Integra: Journal of Integrated Mathematics and Computer Science
Journal Homepage: https://integrajimcs.com/index.php/integra/index
integra
Journal of Integrated Mathematics and Computer Science

Research Paper

Modeling the Dimensions of Globalization, Economic Growth, Inequality, and Poverty in Indonesia Using VAR/VECM Method

Qurrota Ayu Nindien[1*], Nadya Ramadhani Ikhsan[1], Yohanes Novi Armunanto[1]

[1] *Faculty of Economics and Business, Universitas Lampung, Lampung, 35145, Indonesia*
[*] **Corresponding author**: qurrotaayu.nindien@feb.unila.ac.id

Keywords
Economic Cooperation, Economic Openness, Foreign Direct Investment, Income Inequality, Social Globalization, Unemployment, VAR, VECM, Poverty

Abstract
This study examines the relationship between globalization dimensions, economic growth indicators, inequality, and poverty in Indonesia using a VECM approach. All variables are stationary at first difference, and the Johansen test confirms four cointegrating vectors, indicating long-run equilibrium among poverty (POV), FDI, inequality (GR), unemployment (UE), economic openness (IEG), economic cooperation (IEC), and social openness (ISG). Based on AIC, lag 2 is selected, and the VAR stability test confirms model validity. In the long run, FDI, GR, UE, IEG, and ISG significantly affect poverty, while IEC does not. FDI, IEG, GR, and ISG reduce poverty, whereas UE increases it. No variable shows short-run significance, but the significant ECT demonstrates gradual adjustment to long-term equilibrium. FEVD results indicate that up to the tenth period, POV variance is mainly explained by POV (63.97%), followed by ISG (15.77%), GR (12.76%), and UE (5.49%), while FDI, IEG, and IEC contribute less than 1%. Overall, poverty dynamics are dominated by its own persistence, with additional influence from social openness and inequality.

Received: 15 September 2025, Accepted: 24 November 2025
https://doi.org/10.26554/integrajimcs.20252345

1. INTRODUCTION

In the era of globalization, economic activities among countries have become increasingly interconnected, creating significant implications for national development indicators such as economic growth, income inequality, and poverty [1]. Globalization can influence a country's economic structure through trade liberalization, foreign direct investment, and international cooperation. However, while globalization may stimulate economic growth, its effects on poverty reduction and income distribution are not always uniform [2].

Some regions experience substantial benefits, while others face widening economic disparities. Therefore, it is crucial to statistically model and analyze how different dimensions of globalization economic, social, and cooperative affect poverty in Indonesia.

From a statistical perspective, understanding these relationships requires the use of advanced econometric models capable of handling complex interdependencies among variables [3]. The use of Vector Error Correction Model (VECM) allows researchers to capture both short term dynamics and long-term equilibrium relationships between globalization, inequality, and poverty. The presence of cointegration among these variables indicates that they move together in the long run, even though short-term fluctuations may occur. This modeling approach is essential for identifying the dynamic responses of poverty to changes in globalization and macroeconomic variables over time.

Furthermore, the statistical application of the VECM model helps policymakers determine how shocks in globalization dimensions such as economic openness, foreign investment, and social integration affect poverty reduction efforts [4]. By quantifying the strength and direction of these relationships, VECM provides empirical evidence that can guide strategic economic and social policies. For instance, if globalization promotes economic growth but simultaneously increases inequality, the model helps identify the policy balance needed to ensure inclusive growth.

The study from [5] is related to the present this research through their shared focus on the socioeconomic determinants of inequality and poverty. Both studies aim to statistically analyze how structural economic factors contribute to social welfare outcomes, though at different analytical levels. While the path analysis study explores how corruption, taxation, and economic inequality indirectly affect education participation among adolescents, the present study employs a time series econometric approach (VECM) to examine the long run and short run relationships between globalization, economic growth, inequality, and poverty. Together, these studies highlight the importance of using quantitative statistical models to understand complex causal mechanisms between economic variables and social development indicators in Indonesia.

Lastly, this research contributes to the field of applied statistics by integrating time series econometric analysis with socio economic modeling to explain the interrelationship between globalization and poverty in Indonesia. The variables used in this study include poverty (POV) as the main dependent variable, which represents the socio-economic well-being of the population, and several independent variables capturing different aspects of globalization and macroeconomic conditions. These include foreign direct Globalization Investment (FDI) as a proxy for capital inflows and global economic integration, unemployment (UE) representing labor market performance, and income inequality (GR) reflecting the distribution of national income. In addition, the model incorporates three dimensions of globalization economic openness (IEG), economic cooperation (IEC), and social openness (ISG) to measure how trade liberalization, international partnerships, and cross-border social interactions influence poverty dynamics. By including these variables, the study aims to statistically identify both the short-term and long-term effects of globalization dimensions and economic factors on poverty reduction in Indonesia through the VECM (Vector Error Correction Model) framework.

2. METHODS

2.1 Data Types and Sources

The type of data used in this study is secondary data in the form of time series data. The data used is annual data covering the period 1984-2024. The data used in this study was obtained from the World Bank and KOF Swiss. Table 1 shows the data and variables used.

Table 1. Variables, Symbols, Units, and Data Sources

Variable	Symbol	Unit	Sources
Poverty	POV	Percent	World Bank
Income Inequality (Gini Ratio)	GR	Percent	World Bank
Foreign Direct Investment	FDI	Dollars	World Bank
Unemployment Rate	UE	Percent	World Bank
Index Economic Globalization	IEG	Percent	KOF Swiss
Index Economic Cooperation	IEC	Percent	KOF Swiss
Index Social Globalization	ISG	Percent	KOF Swiss

2.2 VAR Method

In constructing time series econometric models, it is always based on existing economic theory. However, in reality, sometimes the theory is unable to adequately explain the behavior of economic variables [6].

