

A Comprehensive Model of Reducing Poverty

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Abstract—The research investigates a comprehensive poverty model by including the variables of financial inclusion, economic growth, and inequality together in the model. This study uses Java Island, Indonesia, with an annual time series from 2000 to 2019. The Vector Error Correction Model (VECM) method estimates short-term and long-term phenomena from the model. The results showed that poverty was influenced by financial inclusion and income inequality in the short term. In contrast, in the long term, poverty was influenced by financial inclusion and economic growth. In the long term, poverty reduction can be achieved through financial development that facilitates financial services for the poor that can increase per capita income.

Keywords—financial inclusion, economic growth, income inequality, poverty introduction

I. INTRODUCTION

Many countries have come a long way to reduce poverty and income inequality. Most developing countries have used economic growth as a tool to reduce poverty levels [1–3]. Studies that previous researchers have conducted show that reducing the level of poverty is through economic growth. Economic growth is still believed to be a powerful remedy for reducing poverty. The increasing of economic growth as the effect of location and sectoral components. The results showed that foreign direct investment in the agriculture sector, rural population, simultaneously had a significant effect on food security to reduce poverty in developing countries [4–8]. But in fact, high economic growth is often accompanied by a widening level of income inequality [3,9,10]. Growth is important but not sufficient to reduce poverty [11]. High inequality will worsen a country's economic growth [10,12,13]. Economic growth supported by income distribution is the key to reducing poverty [6].

Economic growth is a condition in which the real output of an economy increases compared to the previous period. Economic growth requires the support of the financial sector. Financial sector development is a process of funding and institutional development, development of financial instruments to encourage large investment, economic growth, and reduce poverty. Development of the financial sector is carried out to develop the size, efficiency, and stabilization of financial markets by increasing access to financial markets [14]. Many groups in society, especially the poor, have limited

access to formal financial institutions. This group relies more on informal financial institutions to save and borrow funds. A well-developed financial sector has not succeeded in being inclusive, and there are still community groups outside the formal financial system [15]. The financial system is not yet fully inclusive with the poor.

Several studies have identified that financial inclusion plays an important role in the formulation of income distribution policies and poverty reduction [16]. Financial inclusion has a positive effect on economic growth and a mutually beneficial relationship between the two [17,18]. World Bank [19] Providing microeconomic evidence that access to basic services and savings is very beneficial for the poor and the youth in terms of innovation, job creation, and growth. The development of financial services provides easy access for the poor to cheap funds to run small businesses and create jobs, increase income and reduce poverty.

Financial inclusion is a basic pillar in stabilization and economic development [20]. According to Stiglitz [21], the economy will be healthy if the financial sector is healthy. The financial sector is healthy if this sector can optimize its role in the economy. All levels of society can access financial institution services both in saving funds and utilizing funds. Financial institutions can optimize their role to collect third-party funds from all levels of society and transfer them back to the deficit and needy units. Financial sustainability must be improved by operational feasibility and must be designed to be social acceptability [22]. Investment activity increases, job creation occurs, people's purchasing power increases, poverty falls, and the economy grows. There is a positive relationship between defensive pessimism, self-control, consumer financial product bias, and long-term investment [23].

In addition, it is still very rare for researchers to discuss poverty by including financial inclusion as a source of growth. So far, researchers have only partially linked economic growth with poverty, growth with income inequality, and financial inclusion with economic growth. The sources of growth and inequality concerning financial inclusion are still rarely studied, especially in developing countries with relatively low levels of financial inclusion.

The gap between financial inclusiveness and economic growth in various countries shows a crucial problem that

financial inclusion will directly impact minimizing economic disparities and reducing poverty. There is still very limited research that discusses the relationship between financial inclusion and economic growth, economic inequality, and poverty reduction. Based on this phenomenon, we are motivated to research to investigate a comprehensive poverty model by including the variables of financial inclusion, economic growth, and inequality together in the model.

II. REVIEW LITERATURE

The main problem faced by developing countries in promoting sustainable economic growth is large investment funds. Investment funding needs can be met by developing the financial sector. According to McKinnon-Shaw [24], the conditions often faced by developing countries are government policies that lead to restrictions and repression of the financial sector in the form of restrictions on bank interest rates by the government, selective credit allocation, high reserve requirements that limit banking competition activities [25]. This condition will hamper economic growth because banks find it difficult to compete with competitive prices. Therefore, there needs to be liberalization of the financial sector to set interest rates according to their abilities. The McKinnon – Shaw [24] model shows that financial liberalization will improve the competitive climate and increase saving as interest rates increase and promote investment and economic growth. Low or negative real interest rates will reduce saving, reducing the supply of credit for investment, so that economic growth will decline again [25].

According to Schumpeter, the determinants of economic growth are innovation and inventions. Innovation is urgently needed in the financial sector so that there will be developments in the size, efficiency, and stability of the financial market in line with increased access to financial markets, which will provide many benefits for the economy [14]. Financial sector innovation will create perfect information and cheaper transaction costs. Economies of scale increase, the cost of funds is cheap, investment increases, the economy grows, and poverty falls. According to Stiglitz and Weiss [26] and Diamond [27], a well-developed financial market will be a channel for saving for a more profitable investment in the economy, lowering the cost of information that will allocate capital better [28], lowering transaction costs [29]. The credit channel is used to finance working capital needs and fixed capital investment to increase production and productivity of the real sector [30].

According to studies by Lucas [31] and Miller [32], the development of the financial sector contributes to an engine of economic growth. The development of the financial sector as a source of endogenous growth is carried out through capital accumulation, investment, and savings. Financial technology innovation encourages future economic development [33–35]. Research on the financial sector with broadly developed economic growth to determine the relationship between development and domestic savings, capital accumulation, technological innovation, income growth and financial

determination [36–39]. Kim, Kim, Cha and Kim [40] concluded the development of the financial sector would create financial inclusion, namely the ease of access and availability of formal financial services such as deposits, credit, insurance, and others for all people in an economy, sustainably and responsibly [41]. The relationship between the financial sector and economic growth is built through the concept of the trickle effect [40].

