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Data Forecasting Model to Know the Social Impact of Poverty in the Era of Globalization in West Java Province, Indonesia

Aditya Kusumawardana[1], Nanda Hidayati[2]
[1] Kementerian Pertanian, aditya@pertanian.go.id
[2] Universitas IPWIJA, nanda.assalaam@gmail.com

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ABSTRACT

Globalization has a social impact in the form of poverty. Meanwhile, poverty data in West Java Province, Indonesia, will increase in 2021 by 999,960 people. In addition to education, a country's poverty level shows its citizens' welfare. Therefore the poverty level in that country must be considered. In the Sustainable Development Goals, poverty is the priority scale to be considered. Therefore, forecasting is quite crucial in planning to know in advance what will happen. ARIMA (Auto Regressive Integrative Moving Average) is a modeling approach that can calculate the probability of a future value between two specified limits. This study predicts the number of poor people in West Java Province, Indonesia, from 2022 to 2025. The data used are 15 years from 2007 to 2021 and are processed with the Eviews computer program to see patterns and results in the ARIMA model. The modeling stage starts from data stationarity testing, model identification, model estimation, and model verification to forecasting. Based on the results of this study, the prediction results of the number of poor people in 2022 are 3,618,866; in 2023, it will be 3,512,758; in 2024, there will be 3,406,651, and in 2025 it will be 3,300,543 people. This forecasting uses the ARIMA (Auto Regressive Integrative Moving Average) model (1, 2, 1) as the most accurate method with MAD (Mean Absolute Deviation) error parameters of 1,751,747, MSE (Mean Square Error) of 6,977,202,252. 995 and MAPE (Mean Absolute Percentage Error) of 8%.

Corresponding Author:

Name: Nanda Hidayati
Institution: Universitas IPWIJA
Email: nanda.assalaam@gmail.com

1. INTRODUCTION

Globalization has a social impact in the form of poverty. Poverty is a classic problem that always occurs in the development process of a country [1]. Poverty can be seen in low education, poor health, inability to live a life, lack of money, and low income [2]. A population is said to be poor if the average per capita expenditure is below the primary poverty line.

Poverty is a development problem in both developed and developing countries [3]. In Indonesia, the government's efforts to address the problem of poverty have been carried out in various forms, ranging from cash transfer programs or equity to transmigration programs for the poor [4]. On

the other hand, economic growth is essential for achieving sustainable poverty reduction in a region [5].

The Human Development Index describes a population as having access to development outcomes regarding income, health, and education, so if the HDI value is low, the poverty rate is high in the region. Many studies on poverty have been carried out, one of which is by [6], explaining that economic growth affects poverty. However, the research results by [7] explain that economic growth does not affect poverty.

Research on the effect of HDI on poverty conducted by [8], [7], and [7] explains that the Human Development Index affects poverty. Meanwhile, [9] research explains that the Human Development Index does not affect poverty.

Research conducted by [10] explains that the unemployment rate effect on poverty. However, the results of research conducted by [11] explain that the Open Unemployment Rate does not affect poverty. Several previous research results can be concluded that there are still many differences in research results and the complexity of the factors causing poverty. The welfare of citizens in a country is not only seen from the level of education they have but also how the poverty level in that country must be considered. Poverty is something that needs to be addressed by the government. Therefore improvements in the field of poverty need to be implemented.

Based on the poverty rate in the province of West Java, data from the Central Statistics Agency in 2021 was obtained as many as 4,004,860 people. Seeing this, it is necessary to forecast data for the poor in 2025 so that the government can make policies to reduce poverty.

Forecasting is quite crucial in planning to know in advance what will happen. There is often a lead time between current and future events. Lead time is the time interval between current and future events. The existence of this lead time is a reason for planning and forecasting. If the lead time is 0 or very small, then the lead time is not needed for planning. But if the lead time is extended, then the lead time has an important role. In such cases and situations, forecasts occur or are required so that appropriate action can be taken.

Forecasting requires methods, models, or approaches that must be tested for accuracy. The more tested the accuracy of a model, the more desirable it is to use. One of the forecasting methods that can be used is the time series analysis forecasting method. Time series analysis is a quantitative analytical method that considers time, where data is collected periodically based on time sequences to determine predetermined patterns of past data. The ARIMA method is the time series method chosen to conduct this research.