An example of this theoretical inconsistency is when there is uncertainty or ambiguity regarding the relationship between one economic variable and another. Such as which variables are influenced (dependent variables) and which influence (independent variables). Juanda [7] states that there is a model that can capture this non-theoretical time series econometric model, namely by using the Vector Autoregression (VAR) method.

The VAR method developed by Christopher A. Sims [8] is an econometric method used to see the response and ability to provide explanations of one variable to another. This study still has uncertainties regarding the relationship between these economic variables. Therefore, based on this background, this study will use the VAR method in processing the data. Data processing in this study was carried out using EViews13 software.

2.3 VAR Model

Gujarati [9] states that the VAR model assumes that all economic variables are interdependent. This means that sometimes it is not possible to immediately determine which variable influences the other variables. Consequently, this study employs seven equations in the VAR system, corresponding to the seven variables, with each variable serving as the dependent variable in one equation.

The VAR method can also examine short-term and long-term effects. Therefore, in the VAR modeling in this study, there will be several models, where each variable used in this study will take turns becoming the dependent variable. Thus, the model developed for VAR in this study is formulated based on theories developed by [9, 8, 7, 6, 10, 11].
Short-Term Equation:

$$\begin{aligned}\mathrm{POV}_t = {} & \alpha_0 + \alpha_1 \mathrm{POV}_{t-1} + \alpha_2 \mathrm{GR}_{t-1} + \alpha_3 \mathrm{FDI}_{t-1} + \alpha_4 \mathrm{UE}_{t-1} \\ & + \alpha_5 \mathrm{IEG}_{t-1} + \alpha_6 \mathrm{IEC}_{t-1} + \alpha_7 \mathrm{ISG}_{t-1} + \alpha_8 \mathrm{ECT} + \varepsilon_t \end{aligned} \tag{1}$$

$$\begin{aligned}\mathrm{GR}_t = {} & \beta_0 + \beta_1 \mathrm{GR}_{t-1} + \beta_2 \mathrm{POV}_{t-1} + \beta_3 \mathrm{FDI}_{t-1} + \beta_4 \mathrm{UE}_{t-1} \\ & + \beta_5 \mathrm{IEG}_{t-1} + \beta_6 \mathrm{IEC}_{t-1} + \beta_7 \mathrm{ISG}_{t-1} + \beta_8 \mathrm{ECT} + \varepsilon_t \end{aligned} \tag{2}$$

$$\begin{aligned}\mathrm{FDI}_t = {} & \gamma_0 + \gamma_1 \mathrm{FDI}_{t-1} + \gamma_2 \mathrm{POV}_{t-1} + \gamma_3 \mathrm{GR}_{t-1} + \gamma_4 \mathrm{UE}_{t-1} \\ & + \gamma_5 \mathrm{IEG}_{t-1} + \gamma_6 \mathrm{IEC}_{t-1} + \gamma_7 \mathrm{ISG}_{t-1} + \gamma_8 \mathrm{ECT} + \varepsilon_t \end{aligned} \tag{3}$$

$$\mathrm{UE}_t = \delta_0 + \delta_1 \mathrm{UE}_{t-1} + \delta_2 \mathrm{POV}_{t-1} + \delta_3 \mathrm{GR}_{t-1} + \delta_4 \mathrm{FDI}_{t-1} + \delta_5 \mathrm{IEG}_{t-1} + \delta_6 \mathrm{IEC}_{t-1} + \delta_7 \mathrm{ISG}_{t-1} + \delta_\delta \mathrm{ECT} + \varepsilon_t \quad (4)$$

$$\mathrm{IEG}_t = \omega_0 + \omega_1 \mathrm{IEG}_{t-1} + \omega_2 \mathrm{POV}_{t-1} + \omega_3 \mathrm{GR}_{t-1} + \omega_4 \mathrm{FDI}_{t-1} + \omega_5 \mathrm{UE}_{t-1} + \omega_6 \mathrm{IEC}_{t-1} + \omega_7 \mathrm{ISG}_{t-1} + \omega_8 \mathrm{ECT} + \varepsilon_t \quad (5)$$

$$\mathrm{IEC}_t = \sigma_0 + \sigma_1 \mathrm{IEC}_{t-1} + \sigma_2 \mathrm{POV}_{t-1} + \sigma_3 \mathrm{GR}_{t-1} + \sigma_4 \mathrm{FDI}_{t-1} + \sigma_5 \mathrm{UE}_{t-1} + \sigma_6 \mathrm{IEG}_{t-1} + \sigma_7 \mathrm{ISG}_{t-1} + \sigma_8 \mathrm{ECT} + \varepsilon_t \quad (6)$$

$$\mathrm{ISG}_t = \mu_0 + \mu_1 \mathrm{ISG}_{t-1} + \mu_2 \mathrm{POV}_{t-1} + \mu_3 \mathrm{GR}_{t-1} + \mu_4 \mathrm{FDI}_{t-1} + \mu_5 \mathrm{UE}_{t-1} + \mu_6 \mathrm{IEG}_{t-1} + \mu_7 \mathrm{IEC}_{t-1} + \mu_8 \mathrm{ECT} + \varepsilon_t \quad (7)$$

Equations (1) to (7) above are the short-term equations while Equation (8) is the long-term equation.