The financial sector affects poverty and inequality in two ways: directly and indirectly [42]. The financial sector directly affects poverty by making it easier for the poor to access financial resources [43]. Studies in India, China, Ethiopia, Ghana concluded that financial sector development could increase the availability of financial services for the poor and reduce poverty [44,45]. In changing business environment, the financial sector is focusing on new trends in financial management systems. Nowadays, there is a need to achieve long-term financial growth, so financial managers try to develop new models for managing and improving the financial performance of businesses in economic practice to support long term economic growth for the poor and reduce poverty [46]. Economic practice to support long term economic growth includes investment plays a crucial role in the development and growth of all countries, especially developing ones and it is one of the world's main business and a progressively significant source of investment [47].

Financial inclusion initiatives, and economic growth strategies is essential to achieve sustainable economic development [48]. Increasing public savings can be done by removing barriers in the financial sector so that investment activities and economic growth increase and the poverty rate decreases. The high barrier to accessing the financial sector causes the poor to invest their funds in physical assets [42]. Financial sector instability is very detrimental to the poor because the funds that can be accessed by the poor are very limited [45]. The development of the financial sector is not always accessible to all levels of society, especially the poor. This group is still in the informal financial sector. The development of an advanced financial sector has not created an inclusive financial system, namely a financial system that can provide easy access for the poor to the financial sector. The development of an inclusive financial sector is an important pillar in promoting economic growth, reducing inequality and poverty.

A. *Financial Inclusion and Economic Growth*

Previous studies found a relationship between financial inclusion and economic growth. Sarma [49] found a positive relationship between economic growth and financial inclusion for all dimensions (banking penetration, availability of banking services, and use of banking services). Makina and Walle [18] investigated financial inclusion with economic growth in the country with the lowest inclusion rate (in Africa). The result is that there is a positive and significant relationship between the financial inclusion dimensions of access to economic growth. The development of the financial sector impacts globalization

and economic growth [50]. Financial inclusion initiatives, and economic growth strategies is essential for these Indian states to achieve sustainable economic development. Financial development is a causative factors of economic growth in the long run [51]. There is a relationship between financial development and economic growth in CESEE countries [52].

Kumar concluded that the increase in bank networks had a positive impact on financial inclusion [53]. Increasing the number of bank branches will increase efficiency among banks and have a positive impact on economic growth [54,55]. There is the significant impact of financial development on country's economic growth [56].

Hypothesis

H1: Financial inclusion has a significant positive effect on economic growth

B. Financial Inclusion and Income Inequality

Financial sector development does not directly affect negatively reducing income inequality. Galor and Zeira [43] construct preliminary models to predict credit market imperfections that could limit the poor from investing in human capital. Greenwood and Jovanovic [28], Aghion and Bolton [57] explained that the financial sector would encourage economic growth and eliminate poverty. Beck et al. [54] and Agnello et al. [58] explained that a person would benefit from saving income and capital accumulation at the beginning of the financial system development. Inequality will increase at the start of financial deepening if the poor are not fully included in the development of the financial system. Inequality will decrease along with the ease of access for the poor to the financial sector. Financial inclusion can reduce wealth inequality by providing better oversight of financial services targeted at the poor [59]. Providing better oversight of financial services targeted at the poor needs a creativity is often associated with the ability to generate new ideas and solve problems. Through new ideas and problem solving to build financial services targeted at the poor, financial services could be accessed by the poor to reduce inequality [60]. Omar and Kazuo Inaba [61] concluded that financial inclusion significantly reduces poverty and income inequality rates in developing countries.

Hypothesis

H2: Financial inclusion has a statistically negative effect on income inequality

C. Financial Inclusion and Poverty

Boukhatem [62] conducted a one-way test of financial inclusion and poverty in 67 low and middle-income countries from 1988-2012. The result is that there is a direct relationship between financial inclusion and poverty reduction. This happened because of an increase in money supply or bank credit, which contributed to improving the welfare of the poor and increased financial transactions that opened up opportunities for new capital accumulation and income

distribution. Burgess and Pande [44] concluded that the government's efforts to develop bank branch offices in rural areas have helped reduce poverty in India. Brune et al. [63] explained that increasing access to finance through savings accounts has improved the wellbeing of poor households in rural Malawi. Financial development positively influence the poverty alleviation [64]. Allen et al. [65] explained that the presence of commercial banks in Kenya could increase the access of the poor to the financial sector. The more massive spread of commercial bank offices provides many alternatives for the public to carry out activities to save their funds. Sarma [49] and Honohan [66] develop financial access indicators for 160 countries.

Access to finance significantly reduces poverty, but the result is only significant when financial inclusion is the single variable. The addition of independent variables causes financial inclusion not significantly to reduce poverty. Rojas-Suarez [67], using indicators built by Honohan [66], tests the significance level of macroeconomic variables and characteristics of emerging countries, including developing countries in ASIA. In conclusion, economic volatility, low law enforcement, and high inequality in emerging countries significantly limit people's access to the financial sector. This finding contradicts Honohan [66]. The significance of financial inclusion on poverty reduction indicates that the easier access to finance is, the more likely it is to reduce poverty levels because more and more poor people can access financial services that facilitate consumption and production activities. Lopez and Winkler [68], Using a sample of 189 countries during the period 2004-2017, we found that countries with high financial inclusion had very little negative impact from decreasing credit and borrowing. Improvements in financial infrastructure and mobile banking can offset distance barriers by making financial services easily accepted by the public [69]. The low level of modern financial infrastructure accompanied by low financial literacy and income and the lack of formal jobs will hinder rural communities from accessing more advanced digital financial services [70]. Financial inclusion seeks to overcome and provide solutions for people who cannot access the formal financial sector [71].

