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Econometrics case study: analysis of factors influencing the poverty rate in the Special Region of Yogyakarta Province

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ABSTRACT

Background: This research is an econometrics case study aimed at addressing two research questions. Firstly, to provide an overview of the Special Region of Yogyakarta Province. Secondly, to identify the factors influencing the poverty rate in the province. The study utilizes the concepts of poverty, provincial minimum wage, Human Development Index (HDI), economic growth, and unemployment rate. **Method:** Methodologically, the province is chosen as the research location due to its poverty rate that requires attention and its distinctive social, economic, and geographical characteristics. The data used are secondary data, analyzed using multiple linear regression and normality tests. **Findings:** The findings of this study are as follows. Firstly, the Special Region of Yogyakarta situated between 7°33' LS - 8°12' LS and 110°00' BT - 110°50' BT, with a land area of 3,185.8 km2. The province comprises 4 regencies and 1 municipality. Secondly, the factors influencing the poverty rate in the Special Region of Yogyakarta Province are the Human Development Index (HDI) and the unemployment rate. **Conclusion:** The conclusion is that the poverty rate in the Special Region of Yogyakarta influenced by the Human Development Index (HDI) and the unemployment rate. The recommendations that can be given are to increase the HDI and reduce the unemployment rate through various government initiatives such as improving education, creating jobs, and encouraging economic activities. **Novelty/Originality of this article:** This study identifies factors that influence poverty levels using multiple linear regression. The results show that the Human Development Index (HDI) and poverty rates significantly influence poverty rates in this province.

KEYWORDS: econometrics; factors; poverty; Special Region of Yogyakarta.

1. Introduction

Poverty is a complex issue and a major concern in many regions, including the Special Region of Yogyakarta, Indonesia. Poverty can have serious impacts on the social and economic well-being of communities, as well as affecting individuals' ability to meet their basic needs. There are two conditions that cause poverty to occur, namely natural poverty and artificial poverty. Natural poverty occurs due to limited resources, low use of

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technology, and natural disasters. Meanwhile, artificial poverty occurs because community institutions make some members of society unable to control economic means and various other available facilities so that they remain poor (Arfiani, 2020). One factor that has strong potential to influence the poverty rate is the district minimum wage (UMK). UMK is the minimum wage set by the government in each district as the standard minimum wage that must be given to workers in a district. UMK plays a crucial role in ensuring that workers receive fair compensation for their work.

The rate of economic growth of a country can be achieved at a certain level if several factors are considered, including investment, capital formation, technological progress, and several other supporting factors. Long-term economic growth can only be achieved if there is endogenous technological progress and human resource development. Countries that have a faster rate of technological progress must also have a high rate of economic growth. Technological progress is certainly accompanied by an increase in the quality of high resources (Suhendra, 2021).

The Human Development Index (HDI) is a composite indicator used to measure the social and economic progress of a region. HDI combines several important dimensions such as health, education, and income, which are critical factors influencing the quality of life and human well-being. In the context of Special Region of Yogyakarta, an analysis of factors considering the HDI variable can provide a more comprehensive understanding of the relationship between poverty levels and human development factors.

Economic growth is considered one of the primary factors that can help reduce poverty by increasing income and creating economic opportunities for the population. Every economic development effort certainly has its own goal of increasing the number and types of job opportunities for the community (Cao, et al., 2021). Economic growth can create job opportunities, raise incomes, and reduce unemployment rates, all of which have the potential to alleviate poverty. Additionally, economic growth can also impact access to healthcare, education, infrastructure, and other important factors that can influence poverty levels.

Unemployment rate is closely related to the poverty level in the Special Region of Yogyakarta, Indonesia. High unemployment rates can lead to reduced job opportunities and inadequate income for the population, which in turn can contribute to high poverty levels. Special Region of Yogyakarta, with its large population and significant economic potential, faces challenges in addressing high unemployment rates that impact the poverty level in the region. Therefore, an analysis of factors considering the unemployment rate variable can provide a better understanding of the factors influencing the poverty level in Special Region of Yogyakarta.