ARIMA (Auto Regressive Integrative Moving Average) is an inventory modeling approach that can calculate the probability of a future value between two specified limits. The advantages of ARIMA are that it is flexible (follows data patterns), has a relatively high level of forecasting accuracy, and is suitable for forecasting several variables quickly, simply, accurately, and cheaply because it only requires historical data to forecast.

This forecasting uses the Eviews program. Using Eviews, we can display summary data in graphical form; meanwhile, by carrying out procedures, we can do more complex data analysis, such as time-series data. For calculating the time series analysis method, it is better to use the Eviews program because it is more suitable for forecasting results.

Based on the problems above, the researcher wants to predict the number of poor people in West Java for 2025 as a social impact in the era of globalization.

2. LITERATURE REVIEW

Poverty is the inability to meet the minimum standard of basic needs, namely food and non-food needs [12]. Poverty from social inequality is caused by people being categorized as having met the minimum basic needs [13]. However, it is still much lower than the surrounding community [14]. The more significant the income inequality

between the upper and lower classes, the more the number of people as poor people. In other words, poverty is directly proportional to the problem of income distribution [15].

Faisal Basri explained that one of the conditions for the success of development programs is very dependent on the accuracy of identification of the target area and target group. The success of efforts to eradicate the poor depends on the initial steps of policy formulation, including correctly identifying who is in the category of poor people and where they are located and through the poverty profile in the community, making poverty policies more targeted [16]. The evaluation step of every policy that the government has carried out, especially poverty alleviation policies, has supported or even contradicted efforts to reduce the number of poor people [9].

Furthermore, poverty, in a broad sense, is a limitation that a person carries because a work, a country that causes discomfort in life, a sense of justice is threatened, a bargaining position in world relations is threatened, and in the longer term, it can result in the loss of generations, and gloomy future of the nation and State [17].

Developed countries, in measuring their level of economic growth, place more emphasis on quality of life which is expressed by a change in the environment [18].

Variations in poverty in developing countries are caused by

1. differences in geography, population, and income levels;
2. historical differences, some of which were colonized by different countries;
3. differences in the wealth of natural resources and the quality of human resources;
4. the different roles of the private sector and the State;
5. differences in the industrial structure;
6. different degrees of dependence on the economic and political power of other countries; and
7. differences in the distribution of power in domestic political structures and institutions.

Companies will get more profits if they employ workers with high productivity so that companies are willing to give higher wages to their workers. The same condition also applies to the agricultural sector through improving the skills and expertise of the workforce that will be able to improve and be more efficient [19]. In the end, someone who has high productivity will get better welfare which is reflected in an increase in income and consumption [20]. Vice versa, the low productivity of the poor can be caused by their low access to education.

There is a close relationship between high unemployment and poverty. People who work part-time or do not have permanent jobs are consistently among the poor [21]. People who work for a fixed wage under the auspices of the government, such as civil servants (PNS) and private companies, are usually grouped as upper-middle-class people. On average, people who do not have jobs are less prosperous, and those who work entirely are classified as rich. However, not all of these statements are true. Many people are unemployed because they want to get a better job than before and look for one according to their level of education. Many also work Full Time (full time), but the wages they receive are unable to meet their basic needs, and they live under limitations.

a. The Poor in West Java

Poverty is an urgent national problem and requires an integrated and comprehensive systematic approach [22]. In order to meet the basic needs of the population, strategic steps are needed. As stated in its mission to increase quality economic growth, West Java has made various efforts to reduce poverty.

The number of poor people tends to decrease along with the many poverty alleviation programs the West Java government has implemented. The number of

poor people in West Java, which has continued to decline for the last four years (2007-2020) and will increase in 2021, has not been able to change the position of West Java as the district with the highest percentage of poor people in West Java Province.