Long-term equation:

$$\mathrm{POV}_t = \theta_0 + \theta_1 \mathrm{POV}_{t-j} + \theta_2 \mathrm{GR}_{t-j} + \theta_3 \mathrm{FDI}_{t-j} + \theta_4 \mathrm{UE}_{t-j} + \theta_5 \mathrm{IEG}_{t-j} + \theta_6 \mathrm{IEC}_{t-j} + \theta_7 \mathrm{ISG}_{t-j} + \varepsilon_t \quad (8)$$

where
$\alpha_0, \beta_0, \gamma_0, \delta_0, \omega_0, \sigma_0, \mu_0$ = intercept points
$\alpha, \beta, \gamma, \delta, \omega, \sigma, \mu$ = short-term relationship coefficients
$\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6, \theta_7$ = long-term coefficients
ε = error, t = research period (1984–2024), j = lag
$t-1$ = previous period
POV = poverty, GR = Gini ratio
FDI = Foreign Direct Investment (inflow)
UE = Unemployment rate
IEG = Index Economic Globalization
IEC = Index Economic Cooperated
ISG = Index Social Globalization

The criteria for determining whether the relationship between variables is significant or not can be done by comparing the t-statistic value with the t-table 1%, 5% and 10% as follow:
a. If the t-statistic value < t-table, then H_1 is accepted and H_a is rejected: there is no significant relationship between variables
b. If the t-statistic value > t-table, then H_1 is rejected and H_a is accepted: there is a significant relationship between the variables.

2.4 VAR/VECM Estimation Stages

The VAR/VECM method is widely used for forecasting economic variables in the short, medium and long term. If there are several cointegration relationships between variables in the model, the VAR method becomes unrepresentative and therefore unusable. One way to overcome the problem of cointegration between variables is to use the restricted VAR method, also known as the Vector Error Correction Model (VECM). Thus, the VAR model is used when the data does not have a cointegration relationship, while the VECM method is used when there is a cointegration relationship in the model. The use of the VAR/VECM method requires several tests to be carried out before estimating the model of VAR/VECM. The following are the stages:
- Stationarity Test (Unit Root Test)
The purpose of the stationarity test is to see whether the mean variance of the data is constant over time and the covariance between two or more time series data only depends on the lag between two or more periods of time.
- Lag Optimum Test
The optimum lag test aims to identify how far a previous period of a variable can influence another variable. The determination of the number or length of the optimum lag in this study uses the Akaike Information Criteria (AIC).
- VAR Stability Test
The VAR stability test is conducted to determine whether the VAR model used is stable or not. In addition, this test needs to be conducted to determine the validity of the model used in further analysis, namely in the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analyses. The stability of the model in the VAR stability test is determined based on the modulus value of all polynomial root characteristics. If the modulus value of the polynomial root is less than one, then the model used can be said to be stable [9].
- Cointegration Test
This test is conducted to determine whether there is a long-term relationship between the variables under study. This cointegration test determines whether the VECM method can be used or not. If cointegration is found in the model, then the next stage can be continued, which means that the VECM method can be used. If there is no cointegration in the model, then the VECM method cannot be continued and another method that is more appropriate for processing must be chosen. There are several types of cointegration tests, including the Engle-Granger cointegration test and the Johansen cointegration test. This study uses the Johansen cointegration test.

3. RESULTS AND DISCUSSION

In accordance with the method used, the data analysis procedure in this study will test stationarity and determine the variables used at level 1 or 1st difference. Table 2 displays the ADF stationary test.

Table 2. ADF Stationary Test Results

Variable	Level (Prob)	Stationer	1st difference (Prob)	Stationer
POV	0.6327	No	0.0000	Yes
GR	0.6603	No	0.0003	Yes
FDI	0.1310	No	0.0000	Yes
UE	0.6524	No	0.0006	Yes
IEG	0.1133	No	0.0000	Yes
IEC	0.3852	No	0.0000	Yes
ISG	0.8222	No	0.0000	Yes

The data on Table 2 to Table 7 are taken from data processed using Eviews13.

Based on Table 2, the stationarity test using the ADF test results shows that all variables in the level test are greater than 0.05, so it can be said that the variables of poverty (POV), investment (FDI), unemployment (UE), income inequality (GR), economic openness (IEG), economic cooperation (IEC), and social openness (ISG) are non-stationary. Meanwhile, the ADF stationarity test results at the 1st difference level show that all variables are stationary because the 1st difference level probability is less than 0.05. In this study, the optimal lag length was determined by looking at the Akaike Information Criterion (AIC) indicator, which had the smallest value among the other lag results. Table 3 displays the results of optimal lag.

Table 3. Lag Optimum Test

Lag	LogL	AIC
0	-516.7207	27.56425
1	-476.8555	28.04503
2	-414.3622	27.33485*

Based on Table 3 in determining the optimum lag length, it can be seen that the AIC value at lag 2 is smaller than the AIC values at other lags. Thus, the recommended optimum lag is lag 2. Then, tested the stability of VAR against all variables used and then multiplied it by the number of lags from each VAR. VAR stability is used to determine the results of VAR stability estimation. If VAR stability is unstable, the IRF analysis becomes invalid.

To determine the VAR stability test, the VAR system will be stable if all of its roots have a modulus < 1. Table 4 shows the VAR stability test. Based on the that table, the IRF analysis is stable and valid because the modulus is < 1.

Table 4. VAR Stability Test

Root	Modulus
0.564896 - 0.548837i	0.787610
0.564896 + 0.548837i	0.787610
-0.316479 - 0.645081i	0.718532
-0.316479 + 0.645081i	0.718532
0.130113 - 0.598883i	0.612855
0.130113 + 0.598883i	0.612855
0.571530	0.571530
-0.510787 - 0.046270i	0.512878
-0.510787 + 0.046270i	0.512878
0.168669 - 0.300269i	0.344400
0.168669 + 0.300269i	0.344400
-0.140218 - 0.310679i	0.340856
-0.140218 + 0.310679i	0.340856
-0.273775	0.273775

Cointegration test in this study used the Johansen test by comparing the trace statistic value greater than the critical value, so that the data is cointegrated, and vice versa. If the trace statistic value is smaller than the critical value, then the data is not cointegrated. Table 5 shows the Johansen test.