Based on the background above, the research problems investigated in this Econometrics study are as follows. First, what is the General Condition of the Special Region of Yogyakarta Province? Second, what factors influence the poverty level in the Special Region of Yogyakarta Province from 2013 to 2022? Thus, the objectives of this Econometrics research are as follows. First, to understand the General Condition of the Special Region of Yogyakarta Province. Second, to identify the factors influencing the poverty level in the Special Region of Yogyakarta Province from 2013 to 2022. With these objectives, the researchers hope to generate knowledge, especially regarding the factors influencing the poverty level in the province. This knowledge can be useful as a basis and recommendation for stakeholder policy formulation.

1.1 Poverty

Poverty can be defined as a state involving the inability to meet the most basic life requirements, particularly in terms of consumption and income. Poverty is also a cross-sectoral, cross-area, and cross-generational problem, thus requiring an integrated, comprehensive, and sustainable approach to address it. This issue of poverty is highly complex and multidimensional, involving social, economic, cultural, and other aspects.

Various programs, both from the central and regional governments, have been implemented to reduce the poverty rate. In fact, poverty has become one of the key agendas of the Sustainable Development Goals (SDGs), which replaced the Millennium Development Goals (MDGs) at the end of 2015. However, in reality, the poverty alleviation efforts undertaken by the government have not yet achieved optimal results. Although the number of poor people has been reduced, the figure remains significant (Jacobus et al., 2018).

1.2 Minimum wage and human development index

The minimum wage can be in the form of Provincial Minimum Wage, Provincial Sectoral Minimum Wage, and Regency/City Minimum Wage (Putra et al., 2022).Minimum wage is a wage that aims to meet the living needs of workers and prevent exploitation of workers, paid to workers by employers in the form of monthly wages. Minimum wages can reduce the consequences of unemployment and increase labor productivity as predicted by conventional economic theory (Primadila and Asmara, 2022). It is paid based on an employment agreement between the employer and the employee, including allowances, both for the employee and their family. The minimum wage must be sufficient to meet the basic needs of workers, namely clothing, food, and household expenses. The Minimum Wage for Regency (UMK) became known after the implementation of regional autonomy. According to the Regulation of the Minister of Manpower No. 05/Men/1989 dated May 29, 1989, UMK is a minimum standard used by employers or industrial practitioners to provide wages to employees or workers within their business or work environment in a particular district/city for a specific year (Sutama et al., 2019).

Meanwhile, human resources (HR) are a critical factor in economic growth. Humans are the most active participants in economic growth, so achieving economic growth requires workforce efficiency. An expanding population increases the labor force, enabling increased production. The population's growth contributes to economic growth and stimulates national production and economic activity. The Human Development Index (HDI) measures a country's socio-economic development achievements by combining education, health, and real per capita income (Mahuze et al., 2022). The development of human resources is carried out by transforming them into productive workers. The implementation carried out by Indonesia was first carried out in 1996 and was calculated periodically every three years, then in 2004 the calculation of the HDI began to be carried out every year (Faelassuffa and Yuliani, 2021). HDI's benefits include serving as a crucial indicator to measure the success of improving people's quality of life, determining a region's or country's development ranking, and allocating funds from the General Allocation Fund (DAU) (Arifin, 2021).

1.3 Economic growth

The positive influence of population growth on economic development is evident, where the condition and progress of the population are closely related to the growth and development of economic activities. Economic growth refers to a country's ability to increase or maintain its Gross Domestic Product (GDP) by 5% to 7% or more annually over a long period, during which the economy initially remains relatively static. A country's economic growth is defined as the long-term capacity increase of the country to provide various economic goods and services to its population.

The expansion of capacity is influenced by advancements in technology, institutional (organizational) development, and ideological progress within diverse contextual circumstances. The data required to calculate the extent of a country's economic growth is the national income of that country. Data needed to calculate the economic growth of developing countries use Gross Domestic Product (GDP), while developed countries generally use Gross National Product (GNP) (Halim, 2020).