The high poverty rate in West Java is caused by traditional and cultural factors that prioritize religious education (Islamic boarding schools and diniyah schools). While formal education is neglected. In addition, many people with higher education migrated and settled in other areas and were reluctant to live in the West Java region. Therefore, poverty must be viewed widely so that policy implementation can be carried out effectively and efficiently [23]. Poverty is not only a matter of the number of poor people but also how significant the distance between the average expenditure of the poor from the poverty line is called the poverty depth level (P1), and the diversity of expenditures among the poor is called the poverty severity level (P2).

b. The Relationship between Economic Growth and Poverty

Economic growth is an indicator to see the success of development and is a condition for reducing poverty levels. National development is carried out evenly throughout the country, not for one group or part of the community but for all Indonesian people, and must be felt by all people [23]. Economic growth is indeed not enough to eradicate poverty, but economic growth is usually needed [24]. However, even good economic growth will be meaningless for the decline of the poor if it is not accompanied by income distribution [25].

GRDP, as an indicator of economic growth, has a positive effect on poverty. This is because the rate of economic growth is the increase in GDP regardless of whether the increase is larger or smaller. Furthermore, economic development is not only measured by the growth of gross regional domestic product (GRDP) as a whole but must also pay attention to the distribution of income that has spread to all levels of society and who has enjoyed the results [26] so that the decline in the GRDP of an area has an impact on the quality and pattern of household consumption [27]. If the population's income level is minimal, it can be ascertained that many poor households are forced to change their basic food pattern to the cheapest goods with fewer goods [14].

Economic growth has a positive relationship with poverty. This study found that the opposite economic growth does not affect poverty in West Java. This finding is strengthened by [7] research which explains that economic growth does not affect poverty. This condition is due to the low value of economic growth as a systemic impact of the COVID-19 pandemic, affecting most business activities in West Java, so production has decreased drastically. In addition, the West Java government has not yet targeted the provision of inter-sectoral funding subsidies, thereby increasing inequality in economic sectors.

c. Relationship between Human Development Index and Poverty

The calculation of the tests that have been carried out earlier shows that the Human Development Index partially affects the poverty level in West Java. Although the HDI in West Java has increased annually, it has not been able to reach the high category. This shows that human development is uneven. Furthermore, the constituent components of the Human Development Index are education, health, and the community's economy.

Education is a significant factor in the progress of a nation because the quality of reliable resources is determined by education. Public health plays an essential role in improving human resources quality and reducing poverty and economic development in general. It is hoped that healthy human resources can become a substantial capital for development to improve the community's welfare. The results of this study are not in line with previous research conducted by Indah et al. (2020), which is to prove that the

HDI with poverty does not have a relevant influence.

d. The Relationship between Open Unemployment and Poverty

The negative impact of unemployment is to reduce the level of income the community receives, which in turn can reduce the level of welfare. The low level of community welfare caused by unemployment will increase the opportunity for them to be trapped in poverty because they have no income [27]. Moreover, if unemployment in a country is terrible, political and social chaos always hurts the level of community welfare and prospects for economic development in the long term.

Unemployment affects poverty. Furthermore, [28] said that most households in Indonesia significantly depend on salary or wages income currently earned. Therefore, losing employment causes a decrease in most of the income used to buy daily necessities. Furthermore, if this unemployment problem occurs in low-income groups, the unemployed will quickly shift their position to become a group of poor people.

The explanation above illustrates the close relationship between unemployment and poverty. However, the results of this study indicate that unemployment does not affect poverty; this is in line with the results of research conducted by [11], [29] that unemployment does not affect poverty. The a large number of productive age people who are looking for minimal employment opportunities in West Java. This fact is further complicated by the fact that the competencies possessed by job seekers are not to the needs of the industry. However, those looking for work are not part of the poor because, in their lives, they are part of their parents' funds, and some have businesses that can support their daily lives.

3. METHODS

In this study, the data used as research material was obtained through retrieval from the official website of the Central Statistics Agency (BPS) (https://bps.go.id) for time series data on the poor for the annual period from 2007 to 2021. The data is presented in Table 1 below:

Table 1. West Java Poor Population Data from 2007-2021

Year	Amount
2007	5.457.900
2008	5.322.400
2009	4.983.570
2010	4.773.720
2011	4.648.630
2012	4.421.480
2013	4.382.650
2014	4.238.960
2015	4.485.650
2016	4.168.110
2017	3.774.410
2018	3.539.400
2019	3.375.890
2020	3.004.950
2021	4.004.860

The forecasting technique used in this research uses quantitative research methods with time series analysis of the Auto Regressive Integrative Moving Average (ARIMA) model, starting from data stationarity, model identification, model estimation, model verification, and forecasting. This is illustrated in the diagram in Figure 1 as follows.