Table 5. Cointegration Johansen Test

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	214.2312	125.6154	0.0000
At most 1 *	143.5221	95.75366	0.0000
At most 2 *	88.22557	69.81889	0.0009
At most 3 *	57.05096	47.85613	0.0054

Based on Table 5 it can be seen that four trace tests that indicate cointegration, namely trace statistic values greater than critical values at four ranks at a 5% confidence level and marked with an asterisk (*). Thus, the cointegration test results answer the research question in this study. Thus, the answer to the research question in this study is that there is cointegration in the variables of poverty (POV), investment (FDI), unemployment (UE), income inequality (GR), economic openness (IEG), economic cooperation (IEC), and social openness (ISG).

3.1 Short-Run Effects

In the short run, the VECM estimation results indicate that the movements of macroeconomic variables such as investment (FDI), income inequality (GR), unemployment (UE), economic openness (IEG), economic cooperation (IEC), and social openness (ISG) do not yet exert a direct and significant impact on poverty (POV). This occurs because short-term changes in these variables tend to be fluctuating and have not created structural adjustments strong enough to influence poverty levels immediately. For instance, foreign investment inflows in the short run are generally still in the preparatory phase, such as project planning, contracting, or initial construction so they have not yet generated job opportunities or substantial income improvements for low-income groups.

Likewise, short-term changes in income inequality or economic openness mainly reflect market dynamics and temporary capital movements, meaning that their influence on poverty does not appear instantly within the current period.

From the short-term estimation results, the models are shown on Equations (9) to (13) as follow:

$$D(\text{POV}) = 0.022361 - 0.007045\,\text{GR}_{t-1} + 0.626834\,\text{UE}_{t-2} - 0.042860\,\text{IEG}_{t-1} - 0.122139\,\text{ISG}_{t-1} \tag{9}$$

$$D(\text{FDI}) = -0.008972 + 0.094238\,\text{IEG}_{t-1} + 0.083215\,\text{IEC}_{t-1} + 0.173695\,\text{ISG}_{t-1} \tag{10}$$

$$D(\text{IEG}) = -0.232167 - 4.677824\,\text{POV}_{t-1} - 3.382990\,\text{UE}_{t-1} + 0.928357\,\text{IEG}_{t-1} + 0.508421\,\text{IEG}_{t-2} \tag{11}$$

$$D(\text{IEC}) = 0.127208 - 2.464476\,\text{FDI}_{t-1} \tag{12}$$

$$D(\text{ISG}) = 0.073481 + 1.177181\,\text{POV}_{t-1} + 1.768949\,\text{POV}_{t-2} + 4.436050\,\text{FDI}_{t-1} + 1.980646\,\text{FDI}_{t-2} - 2.670038\,\text{GR}_{t-1} - 2.130264\,\text{GR}_{t-2} \tag{13}$$

3.2 Long-Run Effects

Nevertheless, the VECM model demonstrates that short-run relationships still exhibit an adjustment mechanism toward long-run equilibrium through the error correction term (ECT). A significant ECT value indicates that when deviations or disequilibrium occur between the explanatory variables and poverty, the correction mechanism will operate automatically to bring the system back toward long-term equilibrium. This means that although short-run changes in FDI, unemployment, economic openness, or social globalization may not have a significant direct impact on poverty, these changes contribute to the adjustment process that leads to long-run effects, which are shown to be significant in the long-term estimation results. Thus, short-run dynamics reflect a transitional process, while the substantive impact on poverty reduction becomes evident only when these changes persist and progress consistently over the long term.

After conducting the previous test, which pointed to the VECM model, the VECM test could be carried out used alpha 5%. The VECM estimation results reveal the short-run and long-run relationships between poverty (POV), investment (FDI), unemployment (UE), income inequality (GR), economic openness (IEG), economic cooperation (IEC), and social openness (ISG). Table 6 shows the results.

Table 6. Long-Run VECM Estimation Results

Variable	Coefficient	t-stat	t-table	Significant
C	-0.298710			
FDI	-4.592912	11.6473	2.0322	Yes
GR	1.879834	8.20170	2.0322	Yes
UE	0.853815	3.89736	2.0322	Yes
IEG	- 0.140296	2.29776	2.0322	Yes
IEC	- 0.060773	1.01795	2.0322	No
ISG	- 0.626011	7.26226	2.0322	Yes

Equation (14) shows the long-term model:

$$\text{POV} = -0.298710 - 4.592912\,\text{FDI}_{t-2} - 1.879834\,\text{GR}_{t-2} + 0.853815\,\text{UE}_{t-2} - 0.140296\,\text{IEG}_{t-2} - 0.626011\,\text{ISG}_{t-2} \tag{14}$$

According to the result in Table 6, the long-term equation model produced in the VECM test shows that the independent variables of investment (FDI), income inequality (GR), unemployment (UE), economic openness (IEG), and social openness (ISG) have a significant effect on poverty (POV) in the long term. Meanwhile, the variable of economic cooperation (IEC) does not significantly affect POV in the long term.

