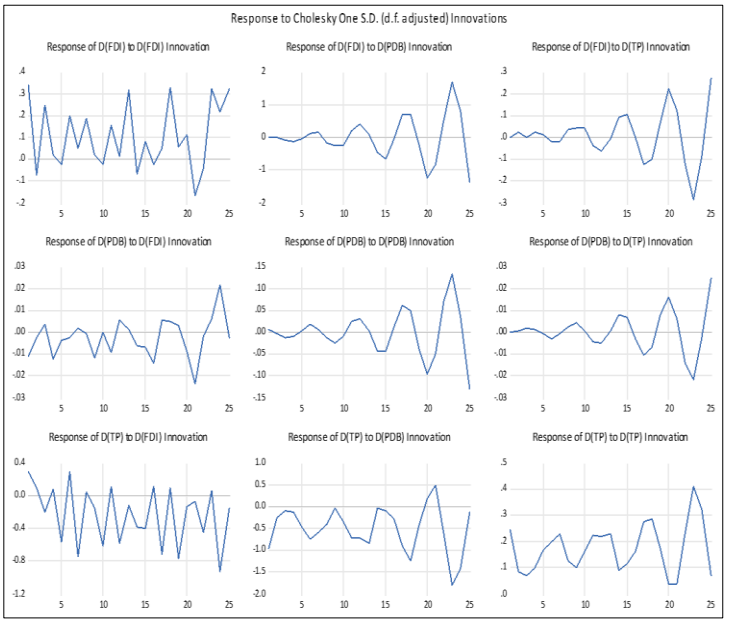

Figure 1. Impulse Response Function (IRF) Test

Source: Processed data using EViews v13, 2025

Response of FDI to FDI Shock (D(FDI) to D(FDI)): The first figure illustrates how FDI responds to a shock in itself. The response shows a recurring fluctuating pattern, with several sharp positive and negative spikes over 25 periods. This pattern indicates that FDI is quite volatile and sensitive

to internal shocks but does not show a tendency to stabilize in the long run. This implies that shocks to FDI are temporary, with effects that tend to return relatively quickly to the mean, although short-term instability remains evident.

Response of FDI to GDP Shock (D(FDI) to D(GDP)): The response of FDI to a shock in GDP shows a relatively small and non-volatile effect. The response values tend to remain close to zero throughout the entire period, with slight positive fluctuations toward the end. This indicates that a shock in GDP does not have a strong impact on FDI in either the short or medium term, consistent with the previous Granger causality results showing that GDP does not cause FDI in the short run. However, the gradual increase at the end of the period can be interpreted as a latent effect of economic growth on investment inflows, which only materializes in the long run.

*Response of FDI to Unemployment Shock (D(FDI) to D(UR)):*The response of FDI to a shock in the unemployment rate (UR) exhibits a moderately fluctuating pattern. Although there are some initial negative responses, the graph does not show a consistent or significant response to shocks in UR. This reinforces the earlier VECM results, which indicate that the effect of UR on FDI is not statistically significant in the short run, suggesting that FDI is more responsive to other macroeconomic conditions such as fiscal stability or inflation, rather than to the unemployment rate alone.

Response of GDP to FDI Shock (D(GDP) to D(FDI)): The response of economic growth to shocks in FDI shows a gradually increasing positive pattern, particularly after the fifth period. The graph demonstrates that although the initial effect of FDI on GDP appears small, in the medium to long term, FDI shocks contribute positively to economic growth. This highlights the role of FDI as a long-term driver of national output, aligning with development economics theory, which states that foreign investment inflows can enhance domestic production capacity and productivity.

Response of GDP to GDP Shock (D(GDP) to D(GDP): The response of GDP to shocks in itself shows a stable and positive graph, with slight fluctuations that remain within a narrow range. This indicates that economic growth tends to maintain internal stability following a shock, and that internal factors within GDP are relatively strong in sustaining growth momentum.