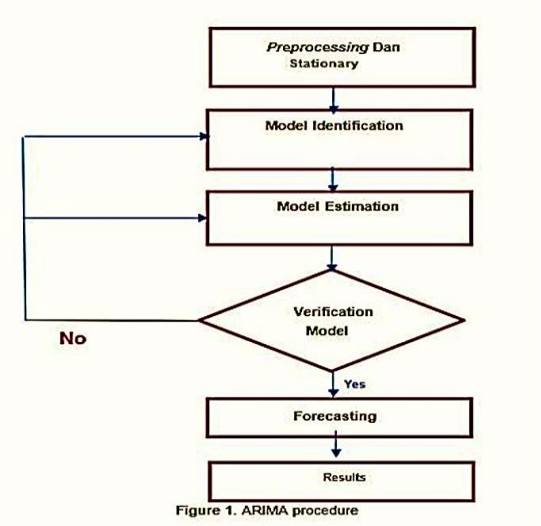

Figure 1. ARIMA procedure

The following is the Auto Regressive Integrative Moving Average (ARIMA) modeling algorithm using the Eviews computer program.

1. Create a new workfile
2. Import data from excel
3. Edit data
4. Model identification can be made in two ways:
   a. Stationarity test
   b. Unit root test (Unit root test)
5. Model estimation
6. Diagnostic examination
7. Forecasting (Forecast)
8. Results and conclusions

Next, determine the error value to determine the data accuracy parameters. Forecasting accuracy in this study uses the Mean Absolute Deviation (MAD), Mean Square Error (MSE), and Mean Absolute Percentage Error (MAPE) functions.

$$MAD = \frac{\sum_{t=1}^{n} |X_t - F_t|}{n} \quad (1)$$

$$MSE = \sum_{t=1} \frac{(x_t - F_t)}{n} \quad (2)$$

$$MAPE = \left(\frac{100\%}{n}\right) \sum_{t=1}^{n} \left|\frac{X_t - F_t}{X_t}\right| \quad (3)$$

Where is the actual data in period t, is the forecast value in period t, and represents the amount of data.

4. RESULTS AND DISCUSSION

Calculates forecasts and errors from data on the number of poor people in West Java from 2007 to 2021 using the autoregressive integrated moving average (ARIMA) method to predict 2022 to 2025.

1. Model-identification results

Based on the results of data identification, data on the poor population of West Java is static data after the unit root test is carried out. The following is a picture of the model identification results:

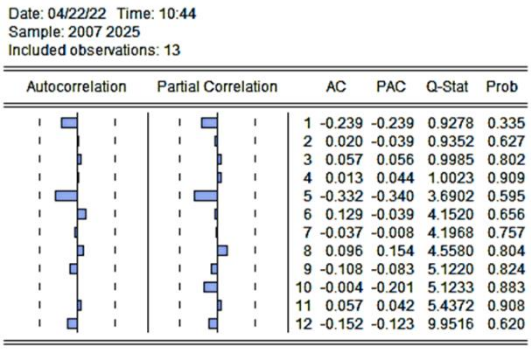

Figure 2. ACF/PACF plot of poor population data

From the plot image above, it can be determined that the arma (1,2), (0,2) models are the best because the sample values for the autocorrelation function (AC) and partial autocorrelation function (PAC) tend to decrease exponentially.

2. Model estimation results

Table 2. Summary of output, model estimation results

R-squared	0.001613	Mean dependent var	-103789
Adjusted R-squared	-0.17991	S.D. dependent var	356463.6
S.E. of regression	387204.2	Akaike info criterion	28.75921
Sum squared resid	1.65E+12	Schwarz criterion	28.89615
Log likelihood	-198.314	Hannan-Quinn criter.	28.74653
Durbin-Watson stat	1.552816		

The output summary table describes the strength of the relationship between the model (independent variable) and the dependent variable. R-Square, often called the coefficient of determination, is a measure of the goodness of fit of the Arima equation, which is to give the proportion or percentage of the total variation in the dependent variable described by the independent variable.

Sum Squared Resid is the sum of the squares of the residuals, a measure of the difference between the data and the estimated model. Moreover, the Durbin Watson Stat is a test statistic used to detect the presence of articulation at lag 1 in the residuals from the regression analysis.