The variable of investment inflows (FDI) produces negative and significant results on POV, which means that a one percent increase in investment will cause poverty to fall by 4.59 percent, with other factors remaining ceteris paribus. This is in line with the hypothesis based on the grand theory, namely the trickle-down effect theory by Lewis in 1954 [11], which states that an increase in wealth and investment among the rich will "trickle down" through job creation, higher wages, and higher consumer spending. Thereby reducing poverty, accompanied by a vertical flow from the rich to the poor. Moreover, in the Vicious Cycle of Poverty Theory by Nurkse in 1953 [12], it is stated that low investment will create low productivity, which in turn will result in low community income, and so on in a vicious cycle [12].

Furthermore, these results are also supported by several previous studies which state that FDI has an influence in reducing poverty [13, 14, 15, 16] and that FDI has a negative and significant impact in the long term in Botswana [17]. However, there are counterarguments regarding the impact of FDI on poverty, with some studies showing a positive impact, indicating that the investment is not absorbed into productivity, such as [18, 19]. Foreign Direct Investment (FDI) is part of a country's long-term support for another country in the areas of management, joint ventures, technology transfer, and expert consultation [20].

According to Ministry of Investment/Indonesia Investment Coordinating Board (BKPM), investment realization increased by 16.5% in 2023 and 23.8% in 2024, with the manufacturing sector, such as basic metals, metal goods, non-machinery, and equipment, being the largest contributor to investment in Indonesia, apart from the mining, regional industry, transportation, and chemical and pharmaceutical industries. The regions with the highest total investment realization are Jakarta, East Java, Central Sulawesi, and Banten.

Income inequality represents by Gini Ratio (GR), it has a negative effect on poverty (POV) with a coefficient of 1.88, which means that when inequality increases by one, poverty decreases by 1.88 percent, ceteris paribus. The results of this study show that the negative effect of income inequality on poverty can be explained by the Kuznets hypothesis [21], whereby an increase in inequality at a certain stage of development reflects increased economic activity that is capable of creating jobs and reducing poverty. Several studies have also found similar results, that income inequality has a negative and significant effect on poverty [22, 23, 24].

In this study, unemployment (UE) has a positive and significant effect on poverty (POV) in Indonesia. When unemployment rises by one percent, poverty also increases by 0.85 percent, ceteris paribus. This is consistent with Keynesian theory in macroeconomics, which states that an increase in unemployment will reduce household consumption and result in a decrease in aggregate income, leading to a decline in the productivity of goods and services, thereby increasing poverty. These results are also supported by other studies that state that unemployment has

a positive and significant effect on poverty [25, 26, 27, 28, 29]. According to Central Bureau of Statistics (BPS), the unemployment situation in Indonesia in 2023 and 2024 shows a downward trend. The Open Unemployment Rate (TPT) in 2023 is 5.32%, then drops to 4.91% in 2024 and an increase in workers due to the manufacturing sector.

Economic openness, as represented by the economic globalization index (IEG), has a negative impact on poverty (POV), in line with the equation model above, which states that when the economic globalization index increases by one index, poverty will decrease by 0.14 percent, ceteris paribus. The higher the economic openness of a country or region, the greater the opportunity for technology transfer, investment flows, and expansion of the productive sector, which can directly or indirectly increase community income and reduce poverty levels. This is also supported by previous studies that discuss economic openness in positively and significantly affecting poverty [29, 30, 31, 32, 33].

Social openness, as indicated by the social globalization index (ISG), has a negative impact on poverty (POV), meaning that when the social globalization index rises by one point, poverty decreases by 0.62 percent, ceteris paribus. Based on Amartya Sen's theory of capability constraints, social openness through the flow of information, communication, migration, and cross-border interactions can improve poor people's access to education, skills, employment, and income. Therefore, the higher the level of social globalization, the greater the opportunity for people to escape poverty.

Several studies that support and are in line with this research about ISG and POV, some of them are [34, 35], on several aspects of social openness that reduce poverty. The conditions of economic openness (IEG) and social openness (ISG) in Indonesia have an index range of 45-60 on a scale of 1-100. Therefore, in terms of policy implications, the government needs to play a role in helping the community to be productive in goods and services between other countries and increase cross-cultural interaction so that it can improve the access of the poor to education, employment, and skills.

3.3 Impulse Response Function (IRF)

Once the best model has been obtained after estimating the VAR model and conducting a cointegration test, the dependent and independent variables can then be determined [36]. In this study, after processing, it was determined that the best model was one that used poverty (POV) as the dependent variable, with an optimum lag of 2.

Impulse response is used to see the impact of changes in one variable on changes in other variables in the system dynamically, by applying shocks to one of the endogenous variables. The magnitude of these shocks is named as "Innovations", which one innovation is equal to one standard deviation of the variable [37]. The impact of these shocks is traced over several future periods. The technique for observing these shocks is known as the Impulse Response Function (IRF). Figure 1 shows the result for IRF.

There are seven graphs that show the results. The first graph is the graph on the first row, the second graph is the graph next to the first graph that lies on the same row, the third graph is the graph next to the second graph on the same row, the fourth graph is the first graph on the second row, and so on, until the seven graph which lies on the third row. The first graph shows shock that happen to the poverty variable itself. The figure shows that when there is a shock to the POV variable, the POV variable itself will respond positively. After that, starting from period 2, it will respond negatively, and after period 10, it will reach stability.

