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FACTORS INFLUENCING THE HUMAN DEVELOPMENT INDEX (HDI) IN LAMPUNG PROVINCE: A MULTIPLE LINEAR REGRESSION ANALYSIS

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Abstract || This study aims to analyze the factors influencing the Human Development Index (HDI) in Lampung Province in 2023. Using multiple linear regression analysis, the study examines the effects of life expectancy, average length of schooling, and the number of poor individuals on the HDI. Secondary data were obtained from the Central Statistics Agency of Lampung Province. The results indicate that life expectancy and average length of schooling have a significant impact on the HDI, whereas the number of poor individuals does not exhibit a statistically significant effect. The regression model yields an R-squared value of 93.92%, suggesting that the independent variables effectively explain variations in the HDI. These findings underscore the need for government policies aimed at improving healthcare and education to enhance the HDI in Lampung Province.

Keywords || Human Development Index; Life Expectancy; Education; Poverty

Abstrak || Penelitian ini bertujuan menganalisis faktor-faktor yang mempengaruhi Indeks Pembangunan Manusia (IPM) di Provinsi Lampung tahun 2023. Menggunakan metode analisis regresi linear berganda, penelitian menguji pengaruh umur harapan hidup, rata-rata lama sekolah, dan jumlah penduduk miskin terhadap IPM. Data sekunder diperoleh dari Badan Pusat Statistik Provinsi Lampung. Hasil penelitian menunjukkan bahwa umur harapan hidup dan rata-rata lama sekolah berpengaruh signifikan terhadap IPM, sementara jumlah penduduk miskin tidak memberikan pengaruh signifikan. Model regresi memiliki R-squared 93,92%, menunjukkan variabel independen mampu menjelaskan variasi IPM dengan baik. Penelitian menyarankan pemerintah fokus pada peningkatan kualitas kesehatan dan pendidikan untuk meningkatkan IPM di Provinsi Lampung.

Katakunci || Indeks Pembangunan Manusia; Umur Harapan Hidup; Pendidikan, Kemiskinan

Introduction

A region can be considered advanced, developing, and prosperous when it achieves optimal development quality and successfully meets the needs of its citizens. The development process encompasses various changes influenced by social status, community attitudes, and national institutions, alongside efforts to accelerate economic growth, address income inequality, and implement poverty alleviation programs (Kiha et al., 2021). In addition to infrastructure development, human resources are a critical factor in supporting a country's progress. Understanding the quality of welfare and national advancement requires measuring development and human resource quality. A country can be categorized as developed, developing, or lagging based on the Human Development Index (HDI) value (Faizin, 2021).

The HDI measures human development achievements based on fundamental components of quality of life (Susanti & Saumi, 2022), including life expectancy at birth, average years of schooling, and the number of individuals living in poverty in 2023. Furthermore, the HDI serves as a benchmark for assessing the overall quality of life in a given region. These three components are key indicators for evaluating the success of efforts to enhance human development (Fitriyah et al., 2021), particularly in Lampung Province. East Java Province has experienced continuous population growth, with the population reaching 41,149,974 in 2022, compared to 40,878,789 in 2021—an increase of 271,185 people within one year. This data provides a basis for comparison and serves as a reference for improving the HDI in Lampung Province (Wulandari et al., 2024). To ensure sustainable development, it is essential to regulate population growth in accordance with regional capacity and to optimize human resources for maximum societal benefit.

The progress of the HDI is closely linked to human welfare. The components that constitute the HDI are essential in driving its advancement. Life expectancy at birth refers to the estimated number of years a newborn is expected to live, assuming that mortality patterns remain constant throughout their lifetime (Purwoko, 2023). This indicator is also used to evaluate government performance in enhancing public welfare and improving healthcare services (Fajri, 2021). Higher levels of population welfare typically correlate with better healthcare services provided by the government.

Another key component, the average years of schooling, is an educational indicator that measures the total years of formal education completed by individuals aged 25 and older (Meilinna et al., 2024). Education, in a broader sense, is defined as a deliberate effort undertaken by families, communities, and governments through guidance, teaching, or training, both within and outside formal institutions, to prepare individuals for active roles in society.