Response of GDP to Unemployment Shock (D(GDP) to D(UR)): This response shows a very small and almost undetectable effect, meaning that shocks to the unemployment rate do not have a direct or significant impact on economic growth in the short term. This finding is consistent with the literature, which suggests that the effect of unemployment on economic output is more structural and does not immediately appear as a short-term dynamic response.

Response of Unemployment to FDI Shock (D(UR) to D(FDI)): The graph shows a negative pattern at the beginning of the period, followed by mild fluctuations, indicating that shocks in FDI slightly reduce the unemployment rate. This aligns with the argument that FDI inflows can generate employment opportunities in the short run, although the effect is not large and tends to be temporary. This also supports the hypothesis that FDI can play a role in labor absorption, although strong supporting policies are needed to ensure its long-term sustainability.

Response of Unemployment to GDP Shock (D(UR) to D(GDP)): The response of unemployment to economic growth shows a consistently negative trend in the short to medium term, meaning that when the economy grows (GDP increases), the unemployment rate tends to decline. This represents the classical form of Okun's Law, which describes the negative relationship between economic output and unemployment. This finding strengthens the evidence that economic growth plays an important role in reducing unemployment, although its effectiveness depends on the structure of the labor market.

Response of Unemployment to Unemployment Shock (D(UR) to D(UR)): The response of unemployment to shocks in itself shows a relatively strong fluctuating pattern, indicating that the unemployment rate tends to maintain its cyclical behavior or has strong inter-period persistence. In other words, shocks to unemployment have persistent effects and take time to dissipate. This suggests that unemployment is rigid and not easily corrected spontaneously within the economic system.

3.10 |Variance Decomposition Test

This test, also known as Variance Decomposition Analysis, is used to measure the contribution of each variable to shocks affecting the system. According to Basuki and Yuliadi (2015), the Variance Decomposition (VDC) analysis aims to determine the magnitude and composition of the influence of each independent variable on the dependent variable. Through this analysis, it is possible to identify the proportion of variance in one variable explained by its own shocks and by shocks from other variables over time. In conclusion, the VDC test provides information about the contribution and composition of each independent variable in shaping its dependent variable. The results of the variance decomposition test can be seen in the table below.

Tabel 8> Uji Variance Decomposition

Variance Decomposition of D(FDI):				
Period	S.E.	D(FDI)	D(PDB)	D(TP)
1	0.3441	100	0	0
2	0.352	99.5633	0.00402	0.4326
3	0.4371	96.5003	3.21866	0.2811
4	0.451	90.8774	8.57065	0.552
5	0.4556	89.2682	10.1484	0.5834
6	0.5165	84.5516	14.8983	0.5501
7	0.5505	75.1994	24.1711	0.6295
8	0.6066	71.5877	27.4632	0.9491
9	0.6632	60.0027	38.723	1.2743
10	0.7148	51.7525	46.7556	1.4919
11	0.7638	49.5542	48.8756	1.5701
12	0.8737	37.896	60.4456	1.6584
13	0.9342	44.6078	53.9392	1.4529
14	1.0364	36.6734	61.3115	2.0151
15	1.2399	26.0796	71.7976	2.1227
16	1.2405	26.1005	71.7785	2.121
17	1.4284	19.8233	77.8291	2.3476
18	1.6317	19.2384	78.5877	2.1739
19	1.6467	19.006	78.696	2.298
20	2.0723	12.2816	85.1381	2.5804
21	2.2416	11.0413	86.4573	2.5014
22	2.3114	10.4175	86.9553	2.6272
23	2.8946	7.87168	89.5035	2.6248
24	3.0214	7.74131	89.7619	2.4968
25	3.3399	7.26645	90.0189	2.7146
Variance Decomposition of D(PDB):				
Period	S.E.	D(FDI)	D(PDB)	D(TP)
1	0.0132	74.6574	25.3426	0
2	0.0136	73.535	26.1033	0.3617
3	0.0186	43.3822	55.1695	1.4482
4	0.0241	51.3414	47.4272	1.2314
5	0.0245	51.9984	46.7911	1.2105
6	0.0311	32.8172	65.5082	1.6746
7	0.0319	31.387	66.979	1.6339
8	0.0344	27.0657	70.8924	2.0419
9	0.0448	22.7411	75.0421	2.2167
10	0.0457	21.8477	75.9954	2.1569
11	0.053	19.2964	78.4433	2.2603
12	0.0619	14.8857	82.8171	2.2972
13	0.062	14.8801	82.8097	2.3102
14	0.0759	10.55	86.8594	2.5906
15	0.0877	8.46399	89.0212	2.5148
16	0.0897	10.5816	86.884	2.5344
17	0.1095	7.3667	89.9623	2.671
18	0.1208	6.23886	91.2442	2.5169
19	0.1265	5.75633	91.5312	2.7125
20	0.1589	3.93416	93.3095	2.7563
21	0.1685	5.46783	91.9383	2.5939
22	0.1831	4.6392	92.5531	2.8077
23	0.2281	3.06156	94.2241	2.7143
24	0.2321	3.83863	93.5271	2.6342
25	0.267	2.90952	94.2228	2.8677
Variance Decomposition of D(TP):				
Period	S.E.	D(FDI)	D(PDB)	D(TP)
1	1.0323	8.03338	86.4041	5.5625