However, economic growth alone does not guarantee employment opportunities for everyone. Unemployment refers to individuals who are part of the workforce but have not yet found employment (Franita dan Fuady, 2019). Not everyone wishes to be unemployed; rather, everyone desires livelihood by securing suitable employment, especially in today's era of intense job competition. Several factors contribute to the high unemployment rate, including an imbalance between the labor force and available job opportunities, insufficient education quality, high poverty rates, mass layoffs, inability to compete globally, and various companies' preference for employing robots or machines over human labor (Fikri and Gopar, 2021).

2. Method

The type of data used is secondary data. In this case, the practical use data sourced from the Central Bureau of Statistics (BPS) and official government websites. This data includes the Poverty Rate Figures in Special Region of Yogyakarta Province from 2013 to 2022, Minimum Wage Figures in Special Region of Yogyakarta Province from 2013 to 2022, Human Development Index in Special Region of Yogyakarta Province from 2013 to 2022, Economic Growth in Special Region of Yogyakarta Province from 2013 to 2022, and Unemployment Figures in Special Region of Yogyakarta Province from 2013 to 2022.

Data collection is a crucial part of the research process. Before data processing, data collection is conducted. The success of data collection greatly depends on how well researchers understand the social environment that is the subject of their research. Researchers must identify the questions formulated in the research focus before determining the required data collection method. This study employs recording and documentation methods for data collection. The data analysis method uses multiple linear regression and normality tests. Multiple linear regression is used to model the relationship between response variables and predictor variables, with more than one predictor variable. In this case, the response variable Y represents the poverty level in the Special Region of Yogyakarta Province. The predictor variables include X1 for the minimum wage in the Special Region of Yogyakarta Province, X2 for the Human Development Index in the Special Region of Yogyakarta Province, X3 for economic growth in the Special Region of Yogyakarta Province, and X4 for the unemployment rate in the Special Region of Yogyakarta Province (Equation 1).

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots + \beta pXp + e \quad \text{(Eq. 1)}$$

The Normality Test is a procedure conducted to assess the distribution of data within a dataset or variable, determining whether the data distribution follows a normal distribution or not. The multicollinearity test is utilized to examine whether there is correlation among independent variables in a regression model. Heteroscedasticity test is a regression model diagnostic tool used to detect variance inequality of residuals from one observation to another. The purpose of heteroscedasticity test is to determine whether there is variance inequality of residuals among observations in a regression model. Autocorrelation test examines the relationship between the residual of one observation and the residual of another observation.

3. Results and Discussion

3.1 General condition of Special Region of Yogyakarta Province

The Special Region of Yogyakarta one of the provinces located in the southern central part of Java Island. The Special Region of Yogyakarta bordered by the Indonesian Ocean to the south, Mount Merapi to the north, Progo River to the west, and Opak River to the east. Astronomically, the Special Region of Yogyakarta situated between 7°33' LS – 8°12' LS and

110°00' BT – 110°50' BT. The province covers an area of 3,185.8 km^2. The physiographic components comprising the Special Region of Yogyakarta Province consist of four physiographic units, namely the Southern Mountainous Unit (Karst Highland) with elevations ranging from 150-700 m, the Merapi Volcanic Unit with elevations ranging from 80 – 2,911 m, the Lowland Unit stretching between the Southern Mountains and the Kulonprogo Mountains at elevations of 0-80 m, and the Kulonprogo Mountains with elevations up to 572 m.

Administratively, the Special Region of Yogyakarta divided into 4 regencies and 1 municipality, namely Sleman Regency, Bantul Regency, Gunungkidul Regency, Kulonprogo Regency, and Yogyakarta City. Each regency/city has different physical conditions, resulting in varying natural potentials. These differences in physical conditions play a role in determining regional development plans. Special Region of Yogyakarta has several important infrastructures, such as the Yogyakarta International Airport (YIA), Tanjung Adikarto Fisheries Port, Tugu Station, Lempuyangan Station, and Maguwo Station (Figure 1).