Hypothesis

H3: Financial inclusion has a significant negative impact on poverty

III. METHODOLOGY

A. Data

To answer the research objectives, we used an annual data series from 2000-2019 combined with six cross-province data in Java, namely DKI Jakarta, Banten, West Java, Central Java, Yogyakarta Yogyakarta, and East Java. The choice of Java Island as the object of research is because Java Island is the center of economic growth in the western part of Indonesia. The determination of the province's territory is in line with the research Agnello et al. [58], Islam and McGillivray [72],

Kennedy et al. [12], Beck et al. [54], where they use cross-country or regional data in examining finance with inequality. The research data is sourced from the Central Bureau of Statistics (www.bps.org) [73] and the Financial Services Authority (www.ojk.org) [74]. Financial inclusion data uses indicators developed by Sharma [54] includes accessibility, availability, and reusability, as in table 1:

TABLE I. OPERATIONALIZATION OF RESEARCH VARIABLES

No.	Variable	Data	Data source
1	Poverty	Number of poor people in Java (million people)	Statistics Indonesia-BPS
2	Income Inequality	Gini Ratio (%)	Statistics Indonesia-BPS
3	Economic growth	The real regional economic growth rate of 6 provinces in Java Island (%)	Statistics Indonesia-BPS
4	Financial Inclusion	The financial inclusion dimension refers to the size of Sarma (2008), which is calculated in three dimensions: Accessibility (d1) = the ratio of the number of third party funds to the number of poor adults in society Availability (d2) = number of bank offices per 100,000 adult communities Usability (d3) = ratio of total deposits and bank credit toward GDP constant	Indonesian Banking Statistics, Financial Services Authority (OJK)

B. Vector Error Correction Model (VECM)

In analyzing the relationship between financial inclusion and economic growth, inequality and poverty use the Vector Autoregressive (VAR) model. The multivariate equation framework has the advantage of allowing disturbances in one variable to be compensated by one or a set of variables. The cointegration approach has the advantage of allowing different variables to adjust and respond to disturbances observed in others so that the system points to long-term equilibrium. The VECM model is used because it is more flexible. Even though the data series is not stationary, the model can still be used as long as it is cointegrated (has a long-term relationship or a balance). Sample analysis in VECM involves the Impulse Response (IRF), and Variance Decomposition (VDC) functions.

$$EG = f(d1, d2, d3)$$

$$GR = f(d1, d2, d3)$$

$$POV = f(d1, d2, d3)$$

$$POV = f(d1, d2, d3, EG, GR)$$

Where is EG (Economic Growth); GR (Gini Ratio); d1 (Accessibility); d2 (Availability); d3 (Usage) where the three dimensions of financial inclusion, Pov (Poverty).

C. Model Specifications

The advantage of the VECM model is that even though the time series data is not stationary, this capital can still be used provided that the data series are cointegrated. To check the stationarity of the data, the unit root test can be used, using the Augmented Dickey-Fuller (ADF) test, as follows:

$$\Delta Y_t = \gamma + \delta t + \rho Y_{t-1} + \Delta \sum_{j=1}^p \phi_j Y_{t-j} + \varepsilon_t \quad (1)$$

Where is $\Delta Y_t = Y_t - Y_{t-1}$ and $\rho = a - 1$.

After the variable passes the stationary test, the next step is to do the cointegration test using the test Johansen-Juselius by comparing the lamda trace and lamda max [75].

The following is the Johansen-Juselius integration test:

Model (p) is

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + B_{xt} + \varepsilon_t \quad (2)$$

y_t is a vector with k non-stationary variable I (1), xt is a vector with deterministic variables, ε_t is an error vector. Equation (p) can be written as well as

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + B_{xt} + \varepsilon_t \quad (3)$$

$$\text{Where } \Pi = \sum_{i=1}^p A_{i-1} \Gamma_i = - \sum_{j=i+1}^p A_j$$

To test the hypothesis, trace test statistics can be used:

$$(r | k) = -T \sum_{i=r+1}^k \log(1 - \lambda_i) \quad \text{and the maximum}$$

Eigenvalue test statistic

$$(r | r+1) = -T \log(1 - \lambda_{r+1})$$

$$= (r | k) - LR_r(r+1 | k)$$

for $r = 0, 1, \dots, k - 1$,

To ascertain whether there is a non-stationary relationship from the series variable, the Granger causality test is used [76][77]. Two series variables are said to be stationary if there are two linear combinations even when the series variable is not stationary at the level. A component of a vector is said to be cointegrated at degrees d, b if each component in xt is integrated into the first degree, I (d) Granger and Weiss [76] and Engle-Granger [77]. The VECM model can be used if both the dependent and independent variables are cointegrated.

The formulation of the VAR model is as follows:

$$y_t = A_0 + \sum_{k=1}^p A_k y_{t-k} + \varepsilon_t \quad (4)$$

yt is the nx one vector form of the variable; A0 is a constant vector; Ak is the nxn coefficient matrix; et is the error term vector

The results of this VAR will show a short-term dynamic model, and the outcome of the cointegration test will show a long-term relationship between variables. If the variables are not stationary and not cointegrated, the VAR model will be used in the estimation. Meanwhile, if the variables are cointegrated, the VECM model will be used in the estimation. After performing the unit root test, the Johansen-Juselius cointegration test, the Granger Causality test, the next step is to estimate the Vector Error Correction Model (VECM). To see the dynamic interactions between endogenous and exogenous variables, the Impulse Response Function (IRF) and Variave Decomposition (VDC) from the analysis sample.

IV. DISCUSSION AND FINDING

A. Root Test

Before testing the VECM model, the first step is to carry out a stationary test to ensure that the variables used to meet the assumptions of the VECM. The data stationarity test was carried out using the root test. If all data is not significant at the initial stage at the level, then further testing will be carried out to ensure the statistical data on the first drop I (1). Suppose all the data is stationary at the first level or derivative. In that case, the next test can be carried out, namely determining the optimum lag length, cointegration test, stability test, VECM model estimation, impulse test, and variance decomposition test. Table 2 contains a summary of the root test results.