2	1.0699	8.27687	85.9212	5.8019
3	1.0932	11.1628	82.8717	5.9655
4	1.1096	11.2487	82.1082	6.6431
5	1.3337	25.3242	68.5474	6.1284
6	1.5761	21.5355	72.4767	5.9878
7	1.8513	31.5676	62.5746	5.8578
8	1.9027	29.9487	64.0692	5.9821
9	1.9123	30.2963	63.4932	6.2105
10	2.0458	35.4884	58.4401	6.0714
11	2.1786	31.5891	62.0008	6.4101
12	2.373	32.6842	61.0547	6.2611
13	2.5316	28.9218	64.7445	6.3336
14	2.5611	30.4114	63.2737	6.3149
15	2.595	31.9241	61.7318	6.3441
16	2.6188	31.5269	61.8675	6.6056
17	2.8779	32.2604	61.3399	6.3998
18	3.1546	26.953	66.8844	6.1626
19	3.2816	30.3969	63.6369	5.9662
20	3.2891	30.4219	63.6235	5.9546
21	3.3269	29.7817	64.3829	5.8354
22	3.4228	29.8567	64.1626	5.9808
23	3.8869	23.1834	71.0639	5.7526
24	4.2573	24.0212	70.6096	5.3692
25	4.2627	24.1021	70.5139	5.384
Cholesky One S.D. (d.f. adjusted) Innovations				
Cholesky ordering: D(FDI) D(PDB) D(TP)				

Source: Processed data using EViews v13, 2025

Variance Decomposition Analysis (VDC) is used to determine the magnitude of each variable's contribution to the fluctuations or variance of an endogenous variable in the system over the next 25 periods. In the context of the VECM, VDC helps assess the relative importance of each variable in influencing the system's dynamics.

Variance Decomposition of D(FDI): The analysis results show that in the initial period, the variability of D(FDI) is almost entirely explained by itself. In period 1, 100% of FDI fluctuations originate from its own shocks. However, over time, the contribution of FDI to its own fluctuations gradually decreases. By period 10, only about 51.75% of FDI variation is explained by itself, while 46.75% is explained by GDP, and the rest by the unemployment rate (TP). The contribution of GDP increases significantly from period 5 onward, reaching approximately 90.01% by period 25. This indicates that in the long run, GDP becomes the dominant factor explaining FDI movements, far exceeding FDI's own influence. Meanwhile, the contribution of TP to FDI remains small (a maximum of around 2.7% in period 25). This reflects that economic growth (GDP) fluctuations have a strong long-term impact on the dynamics of foreign direct investment, while the influence of the unemployment rate is relatively limited.