The title "City of Students" is bestowed upon the Special Region of Yogyakarta Province, proven by the abundance of educational facilities spread throughout the province. Various prestigious universities such as Gadjah Mada University/Universitas Gadjah Mada (UGM), National Development University "Veteran" Yogyakarta/Universitas Pembangunan Nasional "Veteran" Yogyakarta (UPN), Islamic University of Indonesia/Universitas Islam Indonesia (UII), Muhammadiyah University of Yogyakarta/Universitas Muhammadiyah Yogyakarta (UMY), Yogyakarta State University/Universitas Negeri Yogyakarta (UNY), Ahmad Dahlan University/Universitas Ahmad Dahlan (UAD), and others attract students to migrate for education, consequently driving the economy in Yogyakarta. Moreover, the province is enriched with its tourism sector, which serves as a primary attraction for tourists visiting the region. Cultural potential can be observed through well-maintained cultural heritage sites and the deeply rooted customs and traditions still evident in the societal lifestyle.

Fig. 1 Yogyakarta International Airport

3.2 Normality test

The dependent and independent variables used in this study can be seen in Table 1. Meanwhile, one of the main requirements in parametric statistical analysis is the fulfillment of data normality. Testing to ascertain whether data is normal or not can be conducted using the Kolmogorov-Smirnov analysis. The result obtained from the normality test using the Kolmogorov-Smirnov method on the data used in this study shows a significance value of Asymp. Sig. (2-tailed) of 0.200. This indicates that the data is normally distributed because the obtained result is greater than 0.05.

Table 1 Poverty Level, Provincial Minimum Wage (UMP), Human Development Index (HDI), Economic Growth, and Unemployment Rate in Yogyakarta Special Region Province

Year	Poverty Level (Y)	Minimum Wage (X1)	HDI (X2)	Gross Regional Domestic Product (X3)	Unemployment Level (X4)
2013	541.90	947114	2390.10	21307763.6	63172
2014	532.60	988500	2393.33	21307763.6	67418
2015	550.23	988500	2397.68	22393012.2	80245
2016	494.94	1182510	2402.09	23538101.8	57036
2017	488.53	1337645	2405.97	24771530.0	64019
2018	460.10	1454154	2409.98	66993886.2	75032
2019	448.47	1570923	2413.91	27685286.5	71482
2020	475.72	1704608	2414.90	27016498.1	101846
2021	506.45	1765000	2417.33	28410013.4	106432
2022	454.76	1840916	2421.11	39282302.9	94945

3.3 Classical assumption test

3.3.1 Multicollinearity test

The multicollinearity test aims to determine whether there is correlation among independent variables in the regression model. A good regression model should not exhibit high correlation among independent variables. The following is the multicollinearity test for the factors influencing the poverty rate in the Special Region of Yogyakarta from 2013 to 2022 (Table 2).

Table 2. Classic multicollinearity assumption test output

Model 1	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
Constant	3668.511	5467.878		-0.671	0.532		
Provincial Minimum Wage (X1)	-9.525	0.000	-0.880	-1.265	0.262	0.026	36.682
Human Development Index (X2)	-1.308	2.312	-0.376	-0.566	0.596	0.028	35.229
Gross Regional Domestic Product (X3)	-5.011	0.000	-0.190	1.499	0.194	0.782	1.278
Unemployment Rate (X4)	0.002	0.000	0.727	4.149	0.009	0.408	2.454

Based on the above figure, multicollinearity can be observed from the VIF and Tolerance values. In the multicollinearity results above, it can be stated that multicollinearity has occurred because the VIF values are above 10. The VIF value for the Minimum Wage of the Province variable (X1) is 36.682. The VIF value for the Human Development Index variable (X2) is 35.229. The VIF value for the Economic Growth variable (X3) is 1.278. The VIF value for the Unemployment Rate variable (X4) is 2.454 (Table 2).

Table 3. Multicollinearity Test Output that has been treated 1 (Dependent variable is poverty rate)

Model 1	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
Constant	618.037	32.265		19.155	0.000		
Provincial Minimum Wage	-8.902	0.000	-0.810	-3.902	0.005	1.000	1.000

Hence, it can be inferred that among the four variables, two of them exhibit multicollinearity, specifically the Minimum Wage of the Province (Table 3) and the Human Development Index variables (Table 4), given that their VIF values exceed 10. Consequently, when dealing with data affected by multicollinearity, it's advisable to address it by regressing the correlated independent variables. Consequently, the VIF and tolerance have values of 1, indicating that the variables are no longer affected by multicollinearity.