TABLE II. UNIT ROOTS TEST

Region	Statistical Value	Region	Statistical Value
D1 Jakarta	3.671938	Pov Jakarta	-1.417030
D1 Banten	3.210374	Pov Banten	-3.122732
D1 West Java	1.494162	Pov West Java	-2.437478
D1 East Java	3.185970	Pov East Java	-3.365194
D1 Midle Java	1.428572	Pov Midle Java	-2.675398
D1 Yogyakarta	-0.350222	Pov Yogyakarta	-4.370793
D2 Jakarta	-2.947664	EG Jakarta	-4.376986
D2 Banten	-2.223099	EG Banten	-7.052768
D2 West Java	-3.272451	EG West Java	-4.029196
D2 East Java	-2.732612	EG East Java	-3.097591
D2 Midle Java	-2.252805	EG Midle Java	-1.882222
D2 Yogyakarta	-2.166807	EG Yogyakarta	-4.490658
D3 Jakarta	0.791521	GR Jakarta	-3.908967
D3 Banten	-3.029688	GR Banten	-3.407570
D3 West Java	-0.683394	GR West Java	-4.209692
D3 East Java	-3.813847	GR East Java	-3.741538
D3 Midle Java	2.6193930	GR Midle Java	-1.350842
D3 Yogyakarta	-4.296532	GR Yogyakarta	-0.969752

Note:
critical values 5% level: -3.710482
critical values 10% level: -3.2977

Based on the results of data mapping in table 2, it can be seen that at 5% alpha, not all data are significant at the level. This means that the data to be used in the VECM estimation is

not stationary at the level. For this reason, researchers conducted the first degree test as in table 3.

TABLE III. FIRST DIFFERENCE TEST SUMMARY

Region	Statistical Value	Region	Statistical Value
D1 Jakarta	-4.020287	Pov Jakarta	-5.286272
D1 Banten	3.508554	Pov Banten	-5.059458
D1 West Java	-4.888848	Pov West Java	-4.308373
D1 East Java	-5.019582	Pov East Java	-5.837753
D1 Midle Java	-4.176185	Pov Midle Java	-5.079836
D1 Yogyakarta	-4.358749	Pov Yogyakarta	-3.541892
D2 Jakarta	-3.325200	EG Jakarta	-3.745149
D2 Banten	-4.537088	EG Banten	-6.636312
D2 West Java	-4.537088	EG West Java	-8.508558
D2 East Java	-3.998284	EG East Java	-4.017917
D2 Midle Java	-3.904448	EG Midle Java	-4.869712
D2 Yogyakarta	-4.387016	EG Yogyakarta	-5.328553
D3 Jakarta	-5.717511	GR Jakarta	-6.439332
D3 Banten	-5.251231	GR Banten	-4.169898
D3 West Java	-7.902709	GR West Java	-9.027205
D3 East Java	-6.599173	GR East Java	-3.394388
D3 Midle Java	-4.499437	GR Midle Java	-4.127630
D3 Yogyakarta	-6.724307	GR Yogyakarta	-6.969752

Note:
critical values 5% level: -3.710482
critical values 10% level: -3.2977

According to the first derivative test, it can be concluded that at the 5% and 10% confidence level, all data have been stationary at degree 1, I (1). The researcher conducted a further test, namely determining the optimal lag length to eliminate the autocorrelation problem in the model.

B. Determination of the Optimal Lag Length

The lag length test is used to eliminate the autocorrelation problem in the model. From the estimation model, it can be seen that: a) Financial inclusion with economic growth has an optimum lag at 5; b) Financial inclusion with inequality has an optimum lag at 8; c) Financial inclusion with poverty has an optimum lag at 8; d) Financial Inclusion, Economic growth, income inequality with poverty has an optimum lag at 8. From the long lag test results, it can be concluded that all variables have vector cointegration for the series of variables in the system.

C. Cointegration Test

The next step is to conduct a cointegration test. This test is performed to find cointegration between variables in the model. Cointegration is done to test the long-term balance. Cointegration testing in this study uses the Johansen-Juselius cointegration test. From the identification of the lamda trace value with the max statistical value, it can be seen: a) Financial inclusion models with growth have a lamda trace value that is smaller than the critical value. It means that financial inclusion with economic growth is not integrated in the long run; b) The financial inclusion model with inequality has a lamda trace value and a max statistical value greater than the critical value at 5%. This means that financial inclusion with integrated inequality in the long term; c) The financial inclusion model

with poverty has a lamda trace value and a max statistic value greater than the critical value at the 5% level, which means financial inclusion with integrated poverty in the long term; d) Models of financial inclusion, economic growth, income inequality, and poverty have a lamda trace value and a max statistic value greater than the critical value of 5%. From the cointegration test results above, it can be concluded that there are three models, namely financial inclusion with inequality; financial inclusion with poverty; financial inclusion, growth, inequality, and poverty are statistically significant cointegration in the long run. Therefore, we can use the VECM estimation model.

Meanwhile, the economic growth model is not statistically cointegrated in the long run. Therefore, the model to be used in the estimation is the VAR model. The following is a summary of the results of the cointegration test in table 4.

TABLE IV. SUMMARY OF TEST RESULTS JOHANSEN-JUSELIUS COINTEGRATION

Variable	Lamda trace value	Critical Value (5% Level)	max statistic value	Critical Value (5% Level)
Financial Inclusion - Economic Growth	38.22249	47.85613	21,12668	27,58434
Financial Inclusion - Inequality	68,64568	47.85613	45,64300	27,58434
Financial Inclusion-Poverty	61.58686	40.17493	44.10251	24.15921
Financial Inclusion, Economic Growth, Inequality - Poverty	256.3566	103,8473	108,0593	40,95680

D. Vector Error Correction Estimation

1) *Financial inclusion with economic growth:* The VECM model is used to see the short-term and long-term balance of an estimation model. The financial inclusion model with statistical economic growth does not show cointegration in the long run. The financial inclusion model will only be estimated using VAR. The following table 5 summarizes the VAR Model for Financial Inclusion with Economic Growth:

TABLE V. LONG-TERM MODEL OF FINANCIAL INCLUSION WITH ECONOMIC GROWTH

Cointegrating Eq:	D1	D2	D3
EG	-1218,487 (2707.90)	-1484,688 (11953.1)	-5.742049 (7.74001)
	[-0.44997]	[-0.12421]	[-0.74187]

From table 5, the estimation results accept the hypothesis at a confidence level of 0.05 because the statistical t value is smaller than the critical t value. It means that in the long run, financial inclusion partially does not significantly affect economic growth.