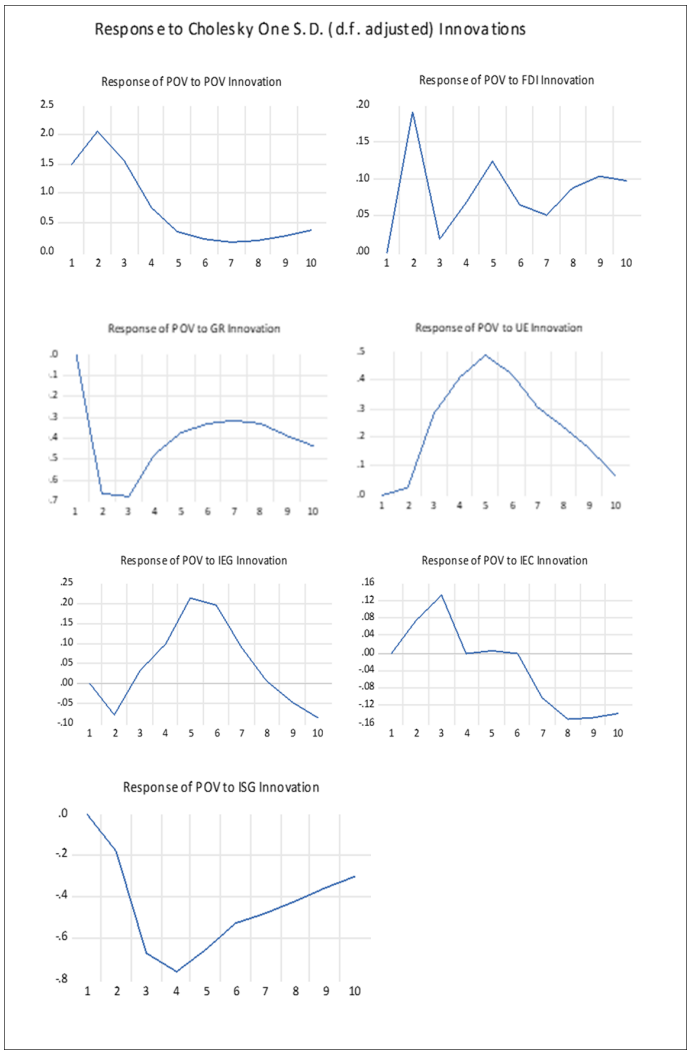

Figure 1. Impulse Response Function Results

The second graph shows the shock that occurred in the FDI variable. The shock was initially responded to positively by POV. Starting in the second period, the response was responded to negatively by POV. This is in accordance with the theory that if FDI increases, POV will decrease.

The third graph shows shocks to the GR. If there is a shock to the GR of 1 standard deviation, POV will respond negatively until the third period. POV will respond according to theory,

Table 7. Variance Decomposition Percentages Results

Period	POV	FDI	GR	UE	IEG	IEC	ISG
1	100.000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
2	92.44894	0.521504	6.371459	0.007859	0.096042	0.079226	0.47497
3	85.10127	0.352774	8.758941	0.775168	0.072476	0.223702	4.71566
4	78.64531	0.346584	9.576351	2.094243	0.141641	0.194247	9.00162
5	73.48960	0.437971	9.932678	3.788155	0.477265	0.179565	11.6947
6	70.25102	0.447951	10.27698	4.916233	0.736571	0.170818	13.2004
7	68.10514	0.450621	10.65271	5.398931	0.767279	0.238639	14.3866
8	66.40700	0.489066	11.12099	5.623320	0.745178	0.393965	15.2204
9	65.06006	0.547648	11.83973	5.638020	0.739730	0.530811	15.6440
10	63.97300	0.593240	12.75775	5.498707	0.766463	0.643223	15.7676

Cholesky One S.D. (d.f. adjusted) Innovations
Cholesky ordering: POV FDI GR UE IEG IEC ISG

starting in the fourth period and onwards.

The fourth graph shows the impact of the EU on poverty. This impact will initially be responded to positively by POV, which is in line with theory. After the fifth period, this impact will be responded to negatively by POV. Stability will occur after the tenth period.

The fifth graph in Figure 1 shows the impact on the Index of Economic Globalization (IEG) variable. At the beginning of the period, this shock will be responded to negatively by POV. From periods 2 to 5, it will be responded to positively, then after the fifth period, it will be responded to negatively again. This is in line with the theory.

The sixth graph illustrates the response of POV in the event of a shock of 1 standard deviation on the economic openness which represent by Index Economic Cooperation (IEC) variable. In the first to third periods, shocks on IEC will be responded to positively by POV. The new theory will be validated in the sixth period, when the shock is responded to negatively by POV. Stability will be achieved after the tenth period. The seventh graph shows the shock that occurs in the Index Social Globalization (ISG). Theoretical consistency occurs immediately in the first period, where the ISG shock will be responded to negatively by the POV. Stability will be achieved after the tenth period.

3.4 Forecast Error Variance Decomposition (FEVD)

In the VAR model, there is an analysis that can predict the percentage contribution of each variable due to changes in other variables. This allows us to see how large the composition is or how important other variables are in the VAR model due to a shock [38]. This analysis is known as Forecast Error Variance Decomposition (FEVD).

FEVD is commonly used to predict the percentage contribution of error variance for each variable due to changes in certain variables, whether these variables themselves or other variables [39]. In addition, FEVD also helps to show which impulse variables are stronger in explaining the variation in the response variable throughout the period [40].