Additionally, poverty is a critical factor in human development. The number of people living in poverty is determined by assessing the socioeconomic conditions of individuals or groups whose basic needs—such as education, healthcare, and essential community services—are unmet (Sopiah & Siregar, 2023). High poverty levels negatively impact human development, as regions with significant poverty rates face greater challenges in achieving economic growth (Suhendi & Astuti, 2023). When poverty is widespread, it becomes increasingly difficult to foster sustainable human development and improve overall quality of life.

Achieving a decent standard of living is essential for ensuring societal well-being. Failure to do so can lead to increased poverty and inequality, thereby hindering efforts to promote welfare and equitable development (Suhendi & Astuti, 2023). Initiatives aimed at improving access to and the quality of education, as well as creating sustainable and dignified employment opportunities, play a crucial role in enhancing the Human Development Index (HDI) and overall human welfare (Sari, 2024).

To improve human development, existing components must be effectively addressed. The government's role in implementing regional autonomy and fiscal decentralization is based on the premise that local governments have a better understanding of their communities' needs and service standards. Therefore, granting regional autonomy is expected to stimulate economic growth and improve community welfare at the local level (Jasasila, 2020). Economic growth is often closely linked to human development, as a robust economy facilitates greater access to education and healthcare services (Abdelina & Saryani, 2020).

Based on this context, this study seeks to examine the most significant factors influencing the HDI in Lampung Province in 2023. The research employs multiple linear regression analysis to assess the extent to which various indicators contribute to HDI performance in Lampung. The multiple linear regression technique offers several key benefits: (1) it quantifies the influence of independent variables on the

dependent variable, and (2) it evaluates the statistical significance of these independent variables in relation to the dependent variable. The findings from this analysis are expected to serve as a reference for policymakers in Lampung Province, enabling them to formulate more effective and efficient strategies for human development.

Methodology

Analysis Techniques

The analysis techniques employed in this study include descriptive statistics, multiple linear regression analysis, and classical assumption tests, such as normality, heteroscedasticity, multicollinearity, autocorrelation, and homogeneity tests (Maulana et al., 2022).

Multiple Linear Regression Analysis

Multiple linear regression is a statistical model used to examine the effects of two or more independent (explanatory) variables on a single dependent variable (Hanggarany, 2022). This model assumes a linear relationship between the predictors and the response variable, which is typically represented by the following equation:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + e}$$

Where:

- -(Y) = Response variable
- (Xn) = Independent variables (i = 1,2,3,...,n)
- (β_1) = Regression coefficients (i = 1,2,3,...,n)
- (β_0 = Intercept
- (**e**) = Error term

Classical Assumption Tests

1) Normality Test

The normality test determines whether the residuals are normally distributed by comparing the Jarque-Bera (JB) probability value with an alpha level of 0.05 (Imelda et al., 2021). In this study, the Shapiro-Wilk method was applied using R-Studio software to generate (D) values and (P) values. If the (D) value exceeds the critical value (Dtable) and the (P) value is less than 0.05, the data is considered non-normally

distributed. Conversely, if the (D) value is lower than (Dtable) and the (P) value exceeds 0.05, the data is considered normally distributed (Sari, 2024).

2) Multicollinearity Test

This test examines whether independent variables in the regression model are correlated using the Variance Inflation Factor (VIF) test, facilitated by R-Studio software. If the VIF value is less than 10, multicollinearity is not present, indicating that the independent variables are not highly correlated (Akolo & Nadjamuddin, 2022).

3) Heteroscedasticity Test

The heteroscedasticity test assesses whether the variance of residuals is constant across observations. In a classical linear regression model, residuals should exhibit homoscedasticity, meaning their variance remains stable (Mahroji & Nurkhasanah, 2019).

4) Autocorrelation Test

The autocorrelation test evaluates whether residuals from one period are correlated with those from a subsequent period. A good regression model should be free from autocorrelation. The dL (lower bound) and dU (upper bound) values are obtained from the Durbin-Watson table with the assistance of R-Studio software (Rumanama et al., 2022).

5) Hypothesis Testing

a) Simultaneous Test (F-Test)

The F-test determines whether independent variables collectively have a significant impact on the dependent variable (Nisa & Rafikasari, 2022).

b) Partial Test (T-Test)

The T-test assesses whether each independent variable individually influences the dependent variable (Nisa & Rafikasari, 2022).