TABLE VI. SHORT-TERM MODEL OF FINANCIAL INCLUSION WITH ECONOMIC GROWTH

Error Correction	D (EG)	D (D1)	D (D2)	D (D3)
D (D1)	-0.584715 (0.14221)	0.054438 (0.06455)	1.28E-05 (2.8E-05)	-5.35E-06 (1.4E-05)
	[-4.11166]	[0.84337]	[0.46376]	[-0.36924]
D (D2)	0.051667 (0.08313)	0.042357 (0.03773)	-3.51E-05 (1.6E-05)	1.72E-05 (8.5E-06)
	[0.62149]	[1.12252]	[-2.16644]	[2.02532]
D (D3)	69.49860 (83.1634)	-27.91275 (37.7474)	0.027135 (0.01620)	0.000286 (0.00848)
	[0.83569]	[-0.73946]	[1.67479]	[0.03380]
C	0.022856 (0.12230)	-0.004685 (0.05551)	7.42E-05 (2.4E-05)	3.62E-05 (1.2E-05)
	[0.18688]	[-0.08439]	[3.11233]	[2.90187]
R-squared	0.415483	0.272989	0.324794	0.726819
Adj. R-squared	0.256828	0.075657	0.141524	0.652670

Note: () Standard Deviation
[] t statistic

Based on Table 6 VAR estimation results, we reject the null hypothesis that economic growth is affected by financial inclusion (accessibility dimension) because the t statistic (4.11166) is more than the critical value t table (1.96). At the same time, we accept the null hypothesis that economic growth is not affected by financial inclusion (availability and useability dimension). This finding is in line with the findings of Makin and Walle [18] but contrary to the findings of Sarma [49], Dollar and Kraay [50], Kumar [53], and Beck et al. [54], Beck et al. [55] where are all the dimensions of financial inclusion (banking penetration, availability of banking services and use of banking services) has a significant positive effect on economic growth. Developing countries, especially countries classified as low income, generally have simple access to formal and non-formal financial institutions [78]. Thus, financial inclusion in the form of availability and means of using financial inclusion cannot be utilized by low-income people. The prudential principle of financial institutions causes low-income people to be often not bankable enough to take advantage of financial institution services. Low-income people are not compatible as a segment of financial institutions. It is understood that the dimensions of availability and useability do not affect economic growth in developing countries. In developing countries,

Financial inclusion is important, and banks drive the implementation of financial inclusion in good-income communities in developed countries. In conditions of a good income society in developed countries, the financial system functions as a channel of funds from savers to borrowers to carry out productive business activities. Schumpeter [79] argues that financial intermediation through the banking system plays an important role in economic development by influencing the allocation of savings and improving productivity, technical change, and economic growth. Schumpeter in 1912 argues also that financial innovation has made great achievements, mainly reflected in the innovations of organisation system, management, financial market, financial business and instruments, and financial technology. [80].

2) *Financial inclusion with income inequality*: Estimates of the effect of financial inclusion on income inequality in the long and short term are summarized in the following table 7:

TABLE VII. LONG-TERM MODEL OF FINANCIAL INCLUSION WITH INCOME INEQUALITY

Cointegrating Eq:	D1	D2	D3
GR	-3325.544 (1675.58)	-28232.01 (12326.8)	-23.82235 (12.0455)
	[-1.98471]	[-2.29029]	[-1.97769]

In the long run, the stimulation results reject the null hypothesis that financial inclusion affects all dimensions (accessibility, availability, reusability) on income inequality because the t statistic is greater than t critical. That means that all dimensions of financial inclusion have a significant negative effect on income inequality in the long run. The higher the financial inclusion, the lower the income inequality.

TABLE VIII. SHORT-TERM MODEL OF FINANCIAL INCLUSION WITH INCOME INEQUALITY

Error Correction	D (GR)	D (D1)	D (D2)	D (D3)
D (D1)	-0.332406 (0.07222)	-0.093207 (1.05417)	-0.000115 (0.00067)	-0.000351 (0.00034)
	[-4.60300]	[-0.08842]	[-0.17180]	[-1.02048]
D (D2)	0.009972 (0.00504)	0.147678 (0.07360)	-4.09E-05 (4.7E-05)	1.96E-05 (2.4E-05)
	[1.97784]	[2.00658]	[-0.87806]	[0.81753]
D (D3)	-7.336102 (3.57011)	-103.6620 (52.1152)	0.045557 (0.03296)	-0.005808 (0.01700)
	[-2.05486]	[-1.98909]	[1.38221]	[-0.34165]
C	0.010117 (0.00514)	-0.129876 (0.07496)	8.03E-05 (4.7E-05)	4.17E-06 (2.4E-05)
	[1.97008]	[-1.73256]	[1.69485]	[0.17057]
R-squared	0.627473	0.647144	0.650287	0.870048
Adj. R-squared	0.338765	0.373680	0.379260	0.769334

Note: () Standard Deviation

[] t statistic

It is different in the short term. It can be seen in table 8 that because the t statistical value is greater than the critical t value for the dimensions of accessibility and reusability, the estimation results reject the null hypothesis. There is a negative effect of financial inclusion in the dimensions of accessibility and reusability on income inequality. The t statistic value is smaller than the critical t value for the availability dimension, so the estimation results accept the null hypothesis. There is no effect of the availability dimension on income inequality. This means that if low-income people cannot access and use financial institution services, it will directly impact income inequality because low-income people will become poorer. People with good income will become more prosperous with the assistance of financial institutions. People with good income mostly use various government assistance programs in developing countries. The availability of financial institutions becomes useless when people with low income cannot access and use financial institutions.