Figure 2 shows the results of FEVD analysis in the study. The

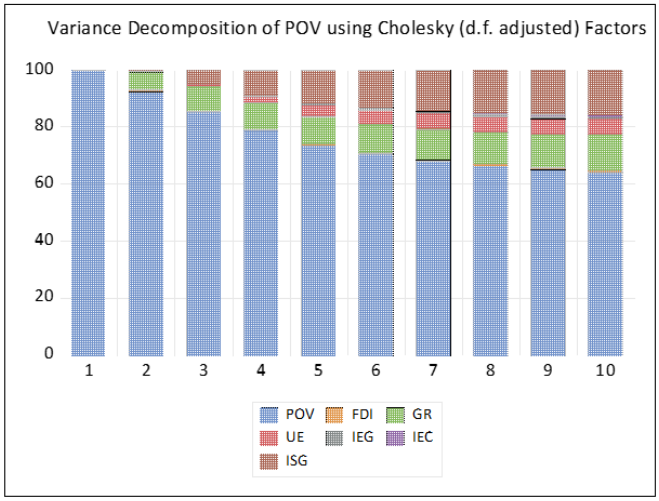

Figure 2. Variance Decomposition Stacked Results

figure shows how much each variable, including the dependent variable itself contributes to the dependent variable when a shock occurs. Different colors represent each variable. POV is blue, UE is red, ISG is brown, FDI is orange, IEG is gray, GR is green, and IEC is purple. From Figure 2, it can be seen that in the first bar, which shows the first period, all colors are blue. This means that when a shock occurs in POV, the contribution to the formation of POV value variance is only determined by the POV variable itself. In the second bar, which shows the second period, there is another color besides blue, namely green, which indicates GR. This means that in the second period, the contribution to the formation of POV variance is no longer determined solely by POV itself, but the Gini Ratio also contributes to the formation of POV. In the third bar, or for the third period, the brown color also appears. This means that in the third period, the formation of POV value variance is not only determined by POV itself, but also by GR and ISG, as well as other variables, although the contribution of other variables is still very small (below 1%).

Up to the tenth bar, which shows the tenth period, the largest contribution to the formation of POV variance is determined by POV itself, followed by ISG and GR.

Table 7 shows the details of the percentage contribution of each variable to the variance in POV values. In the first period, 100% was formed by POV itself. In the second period, other contributions began to appear, with GR contributing 6.37%. Other variables began to contribute, but the amount was still very low, with each variable other than POV itself and GR contributed less than 1%. In the third period, the ISG variable began to contribute significantly to the variance in POV values, namely 4.72%. The two variables that contributed the most were POV at 92.45 and GR at 8.76%. Until the tenth period, the average POV variance was mostly explained by POV itself, which was 63.97%, followed by ISG at 15.77%, GR at 12.76%, and UE at 5.49%. Meanwhile, FDI, IEG, and IEC can only explain less than 1% for the variance of POV. Therefore, it can be concluded that the formation of the variance value of POV is most dominated by the POV value itself, followed by ISG and GR.

4. CONCLUSIONS

From the Results and Discussion we can conclude that all variables are stationary at the first difference, and four cointegrating relationships exist, indicating long-run equilibrium among poverty, investment, unemployment, inequality, and various globalization indicators. The long-run findings show that foreign direct investment, economic openness, and social openness reduce poverty, while unemployment increases it. Income inequality surprisingly shows a negative relationship with poverty, consistent with the Kuznets hypothesis, whereas economic cooperation has no significant long-term effect. In the short run, none of the variables significantly affect poverty, suggesting that short-term fluctuations in investment, unemployment, and openness do not immediately lead to structural changes. However, the significant error correction term (ECT) indicates that deviations from long-run equilibrium are corrected over time, meaning short-run dynamics contribute to long-run adjustments. Overall, the findings highlight the need to strengthen investment, enhance economic and social openness, and reduce unemployment to support long-term poverty reduction in Indonesia. The result of the FEVD shows that until the tenth period, the average POV variance value was mostly explained by POV itself, which was 63.97%, followed by ISG at 15.77%, GR at 12.76%, and UE at 5.49%. Meanwhile, FDI, IEG, and IEC can only explain less than 1% for the variance of POV. Therefore, it can be concluded that the formation of the variance value of POV is most dominated by the POV value itself, followed by ISG and GR.

5. ACKNOWLEDGEMENT

The research is supported by Computer Laboratory, Faculty of Economics and Business Universitas Lampung. The author appreciates the support given.

REFERENCES

[1] R. P. Paksi. Determinants of economic growth: Case of indonesia. *Jurnal Dinamika Pembangunan*, 3(3):157–171, 2020.

[2] T. Taufiqurrahman and K. Khoirunurrofik. Special economic zones (sezs) impact on poverty in indonesia. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 7(2):231–249, 2023.

[3] Warsono, A. M. Sulandra, D. Kurniasari, M. Usman, and B. Susetyo. Integrating var and cnn models for accurate forecasting of money supply in indonesia. *Integra: Journal of Integrated Mathematics and Computer Science*, 2(2):48–55, 2025.

[4] R. Nopiah, A. Ekaputri, and D. Anggraini. Financial technology and poverty alleviation in indonesia during the covid-19: Impact evaluation analysis. *Ekombis Review*, 12(1):499–516, 2024.

[5] A. Puspitasari, E. Khinara, K. S. Rodiyah, S. P. Sunardi, and J. I. Daoud. Path analysis effect corruption, tax, inequality economy and poverty level against percentage of teenagers not attending school. *Integra: Journal of Integrated Mathematics and Computer Science*, 2(1):25–32, 2025.

[6] A. Widarjono. *Ekonometrika: Teori dan Aplikasi*. UPP STIM YKPN, Yogyakarta, 5 edition, 2018.

[7] B. Juanda and Junaidi. *Ekonometrika Deret Waktu: Teori dan Aplikasi*. IPB Press, Bogor, 2012.

[8] C. A. Sims. Macroeconomics and reality. *Econometrica*, 48(1):1–48, 1980.

[9] D. N. Gujarati and D. C. Porter. *Basic Econometrics*. McGraw-Hill, 2009.

[10] M. Firdaus. *Aplikasi Ekonometrika dengan E-views, Stata dan R*. IPB Press, 2020.

[11] W. A. Lewis. Economic development with unlimited supplies of labour. *The Manchester School*, 22(2):139–191, 1954.