Table 4. Multicollinearity test output that has been treated 2 (dependent variable: Provincial Minimum Wage)

Model 1	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
Constant	-74689722.9	4847383.553		-15.431	0.000		
Human Development Index	31652.723	2014.153	0.984	15.715	0.000	1.000	1.000

3.3.2 Heteroscedasticity test

According to Meidiawati (2016), the heteroscedasticity test is performed to examine whether there is variance inequality of residuals among observations in the regression model. Based on the scatterplot pattern in the analysis of factors influencing the poverty rate in the Special Region of Yogyakarta Province, it is observed that there are no discernible patterns in the scatterplot. Therefore, the data is deemed unaffected by heteroscedasticity. Figure 2 is the results of the heteroscedasticity test along with the Scatter Plot image.

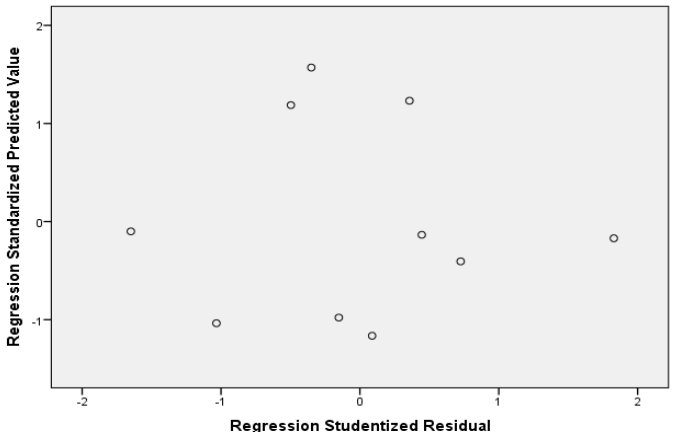

Figure 2 Output Scatterplot

3.3.3 Autocorrelation test

The autocorrelation test aims to examine whether there is correlation between the disturbance errors (residuals) in a linear regression model at time period t with the errors at time period t-1 (previous). According to Nagara & Hendrati (2022), autocorrelation testing is conducted to test the hypothesis in regression where the dependent variable is not related to itself. This means that the value of the dependent variable has no relationship with itself, whether it's the value from the previous period or the subsequent period.

Table 5. Autocorrelation test output

Model	R	R^2	Adjust R^2	Std. Error of the estimate	Durbin-Watson
1	0.968	0.937	0.887	12.366	2.196

Autocorrelation detection is performed using the Durbin-Watson (DW test). A good regression model is one that is free from autocorrelation. Decision-making regarding the presence of autocorrelation is based on specific criteria. Firstly, if the Durbin-Watson (DW) value is above +2, it indicates the presence of negative autocorrelation. Secondly, a DW value that falls between -2 and +2 suggests that there is no autocorrelation in the data. Lastly, a DW value below -2 indicates the presence of positive autocorrelation. These criteria help in understanding the correlation patterns within the residuals of a regression analysis. Based on the output shown in Table 5, it can be concluded that the Durbin-Watson value is 2.196. Therefore, it can be confirmed that the variable does not exhibit autocorrelation symptoms, as the result falls within the range of -2 to +2.

3.4 Regression analysis of poverty factors

3.4.1 F-Test

The F-test, also known as the ANOVA test, is a test used to examine how all independent variables collectively influence the dependent variable. The purpose of the F-test is to determine whether the independent variables collectively (simultaneously) affect the dependent variable. The ANOVA statistical test is a form of hypothesis testing that allows conclusions to be drawn based on the summarized data or statistical groups. Decision-making based on this test involves examining the F-value found in the ANOVA in Table 6. Based on the F-test conducted, the significance level of the independent variables is found to be 0.003. The significance level of the independent variables (X1, X2, X3, X4) = 0.003 > 0.05, which means the independent variables significantly influence the dependent variable.