The findings of this study are in line with Beck et al. [54] and Agnello et al. [58], where income inequality will disappear as it becomes easier for the poor to access financial sector services. Neaime and Gaysset [81], the accessibility dimension

of financial inclusion can reduce income inequality. Financial inclusion can reduce wealth inequality by allocating government aid funds only for the poor. Government program assistance is only intended for the poor segment of society. [59] especially in developing countries [61]. Government commitment is needed in allocating aid funds so that the segment is right on target for the poor. The commercial banks must adopt online services for their transactions to stay competitive and fulfill the customers' needs especially poor customer's needs in the remote area. There is a need to satisfy online customers in a competitive environment. Competitive environment includes information and communications technologies to promote change in the banking service sector. Control and improvement can be created which will probably result in increasing the adoption of e-marketing and exploiting its advantages in improving the performance of the bank [82–84].

The development of the financial system will lead to income inequality if its development is not inclusive, involving the poor. Low financial inclusion will lead to high-income inequality [85]. Countries with relatively high financial inclusion tend to have low-income inequality [86]. The level of financial inclusion can reduce the level of inequality and increase the prosperity of a country. In order to achieve economic growth to reduce the level of inequality every country needs to ensure an adequate institutional environment and financial incentives for technological development [87]. However, in developing countries, the informal groups that contribute greatly to job creation do not get financial inclusion facilities [88].

3) *Financial inclusion with poverty*: In the long run, the estimation results in Table 9 reject the null hypothesis of the effect of financial inclusion (the dimensions of availability and reusability) on poverty because the statistical t value for both dimensions is greater than the critical t value. Meanwhile, the estimation of financial inclusion in the accessibility dimension accepts the null hypothesis on poverty because the statistical t value is smaller than the critical t value. In the long run, the factor that affects reducing income inequality is the financial inclusion of the reusability dimension. The more people use financial institution services. The less income inequality will be. Meanwhile, the availability dimension of financial inclusion has an impact on increasing income inequality.

TABLE IX. LONG-TERM MODES OF FINANCIAL INCLUSION WITH POVERTY

Cointegrating Eq:	D1	D2	D3
POV	-18085.29 (3033066)	355940.1 (144939.)	-19.15271 (8,29920)
	[-0.00596]	[2,45580]	[-2.30778]

TABLE X. SHORT-RUN MODELS OF ESTIMATING FINANCIAL INCLUSION WITH POVERTY

Error Correction:	D (POV)	D (D1)	D (D2)	D (D3)
D (D1)	-0.046740 (0.01953)	5.58E-05 (4.8E-05)	7.16E-08 (2.6E-08)	2.66E-08 (1.4E-08)
	[-2.39349]	[1.17201]	[2.74291]	[1.93691]
D (D2)	-30.36105 (55.0091)	0.291137 (0.13418)	7.34E-05 (7.3E-05)	3.99E-05 (3.9E-05)
	[-0.55193]	[2.16982]	[0.99809]	[1.03107]
D (D3)	13868.65 (38517.2)	-210.1713 (93,9494)	-0.046522 (0.05146)	-0.027588 (0.02709)
	[0.36006]	[-2.23707]	[-0.90404]	[-1.01826]
D (POV (-1))	0.127756 (0.14380)	-0.000131 (0.00035)	5.17E-07 (1.9E-07)	1.40E-07 (1.0E-07)
	[0.88844]	[-0.37221]	[2.69342]	[1.38306]
R-squared	0.772223	0.613854	0.712930	0.888842
Adj. R-squared	0.605558	0.331309	0.502879	0.807507

Note: () Standard Deviation

[] t Statistics

The short-term estimation results of the accessibility dimension reject the null hypothesis because the statistical t value is greater than the critical t value. There is a negative effect of the accessibility dimension of financial inclusion on poverty. Meanwhile, the short-term estimates of the availability and reusability dimensions accept the null hypothesis because the statistical t value is smaller than the critical t value. There is no effect of the dimensions of availability and reusability on poverty. The findings of this study are in line with the findings Bhandari [89] that the availability of bank services for individuals is not a successful strategy to reduce poverty. This is also in line with the research findings of Boukhatem [62], Burgess and Pande [44], Takeshi Inoue [90], that accessibility in the form of additional bank branch offices in rural areas helps reduce poverty in India.

Brune et al. [63] found that increasing access to financial institutions has increased savings accounts, increased happiness, and reduced poverty. Allen et al. [65] also found that a massive commercial bank branch office has offered an alternative to savings for the public. Sarma [49] and Honohan [37] also found that increasing access to finance significantly reduced poverty, but the correlation decreased when the income per capita variable was added. Park and Mercado [71] found that financial inclusion can reduce poverty and income inequality in 177 countries, including 37 developing countries in ASIA. Burgess and Pande [44] evaluating the importance of expanding bank branches in urban and rural areas to reduce poverty.

4) *Comprehensive model of influence of financial inclusion, economic growth, income inequality on poverty:* The researcher combines poverty, financial inclusion, economic growth, and income inequality in one model in the last model. The researcher wants to investigate whether financial inclusion still affects poverty if the variables of economic growth and income inequality are added.

In the long run, the estimation results reject the null hypothesis because the t statistic is greater than t critical. There is an effect of financial inclusion and economic growth on poverty. Meanwhile, the estimation results accept the null hypothesis because the t statistical value is smaller than the critical t value. There is no effect of income inequality on poverty. This finding is in line with Beck et al. [36] that the development of financial intermediation is a source of productivity for production and economic growth factors. The development of financial intermediation indirectly increases the standard of living of the poor or reduces poverty [91].