[12] R. Nurkse. *Problems of Capital Formation in Underdeveloped Countries*. Oxford University Press, 1953.

[13] F. Ahmad, M. U. Draz, L. Su, I. Ozturk, A. Rauf, and S. Ali. Impact of fdi inflows on poverty reduction in the asean and saarc economies. *Sustainability*, 11(9):2565, 2019.

[14] F. O. Anetor, E. Esho, and G. Verhoef. The impact of foreign direct investment, foreign aid and trade on poverty reduction: Evidence from sub-saharan african countries. *Cogent Economics and Finance*, 8(1):1737347, 2020.

[15] M. B. Khan, X. Huobao, and H. Saleem. Direct impact of inflow of foreign direct investment on poverty reduction in pakistan: a bounds testing approach. *Economic Research-Ekonomska Istraživanja*, 32(1):3647–3666, 2019.

[16] Q. A. Do, Q. H. Le, T. D. Nguyen, V. A. Vu, L. H. Tran, and C. T. T. Nguyen. Spatial impact of foreign direct investment on poverty reduction in vietnam. *Journal of Risk and Financial Management*, 14(7):292, 2021.

[17] M. T. Magombeyi and N. M. Odhiambo. Fdi inflows and poverty reduction in botswana: an empirical investigation. *Cogent Economics and Finance*, 6(1):1480302, 2018.

[18] S. Arogundade, M. Biyase, and S. Bila. Be nice to thy neighbors: Spatial impact of foreign direct investment on poverty in africa. *Economies*, 10(6):128, 2022.

[19] M. T. Magombeyi and N. M. Odhiambo. Dynamic impact of fdi inflows on poverty reduction: Empirical evidence from south africa. *Sustainable Cities and Society*, 39:519–526, 2018.

[20] M. Mahadiansar, R. Setiawan, E. Darmawan, and F. Kurnianingsih. Realitas perkembangan investasi asing langsung di indonesia tahun 2019. *Matra Pembaruan*, 5(1):65–75, 2021.

[21] S. Kuznets. International differences in income levels: Reflections on their causes. *Economic Development and Cultural Change*, 2(1):3–26, 1953.

[22] M. Amponsah, F. W. Agbola, and A. Mahmood. The relationship between poverty, income inequality and inclusive growth in sub-saharan africa. *Economic Modelling*, 126:106415, 2023.

[23] R. J. Kumaat, D. C. Rotinsulu, and V. A. Rumate. Analysis of income inequality and its effect on poverty through economic growth (case of talaud islands district). In *6th Annual International Conference on Management Research (AICMaR 2019)*, pages 178–181. Atlantis Press, 2020.

[24] I. Musa, E. Enaberue, and S. Magaji. Impact of income inequality on poverty level in nigeria: Evidence from ardl model. *Asian Journal of Economics, Business and Accounting*, 24(5):86–98, 2024.

[25] O. A. Adelowokan, O. E. Maku, A. O. Babasanya, and A. B. Adesoye. Unemployment, poverty and economic growth in nigeria. *Journal of Economics and Management*, (35):5–17, 2019.

[26] D. Dahliah and A. N. Nur. The influence of unemployment, human development index and gross domestic product on poverty level. *Golden Ratio of Social Science and Education*, 1(2):95–108, 2021.

[27] N. Feriyanto, D. E. Aiyubbi, and A. Nurdany. The impact of unemployment, minimum wage, and real gross regional domestic product on poverty reduction in provinces of indonesia. *Asian Economic and Financial Review*, 10(10):1088–1100, 2020.

[28] M. S. Meo, V. J. Khan, T. O. Ibrahim, S. Khan, S. Ali, and K. Noor. Asymmetric impact of inflation and unemployment on poverty in pakistan: new evidence from asymmetric ardl cointegration. *Asia Pacific Journal of Social Work and Development*, 28(4):295–310, 2018.

[29] M. Z. Ngubane, S. Mndebele, and I. Kaseeram. Economic growth, unemployment and poverty: Linear and non-linear evidence from south africa. *Heliyon*, 9(10), 2023.

[30] O. S. Adegboyo, O. O. Efuntade, D. O. Olugbamiye, and A. O. Efuntade. Trade openness and poverty reduction in nigeria. *EuroEconomica*, 40(2), 2021.

[31] T. S. Arabiyat, M. Mdanat, and G. Samawi. Trade openness, inclusive growth, and inequality: Evidence from jordan. *The Journal of Developing Areas*, 54(1), 2020.

[32] G. Maluleke and N. Vacu-Nqila. Trade openness and poverty reduction in south africa. *Acta Economica*, 22(40):97–118, 2024.

[33] H.-T. Nessa and K. S. Imai. Trade openness and working poverty: empirical evidences from developing countries. *International Trade, Politics and Development*, 7(2):58–76, 2023.

[34] N. Awuse. The effects of internal migration on poverty reduction in ghana. *African Journal of Applied Research*, 4(2):65–80, 2018.

[35] J. Kwak and M. Chankseliani. International student mobility and poverty reduction: A cross-national analysis of low-and middle-income countries. *International Journal of Educational Research*, 128:102458, 2024.

[36] R. Davidson and J. G. MacKinnon. *Econometric Theory and Methods*. Oxford University Press, New York, 2004.

[37] H. Seddighi. *Introductory Econometrics: A Practical Approach*. Routledge, 2013.

[38] P. J. Brockwell and R. A. Davis. *Introduction to Time Series and Forecasting*. Springer, 2002.

[39] W. Enders. *Applied Econometric Time Series*. John Wiley & Sons, 2008.

[40] M. Verbeek. *A Guide to Modern Econometrics*. John Wiley & Sons, 2017.