Analysis Flow

This study utilizes R-Studio and Microsoft Excel for data analysis. The analytical steps include:

a) Defining the research problem.
b) Conducting a literature review to establish a theoretical framework.
c) Identifying research objectives, specifically examining the factors influencing the Human Development Index (HDI) in Lampung Province in 2023
d) Collecting relevant data related to the study's problem formulation, including dependent variable: Human Development Index (HDI) (Y). Independent variables: Life expectancy at birth (X1), average length of schooling (X2), and the number of poor individuals (X3).
e) Entering data into Microsoft Excel.
f) Conducting descriptive analysis, including numerical summaries and data visualization (e.g., histograms and scatter plots).
g) Applying multiple linear regression analysis using R-Studio packages.
h) Performing classical assumption tests to verify whether the model meets standard assumptions and conducting hypothesis testing to determine the statistical significance of the model.
i) Interpreting the results.
j) Drawing conclusions based on the findings.

Data Sources

This study relies on secondary data obtained from the official website of the Central Statistics Agency (BPS) of Lampung Province in 2023 (Lampung BPS, 2023). The data used is quantitative and cross-sectional in nature.

Research Variables

A variable is a measurable element that facilitates the formulation of arguments and conclusions in decision-making. This study uses HDI data as the dependent variable (Y), following previous research conducted in West Java Province (Fitriyah et al., 2021). The specific variables analyzed in this study include:

Table 1. Definition of Variables

Variable	Definition	Unit
Y	Human Development Index (HDI)	Percentage
X_1	Life Expectancy at Birth (UHH)	Years
X_2	Average Length of Schooling (RLS)	Years
X_3	Number of Poor Individuals	Thousands

Analysis and Discussion

Descriptive Statistical

To describe the characteristics of the data used in this study, a numerical summary is provided, including the sample size, mean, median, minimum, maximum, and mode for each variable.

Table 2. Numerical Summary

Variabel	N	Mean	Minimum	Maksimum	Median	Modus
HDI (Y)	15	70.18	65.64	78.56	69.11	69.11
Life Expectancy (X_1)	15	69.82	64.29	72.12	69.97	70.42
Average Length of Schooling (X_2)	15	8.339	7.110	11.000	7.990	8.36
Number of Poor Individuals (X_3)	15	64.71	12.80	148.26	51.26	51.26

Based on the numerical summary, the average Human Development Index (HDI) in Lampung Province in 2023 is 70.18, with a minimum value of 65.64 and a maximum value of 78.56. The median and mode both have a value of 69.11, indicating that the majority of regions have an HDI around this level. The life expectancy variable has an average value of 69.82 years, ranging from a minimum of 64.29 years to a maximum of 72.12 years. The median life expectancy is 69.97 years, which is close to the mean, suggesting a relatively even distribution across the regions.

The average length of schooling in Lampung Province is 8.34 years, indicating that most individuals attain only a junior high school education. The minimum value is 7.11 years, while the maximum is 11.00 years. The median value is 7.99 years, slightly below the mean, suggesting that a few areas with higher levels of education raise the average.

The number of poor individuals in Lampung Province has an average value of 64.71 thousand, with a minimum of 12.80 thousand

and a maximum of 148.26 thousand. The median and mode are both 51.26 thousand, lower than the mean, indicating that while most regions have lower poverty levels, a few areas with significantly higher poverty rates increase the overall average. To better visualize the data distribution, a histogram was generated using RStudio software, displaying the frequency distribution of the study variables.