Table 6 Anova Table

F	Sig.
19.904	0.003

4.4.2 t-Test

The t-test statistic indicates the extent to which one independent variable individually explains the variation in the dependent variable. The testing is conducted using a significance level of 0.05 (α = 5%). According to Zein et al. (2019), in the t-test process, Standard Deviation or Standard Deviation is used, which is a statistical formula utilized to determine how data is distributed within a sample, as well as how close individual data points are to the mean or average value of the sample data. Another formula commonly used in statistical analysis is variance, which is a measure of dispersion or variability. The acceptance or rejection of hypotheses between an independent variable and the dependent variable is determined through a significance test. If the significance value of the t-test (sig) is < 0.05, then the null hypothesis (H0) is rejected, indicating that there is a significant

influence of the independent variable on the dependent variable. Conversely, if the significance value of the t-test (sig) is > 0.05, then the null hypothesis (H0) is accepted, suggesting that there is no significant influence of the independent variable on the dependent variable.

The t-test is one of the statistical tests used to test the truth or falsity of a hypothesis that states that between two sample means taken randomly from the same population, there is no significant difference. The t-test is conducted to test the research hypothesis regarding the partial influence of each independent variable on the dependent variable. Below are the results of the regression analysis:

Table 7. Significance level

Variable	Sig.
Provincial Minimum Wage (X1)	0.217
Human Development Index (X2)	0.601
Gross Regional Domestic Product (X3)	0.140
Unemployment Level (X4)	0.015

Based on Table 7 regarding the t-test results of factors influencing the poverty rate in the Special Region of Yogyakarta Province, it can be observed that the significance level of the Minimum Wage of the Province variable (X1) = 0.217, which is greater than α = 0.05 (0.217 > 0.05). This means that the Minimum Wage of the Province variable does not significantly influence the poverty rate in the Special Region of Yogyakarta Province individually. Table 7 also showing the t-test results of factors influencing the poverty rate in the Special Region of Yogyakarta Province, it can be observed that the significance level of the Human Development Index variable (X2) = 0.601, which is greater than α = 0.05 (0.601 > 0.05). This means that the Human Development Index variable does not significantly influence the poverty rate in the Special Region of Yogyakarta Province individually. Meanwhile, the level of significance of the Gross Regional Domestic Product (GRDP) variable (X3) = 0.140 which is greater than α = 0.05 (0.140 > 0.05). This means that the Gross Regional Domestic Product variable does not have a significant effect on the poverty rate in the Special Region of Yogyakarta Provinceindividually.Unemployment Level. Table 4 also indicates that the significance level of the Unemployment Rate variable (X4) = 0.015 which is smaller than α = 0.05 (0.015 < 0.05). This means that the Unemployment Rate variable individually has a significant effect on the poverty rate in the Special Region of Yogyakarta Province.

3.4.3 Regression model

Multiple linear regression is a regression model that incorporates more than one independent variable. Through multiple linear regression analysis, researchers seek to ascertain both the direction and magnitude of the impact that independent variables exert on the dependent variable (Ghozali, 2018). The multiple linear regression test is conducted to gain an understanding of how independent variables, including Minimum Wage of the Province (UMP), Human Development Index (IPM), Gross Regional Domestic Product (PDRB), and Unemployment Rate affect the dependent variable, which is the poverty rate in the Special Region of Yogyakarta Province, with a significance level of 0.05. Below is the data for the multiple linear regression model of the poverty rate in the Special Region of Yogyakarta Province (Table 8).

The poverty rate function can be formulated from the coefficient table of the regression analysis results. The observed form of the poverty rate function this time is Y = A + B1X1 + B2X2 + B3X3 + B4X4. Y represents the dependent variable, which is the poverty rate. A is the constant value obtained without any independent variables. B1, B2, B3, and B4 represent the values of each variable X1, X2, X3, and X4, respectively. The poverty rate function resulting from the regression analysis is Y = -5848.863 – 4.640E-5X1 + 2.724X2 - 5.856E-7X3 + 0.02X4. Based on the multiple linear regression equation above, the results

can be explained as follows: The constant value (A) has a negative value of -5848.863, indicating an inverse relationship between the independent variables and the dependent variable. This suggests that if all independent variables, including UMP (X1), IPM (X2), GDP (X3), and the unemployment rate (X4), are valued at 0% or experience no change, then the poverty rate is -5848.863. The regression coefficient for the UMP variable (X1) is -4.640E-5, indicating a negative influence between the UMP variable and the poverty rate. This means that if the UMP increases by 1%, the poverty rate will decrease by -4.640E-5, assuming other variables remain constant.