3. The results of the diagnostic check (diagnostic checking)

By performing the Q-LjungBox test and the ACF/PACF plot, it can be seen the

correlation and estimation results with the observed model:

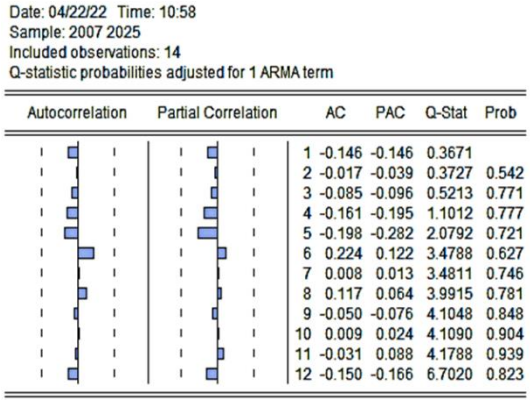

Figure 3. ACF/PACF plot and Q-LjungBox test

From the picture above, it can be seen that ACF and PACF are not significant, which is indicated by the p-value (prob) of the Q-LjungBox statistic, which is greater than a = 5%. It is concluded that the residuals from the model have a serial correlation with the two arithmetic models (1,0) and (0,1). Thus, model 2 is an appropriate model for describing data and forecasting.

4. Forecasting results and errors

After forecasting and generating predictive data, the data is then transferred from Eviews to excel to calculate the Mean Absolute Deviation (MAD), Mean Square Error (MSE), and Mean Absolute Percentage Error (MAPE) values. The following is presented in Table 2:

Table 2. Prediction Data and Error values

Year	Quantity	Prediction	SE	AD	PE
2007	5.457.900		29788672410000	5457900	
2008	5.322.400		28327941760000	5322400	
2009	4.983.570		24835969944900	4983570	
2010	4.773.720	4.879.208	11127754308	105488	2%
2011	4.648.630	4.786.924	19125275138	138294	3%
2012	4.421.480	4.680.712	67201604714	259233	6%
2013	4.382.650	4.573.784	36532152860	191134	4%
2014	4.238.960	4.467.682	52313885735	228722	5%
2015	4.485.650	4.361.623	15382614127	124027	3%
2016	4.168.110	4.255.515	7639675164	87405	2%
2017	3.774.410	4.149.405	140620954780	374995	10%
2018	3.539.400	4.043.297	253912082122	503897	14%
2019	3.375.890	3.937.189	315056945345	561299	17%
2020	3.004.950	3.831.082	682493426515	826132	27%
2021	4.004.860	3.724.974	78336250436	279886	7%
2022		3.618.866	13096192066752	3618866	
2023		3.512.758	12339471568642	3512758	
2024		3.406.651	11605268767581	3406651	
2025		3.300.543	10893583667787	3300543	
MSE			6977202252995	33283200	
MAD				1751747	
MAPE					8%

West Java Poor Population Data

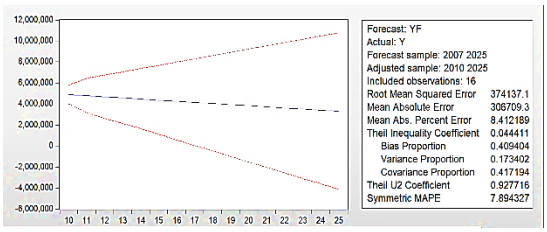

Figure 4. Simulation results for the auto regressive moving methodaverage (ARIMA).

5. CONCLUSION

Based on the findings and discussion, it is found that the poor population in West Java will increase in 2021 by 999,960 people, and the prediction results from forecasting using ARIMA (Auto Regressive Integrative Moving Average) will decrease from 2022 to 2025. Forecasting obtained is for predicting the number of poor people. in 2022 there are 3,618,866, in 2023 it will be 3,512,758, in 2024 it will be 3,406,651 and in 2025 it will be 3,300,543 people. This forecasting uses the ARIMA (Auto Regressive Integrative Moving Average) model (1, 2, 1) as the most accurate method with MAD (Mean Absolute Deviation) error parameters of 1,751,747, MSE (Mean Square Error) of 6,977,202,252. 995 and MAPE (Mean Absolute Percentage Error) of 8%.

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