The short-term estimation results reject the null hypothesis because the t statistical value is greater than the critical value. There is an effect of financial inclusion and inequality on poverty reduction. Meanwhile, the estimation results of economic growth accept the null hypothesis because the statistical t value is smaller than the critical t value. It means that in the short term, financial inclusion in the dimensions of accessibility and availability significantly reduces poverty. In the short term, economic growth does not affect reducing poverty. Economic growth is influenced by financial inclusion in the dimensions of availability and reusability, but economic growth is not influenced by poverty and income inequality. Financial inclusiveness exhibits a non-monotonic positive relation with economic growth. The positive effect is more pronounced at a high level than in the low level of financial inclusion index. These new findings should motivate policymakers and the banking sector in each country to exert greater effort in raising the level of financial inclusion in stimulating sustainable economic growth [92]. Changes in income distribution determine the success of reducing poverty through changes in economic growth and a reduction in inequality in income, assets, and access of the poor to economic growth [91].

Increasing the income distribution of the poor can reduce poverty. Economic growth for the poor can be interpreted as an increase in the status of the poor through improved income distribution. Even so, economic growth and improvement in income distribution also have an impact on people with good income because average growth is also related to poverty [93, 94].

Dollar and Kraay [50], Deninger and Squire [95] found a relationship between economic growth and poverty. Dollar and Kraay stated that economic growth benefits the poor. Hanmer and Naschold [96] found that income distribution has an impact on reducing inequality and poverty. The interaction between financial development and poverty can be demonstrated through economic development, which impacts high economic growth performance [91]. Financial development can have multiple impacts on poverty, the first indirectly through income growth and the second direction through improving financial services for the poor. Financial development as a tool of economic prosperity of a country depends both on physical and on human resources, therefore it is both material and economic capital together with the human resources of a "critical mass"

of highly skilled persons that determine the economic and social development of the countries [97].

TABLE XI. COMPREHENSIVE MODEL OF POVERTY-FINANCIAL INCLUSION, ECONOMIC GROWTH, AND INCOME INEQUALITY

Cointegrating Eq:	Pov	D1	D2	D3	GR	
EG (-1)	8523,384 (2983.72)	7.018382 (3.57139)	0.014665 (0.00632)	-0.000612 (0.00018)	0.001280 (0.01580)	
	[2.85663]	[1.96517]	[2.32105]	[-3.47201]	[0.08100]	
Error Correction:	D (POV)	D (D1)	D (D2)	D (D3)	D (GR)	D (EG)
D (D1)	-0.165844 (0.05255)	0.000130 (0.00013)	6.32E-08 (6.9E-08)	4.14E-08 (4.0E-08)	-1.93E-05 (8.2E-06)	0.000675 (0.00049)
	[-3.15588]	[0.98301]	[0.91956]	[1.02743]	[-2.36467]	[1.36676]
D (D2)	-92.52414 (60.3211)	0.244583 (0.15180)	6.43E-05 (7.9E-05)	5.27E-05 (4.6E-05)	-0.024910 (0.00939)	1.283739 (0.56718)
	[-1.53386]	[1.61117]	[0.81473]	[1.13780]	[-2.65345]	[2.26337]
D (D3)	133763.2 (55829.2)	-216.6584 (140,500)	-0.073160 (0.07305)	-0.061686 (0.04283)	24,54562 (8,68869)	- (524,944)
	[2,39594]	[-1.54205]	[-1.00154]	[-1.44016]	[2.82501]	[-1.83294]
D (EG)	-33367.95 (204743.)	-483.4916 (515,258)	-0.497604 (0.26789)	-0.325565 (0.15708)	15.69371 (31,8642)	3538,514 (1925.14)
	[-0.16297]	[-0.93835]	[-1.85750]	[-2.07259]	[0.49252]	[1.83806]
D (GR)	-2701,169 (1173.98)	3.107176 (2.95445)	-0.000781 (0.00154)	0.000457 (0.00090)	-0.687762 (0.18271)	11,94928 (11.0386)
	[-2.30086]	[1.05169]	[-0.50852]	[0.50788]	[-3.76429]	[1.08250]
D (POV (-1))	-0.322751 (0.18756)	0.000423 (0.00047)	5.04E-07 (2.5E-07)	1.64E-07 (1.4E-07)	1.35E-05 (2.9E-05)	0.001279 (0.00176)
	[-1.72081]	[0.89536]	[2.05573]	[1.14126]	[0.46400]	[0.72513]
D (POV (-7))	-0.223124 (0.09623)	-0.000269 (0.00024)	2.18E-07 (1.3E-07)	1.22E-08 (7.4E-08)	3.30E-05 (1.5E-05)	0.000595 (0.00090)
	[-2.31874]	[-1.11267]	[1.73177]	[0.16564]	[2.20417]	[0.65762]
D (D2 (-1))	-199705.2 (142123.)	738,9295 (357,669)	-0.398186 (0.18596)	0.447713 (0.10904)	-64.04642 (22.1187)	1175,150 (1336.34)
	[-1.40515]	[2.06596]	[-2.14128]	[4.10600]	[-2.89558]	[0.87938]
D (D2 (-2))	-454746.1 (170067.)	694,8651 (427,993)	-0.233191 (0.22252)	0.080513 (0.13048)	-36.51954 (26.4676)	1625,751 (1599.09)
	[-2.67392]	[1.62354]	[-1.04796]	[0.61706]	[-1.37978]	[1.01667]
R-squared	0.875329	0.775011	0.849301	0.927618	0.806429	0.748281
Adj. R-squared	0.645934	0.361033	0.572015	0.794435	0.450258	0.285119

Note: () Standard Deviation

[] t Statistics

The magnitude of the coefficient of determination (R²) is 87.53. This means that variations in poverty are explained by

economic growth, income inequality, and financial inclusion by 87.53% and the rest by other variables not included in the estimation model.