Tabel 8. Linear Regression Model

Variable	Regression coefficients
Constant	-5848.863
Provincial Minimum Wage (X1)	-4.640
Human Development Index (X2)	2.724
Gross Regional Domestic Product (X3)	-5.856
Unemployment Level (X4)	0.02

For the IPM variable (X2), the regression coefficient is 2.274, which signifies a positive influence on the poverty rate. If the IPM increases by 1%, the poverty rate will increase by 2.274, with other variables held constant. The GDP variable (X3) has a regression coefficient of -5.856E-7, indicating that a 1% increase in GDP will result in a decrease in the poverty rate by -5.856E-7, assuming all other variables remain unchanged. The negative sign here indicates an inverse relationship between GDP and the poverty rate. Lastly, the regression coefficient for the unemployment rate variable (X4) is 0.02, which suggests a direct relationship between the unemployment rate and the poverty rate. If the unemployment rate increases by 1%, the poverty rate will increase by 0.02, assuming other independent variables are constant. Thus, the initial model is as follows (Equation 2).

$$Y = 3668.511 – 9.525\ X1 - 1.308\ X2 - 5.011\ X3 + 0.002 \quad \text{(Eq. 2)}$$

First, regress the correlated independent variables, specifically UMP (dependent) and IPM (independent). The regression model is expressed as X1 = -74798722.9 + 31652.723 X2. This model helps identify the relationship between UMP and IPM while accounting for their correlation. Next, transform the variables derived from the regression in the first step to obtain X1'. Based on those steps, the transformed data of the minimum wage variable for the Special Region of Yogyakarta can be obtained as follows (Table 9). First, regress X1′ back with the dependent variable Y, which represents the poverty rate of the Special Region of Yogyakarta. This step helps to assess the relationship between the transformed independent variable X1′ and the dependent variable Y. The equation for the new model is expressed as Y = 618.037 - 8.902E-5 X1'.

Table 9. Provincial minimum wage variable data for Special Region of Yogyakarta Provinceafter treatment

Year	X1'
2013	854450.3423
2014	956688.6376
2015	1094377.983
2016	1233966.491
2017	1356779.056
2018	1483706.476
2019	1608101.677
2020	1639437.873
2021	1716353.99
2022	1836001.283

3.5 Regression analysis after treatment

3.5.1 F test

The purpose of the F-test is to determine whether the independent variables collectively (simultaneously) influence the dependent variable. The ANOVA statistical test is a form of hypothesis testing where conclusions can be drawn based on the data or statistical groupings. Decision-making based on this test is done by examining the F-value found in the ANOVA table. After treatment has been applied to the affected variables, the results of the F-test can be observed as follows (Table 10). Based on the conducted F-test, it is found that the significance level of the independent variable is 0.001. The significance level of the independent variables (X1, X2, X3, X4) = 0.001 > 0.05, which means that the independent variables significantly affect the dependent variable.

Table 10. ANOVA tables after treatment

F	Sig.
22.195	0.001

3.5.2 t-Test

The t-test statistic indicates how much influence an independent variable has individually in explaining the variation of the dependent variable. The testing is conducted using a significance level of 0.05 (a = 5%). The t-test is one of the statistical tests used to test the truth or falsity of the hypothesis that there is no significant difference between two sample means taken randomly from the same population. The t-test is performed to test the research hypothesis regarding the partial influence of each independent variable on the dependent variable.