Variance Decomposition of D(GDP): For the D(GDP) variable, in the initial period, about 74.65% of GDP variation is explained by FDI, and 25.34% by itself. This is quite surprising and indicates that the initial shock from FDI has a strong impact on GDP dynamics in the first year. However, over time, the role of FDI in explaining GDP decreases, while the contribution of GDP to itself increases substantially.By period 10, approximately 75.95% of GDP variation is explained by itself, and only 21.85% comes from FDI. This value continues to increase until period 25, where about 94.22% of GDP variation originates from its own shocks, and only around 2.90% from FDI. The contribution of TP to GDP variation remains very small throughout the periods (never exceeding 3%).

Variance Decomposition of D(TP): The analysis of D(TP) shows that in the first period, about 86.40% of TP variation is explained by GDP, while FDI and TP itself account for only 8.03% and 5.56%, respectively. This indicates that economic growth (GDP) is the main factor influencing fluctuations in the unemployment rate in Indonesia. Over time, the role of GDP decreases but remains dominant. In period 10, about 68.54% of TP variation is still explained by GDP, while FDI contributes around 25.24%, and TP itself only about 6.12%. Even up to period 25, GDP still explains approximately 70.51% of TP variation, reinforcing that the relationship between economic growth and unemployment is strong and consistent. The contribution of FDI to TP gradually increases from 8% at the beginning to about 24.10% in period 25. This reflects that FDI begins to play a larger role in explaining variations in unemployment in the long term, although not as strong as GDP's influence. Meanwhile, the contribution of TP's own shocks remains low throughout the periods, indicating that changes in unemployment are driven more by external factors (GDP and FDI) than by internal labor market cycles.

4 | DISCUSSIONS

4.1 | Long-Run Relationship between FDI, GDP, and Unemployment Rate in Indonesia

Based on the results of the Johansen cointegration test, three cointegrating relationships were found among the variables of foreign direct investment (FDI), gross domestic product (GDP), and unemployment rate (TP) at the 5% significance level. The trace statistics for all three null hypotheses (none, at most 1, at most 2) are greater than their corresponding critical values, and all probability values are well below the 0.05 significance threshold. These findings provide strong evidence of a significant and stable long-term relationship among the three variables. Therefore, the use of the Vector Error Correction Model (VECM) in this study is appropriate and econometrically justifiable.Furthermore, the cointegration equation derived from the VECM estimation shows that GDP and the unemployment rate have a negative long-term effect on FDI. The GDP coefficient in the cointegration equation is -38.1963 and statistically significant, indicating that an increase in economic growth tends to reduce FDI inflows. This can be explained by the financing substitution effect, where higher GDP reduces the need for foreign investment as domestic financing becomes more stable. Meanwhile, the unemployment rate coefficient is also negative and significant, suggesting that rising unemployment adversely affects FDI inflows. Overall, these results confirm that the macroeconomic variables analyzed are interconnected in the long run, where one variable can influence or be influenced by the others within the system. These findings support development and macroeconomic theories that assert that foreign investment, economic growth, and employment are interrelated elements in the long term.The finding of a long-run relationship among FDI, economic growth, and unemployment is consistent with various macroeconomic and development theories. In the framework of endogenous growth theory proposed by Romer (1990), FDI serves as an important source of capital accumulation and technology transfer, ultimately driving long-term economic growth. Likewise, the Solow model recognizes the role of investment (both domestic and foreign) as a key determinant in the long-term output growth process.