E. Impulse Response

According to the variance decomposition, it is known that the economic growth model is influenced by itself at 87% and 13% financial inclusion with 9% from the reusability dimension. Furthermore, from the income inequality model, 41.84% is influenced by himself and 53.36% by the reusability dimension of financial inclusion. Meanwhile, the poverty model is influenced by 20.03% and the reusability dimension financial inclusion of 69.74%, while economic growth and income inequality only contribute to poverty by only 2.6% and 1.97%, respectively. From the three models, it can be concluded that the contribution of financial inclusion, especially the dimension of reusability, is very large in reducing inequality and poverty. Thus, to reduce poverty, the poor must be bankable. That is, they can use various banking services. So far, it is difficult for the poor and micro-business groups to reach bank services so that their business activities are difficult to develop.

Therefore, social intermediation facilities are important for this group to enjoy bank services. By using social groups, the poor and micro-businesses can use various low-interest government financing schemes. This group will learn to have neat, structured records and comply with banking regulations by using bank services. The effect of moral hazard can be minimized from the behavior of the poor and micro businesses. Social intermediation facilities are important for this group to enjoy bank services. By using social groups, the poor and micro-businesses can use various low-interest government financing schemes. This group will learn to have neat, structured records and comply with banking regulations by using bank services. The effect of moral hazard can be minimized from the behavior of the poor and micro businesses. Social intermediation facilities are important for this group to enjoy bank services. By using social groups, the poor and micro-businesses can use various low-interest government financing schemes. This group will learn to have neat, structured records and comply with banking regulations by using bank services. The effect of moral hazard can be minimized from the behavior of the poor and micro businesses.

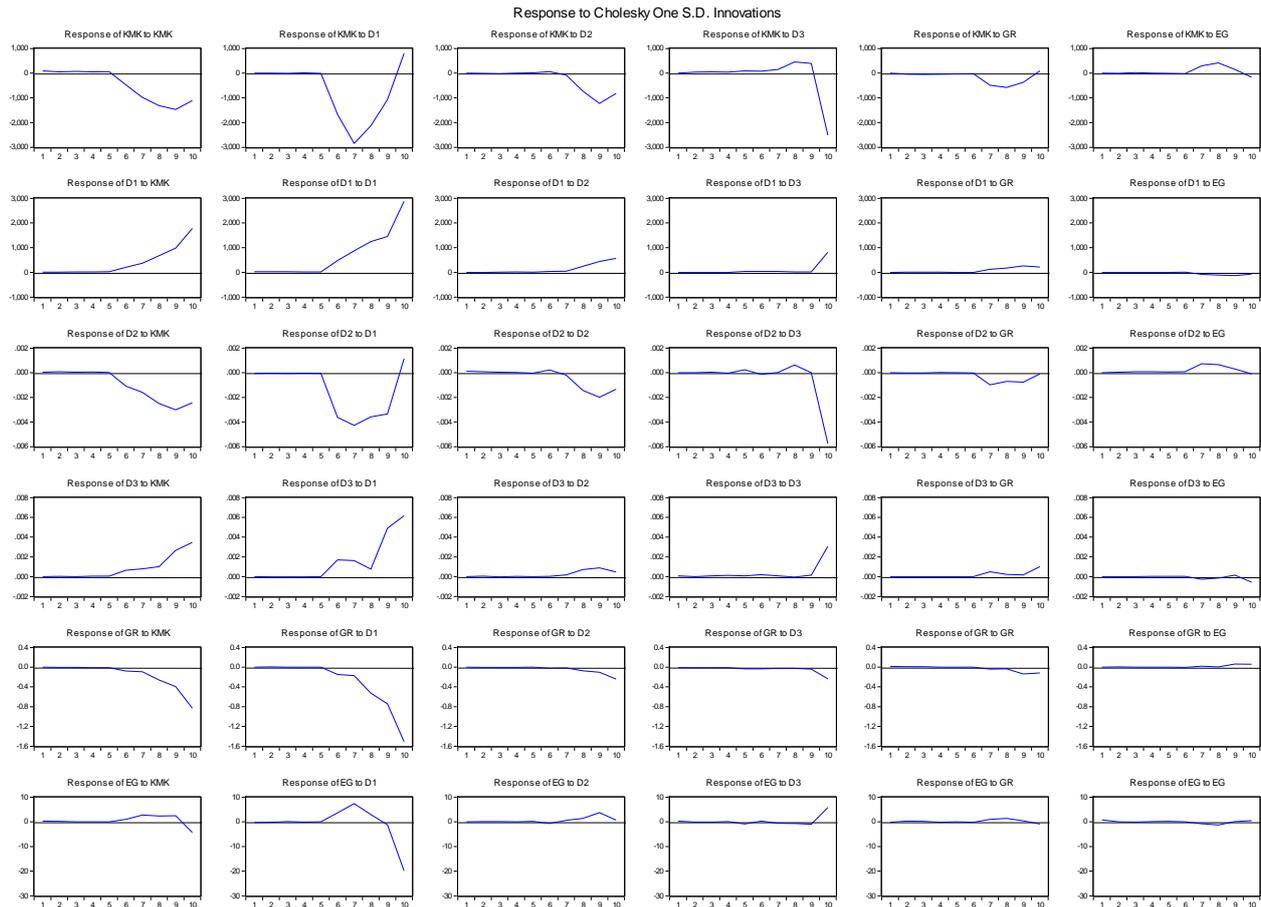


Fig. 1. Responses to Cholesky One S.D. Innovation.

V. CONCLUSIONS

This study answers research questions by finding that poverty is influenced by financial inclusion and income inequality in the short term. In contrast, in the long term, poverty is influenced by financial inclusion and economic growth. In the long term, poverty reduction can be achieved through financial development that facilitates financial services for the poor, which can increase per capita income, purchasing power, and aggregate demand to impact economic growth.

This finding supports the hypothesis that in the long run, in developing countries, development in the financial sector and inclusive economic growth are needed to solve poverty. Development in the financial sector and economic growth can reduce poverty if it involves the poor as a segment of financial services. The limitation of this research is the scope of research. There is no separation of financial inclusion on rural and urban poverty. It becomes an opportunity for further research using a wider scope of research and separating rural and urban poor groups.

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