Table 11 presents the results of the t-test concerning the factors that influence the poverty rate in the Special Region of Yogyakarta. It shows that the significance level for the Human Development Index (HDI) variable (X2) is 0.001, which is less than the alpha level of 0.05 (0.001 < 0.05). This indicates that the HDI variable has a significant individual effect on the poverty rate in the Special Region of Yogyakarta. Furthermore, the significance level for the Gross Domestic Product (GDP) variable (X3) is 0.230, which exceeds the alpha level of 0.05 (0.230 > 0.05). This suggests that the GDP variable does not have a significant individual impact on the poverty rate in the Special Region of Yogyakarta. Lastly, the significance level for the unemployment rate variable (X4) is 0.009, which is less than the alpha level of 0.05 (0.009 < 0.05). This implies that the unemployment rate variable has a significant individual effect on the poverty rate in the Special Region of Yogyakarta.

Table 11. Coefficient After Treatment Table

Variable	Sig
Human Development Index (X2)	0.001
Gross Regional Domestic Product (X3)	0.230
Unemployment Level (X4)	0.009

According to the regression analysis findings, there are also "Excluded variables," indicating the removal of independent variables from consideration in model development.The purpose of variable elimination is to obtain the best model with small standard errors. Small standard errors can be indicated by the absence of multicollinearity among independent variables.

3.5.3 Regression model

After treatment, the following is the data for the multiple linear regression model of the poverty rate of the Special Region of Yogyakarta (Table 11). The function for the poverty

rate can be formulated from the coefficient table of the regression analysis. The observed form of the poverty rate function this time is Y = A + B1X1 + B2X2 + B3X3 + B4X4. Y is the dependent variable, which is the poverty rate. A is the constant value obtained without any independent variables. B1, B2, B3, and B4 represent the values of each variable X1, X2, X3, and X4. Due to the presence of the Excluded Variables table, the X1 variable listed in the Excluded Variables table does not have a direct or significant influence on the variable being studied. Therefore, changes in that variable will not impact the analysis or predictions made. Thus, its function changes to Y = A + B2X2 + B3X3 + B4X4. The poverty rate function resulting from the regression analysis is Y = 10337.182 – 4.128X2 - 4.668E-7X3 + 0.001X4.

Table 12. Coefficient and excluded variables table

Model 1	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
Constant	10337.182	1515.036		6.823	0.000
Human Development Index (X2)	-4.128	0.640	-1.186	-6.453	0.001
Gross Regional Domestic Product (X3)	-4.669	0.000	-0.177	-1.336	0.230
Unemployment Level (X4)	0.001	0.000	0.640	3.788	0.009

Based on the multiple linear regression equation presented, several interpretations can be drawn. The constant value (A) is -5848.863, indicating an inverse relationship between the independent variables and the dependent variable; if the Human Development Index (IPM) (X2), Gross Domestic Product (PDRB) (X3), and unemployment rate (X4) are all at 0 percent or unchanged, the poverty rate would be 10337.128. The regression coefficient for the IPM variable (X2) is -4.128, suggesting that a 1% increase in IPM results in a decrease in the poverty rate by 4.128, assuming other variables remain constant. Similarly, the regression coefficient for the PDRB variable (X3) is -4.668E-7, indicating that a 1% increase in PDRB leads to a decrease in the poverty rate by -4.668E-7, provided other independent variables are constant. In contrast, the unemployment rate variable (X4) has a positive regression coefficient of 0.02, implying that a 1% increase in the unemployment rate results in an increase in the poverty rate by 0.02, with other variables held constant.

4. Conclusion

Based on the description above, the conclusions that can be drawn are as follows. First, the Special Region of Yogyakarta located between 7°33' S - 8°12' S and 110°00' E - 110°50' E. Special Region of Yogyakarta Province has a total area of 3,185.8 km2. This province consists of 4 regencies and 1 municipality. Second, the factors influencing the poverty rate in the Special Region of Yogyakarta Province are the Human Development Index (HDI) and the unemployment rate. Based on the description above, the recommendations that can be given are as follows. First, the government of the Special Region of Yogyakarta Province needs to improve the HDI, such as starting from income (per capita income), life expectancy, years of schooling, and literacy rate. Second, the government of the Special Region of Yogyakarta Province needs to reduce the unemployment rate in the region, such as by creating new job opportunities, promoting economic activities, establishing job training centers, and so forth.

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Author Contribution

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