Empirically, this finding is supported by the study of Borensztein et al. (1998), which found that FDI has a positive long-term impact on economic growth, particularly when supported by adequate human capital. Similarly, Alfaro et al. (2004) stated that FDI can enhance economic efficiency and output in the long run, but its effect depends heavily on economic stability and national policy.The relationship between unemployment and FDI is also explained in the Harrod-Domar model, which posits that capital investment can reduce unemployment through the creation of new production capacity. This finding is reinforced by Dritsaki and Stiakakis (2014), who found a cointegration relationship among FDI, unemployment, and GDP in European countries. Therefore, the cointegration results in this study support previous theoretical and empirical findings, indicating that the relationship between foreign investment, growth, and the labor market is structural and sustainable in the long term.

4.2 | Short-Run Effects of FDI on Economic Growth and Unemployment in Indonesia

To address this issue, the analysis focuses on short-term estimation results within the VECM model, as well as the Granger causality test. The Granger test results indicate that FDI does not have a statistically significant short-run effect on either economic growth (GDP) or the unemployment rate (TP). This is shown by the high probability values ($p > 0.05$) for the hypotheses "FDI does not Granger cause GDP" and "FDI does not Granger cause TP," which are 0.8598 and 0.9815, respectively. This means that short-term shocks to FDI are not strong enough to directly influence GDP or unemployment during the observation period.This finding is further supported by the short-term estimation results in the VECM, where none of the differenced FDI coefficients are statistically significant in the GDP or TP equations. In other words, changes in FDI in previous periods do not have a meaningful impact on current changes in GDP or TP. Conversely, GDP exhibits a short-term effect on FDI, particularly at the first lag, which is statistically significant. This indicates that foreign investment inflows are more responsive to economic growth conditions rather than the other way around.The absence of a short-term effect of FDI on GDP and TP can be explained theoretically. Foreign investment typically requires time to materialize into production or job creation. Its effects are not immediately visible in national output or employment but emerge once investment projects are implemented and integrated into the economy.

Therefore, in the short run, it is reasonable that FDI does not have a significant effect on economic growth or unemployment, even though such a

relationship exists in the long term as revealed by the cointegration and IRF-VDC analyses.The lack of significant short-run effects of FDI on GDP and unemployment is consistent with several previous theories and studies emphasizing that FDI effects are indirect and take time to materialize. In Solow's growth theory, for instance, FDI does not instantly increase output in the short term but contributes gradually through capital accumulation and technological spillovers. Thus, the findings of this study are consistent with the economic transition logic from investment to output growth. Herzer et al. (2008) also found that the effect of FDI on economic growth tends to be insignificant in the short term, particularly in developing countries with limited technological absorption capacity and infrastructure. Similarly, Acaravci and Ozturk (2012) found that the impact of FDI on unemployment becomes significant only when investment is directed toward labor-intensive sectors.In the context of Indonesia, the absence of short-run relationships may also be linked to the nature of FDI, which mostly flows into sectors such as mining and infrastructure—industries that are capital-intensive rather than labor-intensive and have long implementation periods. Therefore, it is unsurprising that no significant short-run effects are found on GDP or unemployment. This finding implies that policymakers should aim to redirect foreign investment toward productive sectors that have direct impacts on the real economy and job creation.

4.3 | Adjustment Process of GDP and Unemployment toward Long-Run Equilibrium Following Deviations in FDI

In the VECM framework, the mechanism of adjustment toward long-run equilibrium is represented by the Error Correction Term (ECT). A statistically significant and negative ECT coefficient indicates that the variable corrects deviations from the long-run equilibrium. The results of this study show that only GDP has a valid ECT coefficient, at -0.0816 with a t-statistic of -2.8955. This means that when a deviation or shock occurs in the system (for example, due to a sudden change in FDI), economic growth will adjust back to its long-run equilibrium at a speed of approximately 8.16% per year.Conversely, the ECT coefficients for TP and FDI are not statistically significant. In fact, the ECT for TP is positive (+2.8741), which theoretically contradicts the principle of error correction. This suggests that the unemployment rate does not adjust toward long-run disequilibrium and may even exacerbate existing deviations. FDI also shows no significant correction mechanism, reinforcing earlier findings that FDI tends to be exogenous and not directly affected by long-term system dynamics.Therefore, it can be concluded that GDP plays the leading role in stabilizing the long-run economic system. When imbalances arise due to changes in FDI or unemployment, GDP is the variable that actively adjusts toward equilibrium, while the other variables do not show corrective responses. This finding is significant as it highlights the strategic role of GDP in maintaining macroeconomic stability in Indonesia and emphasizes economic growth as the policy anchor for balancing investment and employment.

The long-run adjustment process exhibited by GDP through the error correction term (ECT) aligns with the VECM theory developed by Engle and Granger (1987), which posits that the existence of long-run relationships (cointegration) must be accompanied by a short-run correction mechanism to ensure system stability. In this context, the significant and negative ECT value for GDP indicates that Indonesia's economic growth has the ability to revert to its long-run equilibrium after disturbances caused by other variables such as FDI and unemployment.This finding is supported by Pelinescu (2015), who showed that in developing countries, GDP tends to exhibit a more active long-run correction mechanism than variables such as FDI and labor, since economic growth aggregates various production factors and is thus more adaptive to structural changes. Conversely, the unemployment rate, which shows an insignificant or even positive ECT, reflects labor market rigidity—consistent with Blanchard and Wolfers (2000), who found that in many developing countries, unemployment tends to be persistent and unresponsive to macroeconomic shocks in both the short and long term.

Meanwhile, the absence of a correction response in FDI reflects that FDI is primarily influenced by external factors such as global capital flows, political stability, or foreign investor confidence. Hence, the finding that only GDP adjusts in the long term reinforces the literature that economic growth is the most responsive endogenous variable in maintaining system equilibrium, whereas FDI is exogenous in the long-run context. This provides a policy implication that strengthening economic growth should be prioritized due to its key role in stabilizing the national macroeconomic system.

5 | CONCLUSIONS

Based on the analysis and discussion using the Vector Error Correction Model (VECM) method, several conclusions can be drawn as follows:

- here exists a long-run relationship among FDI, GDP, and the unemployment rate in Indonesia. This is evidenced by the Johansen cointegration test, which identified three cointegrating relationships. Thus, the three variables are structurally interrelated in the long term.
- In the long run, economic growth (GDP) and the unemployment rate (TP) have a negative effect on FDI. This means that increases in GDP and TP are followed by declines in FDI. This relationship suggests that when the economy grows and unemployment rises, FDI inflows do not necessarily increase, possibly due to the substitution effect of domestic financing or labor market uncertainty.
- In the short run, FDI does not have a significant effect on either GDP or TP. The results of the Granger causality test and short-term VECM parameters indicate that changes in FDI do not directly cause changes in economic growth or unemployment in the short term.
- Only GDP is able to adjust toward long-run disequilibrium, as indicated by a negative and statistically significant error correction term (ECT). This implies that GDP is the most responsive and stable variable in the system, whereas FDI and TP do not exhibit meaningful adjustment mechanisms.

6 | ACKNOWLEDGEMENT

1. Policy Implications: The government needs to strengthen macroeconomic policies that support sustainable economic growth through improvements in infrastructure, business facilitation, and fiscal and monetary stability. FDI should be directed toward labor-intensive sectors such as manufacturing, agribusiness, and the creative industry so that it contributes more significantly to job creation. In addition, better coordination between investment and labor market policies is necessary to ensure that the benefits of FDI are reflected not only in economic growth but also in unemployment reduction.
2. Suggestions for Future Research: Future researchers are advised to use data with higher frequency and a longer time span to improve estimation accuracy. The inclusion of additional variables—such as inflation, interest rates, ease of doing business, and institutional quality—would enrich the analysis. Other methodologies such as ARDL, panel data, or SVAR models could also be considered. Furthermore, it is important to trace the transmission mechanisms of FDI to the real economy, for instance through productivity enhancement, technological innovation, or export capacity improvement.

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