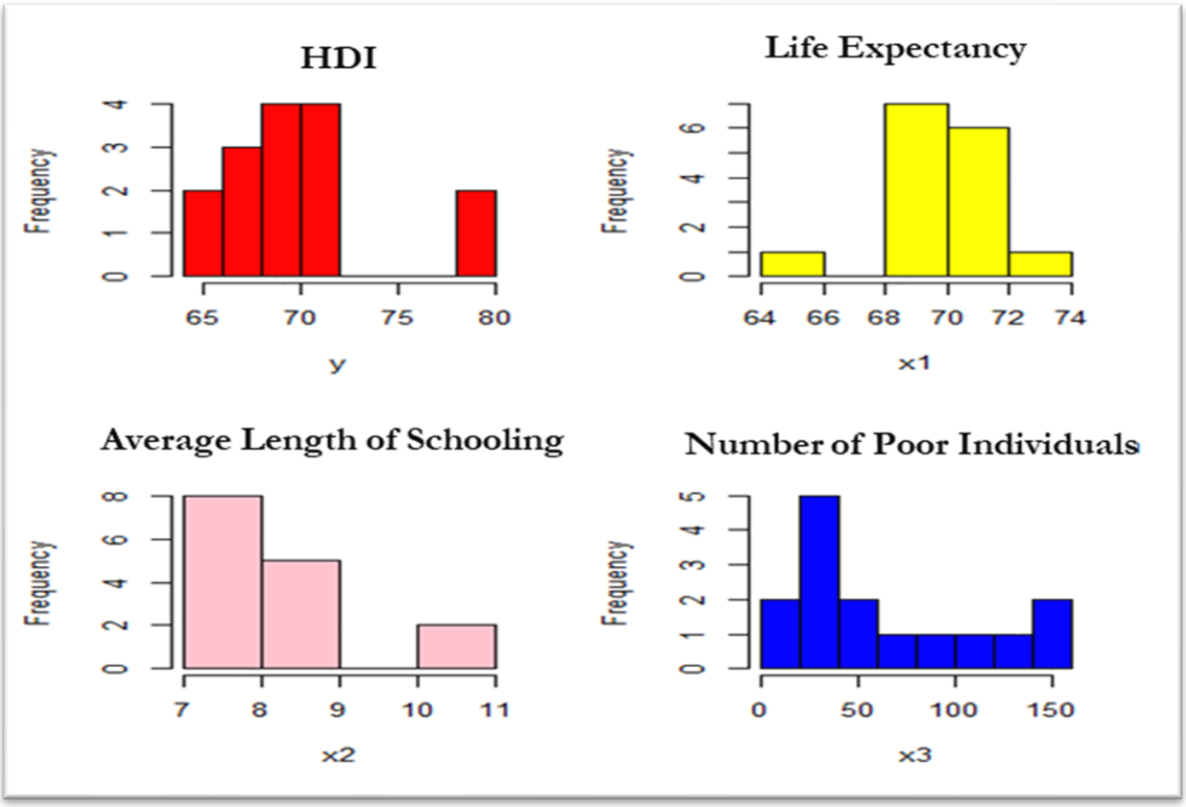

Figure 1. Histogram of Independent and Dependent Variables

The histogram shows that HDI values range from 65% to 80%, with the most frequently occurring values around 70%. The highest frequency is approximately 4, indicating that 70% HDI is the most common value. The distribution is asymmetric (not normally distributed), as higher values, such as 80%, appear infrequently.

For the relationship between X_1 (Life Expectancy) and Y (HDI), the life expectancy values range from 64 to 74 years, with most observations clustering around 68 to 72 years and the highest frequency reaching 6. This suggests that the average life expectancy in Lampung Province is conducive to human resource development, as improved healthcare services contribute to higher life expectancy.

Regarding the relationship between X_2 (Average Length of Schooling) and Y (HDI), schooling values range from 7 to 11 years. The most frequently occurring value is 7 years, with a peak frequency of 8.

The frequency decreases sharply for 8 and 9 years but increases again for 11 years. This indicates that while most individuals have around 7 years of schooling, a smaller but significant group attains higher education levels (11 years). This educational disparity highlights its impact on human development, as education plays a crucial role in shaping cognitive abilities, attitudes, and decision-making. Consequently, government policies related to human development are largely influenced by educational attainment.

For the relationship between X_3 (Number of Poor Individuals) and Y (HDI), poverty levels range from 0 to 150 thousand. The most frequent range is 0 to 50 thousand, with the highest frequency of 5. The frequency decreases significantly in higher value ranges, but there is a slight increase around 150 thousand. This suggests that most regions in Lampung have relatively lower poverty levels, although a few areas exhibit high poverty rates, which influence the overall distribution.

To further analyze the relationships between the independent and dependent variables, a scatter plot was generated using RStudio software. This visualization helps identify patterns and provides an initial overview of the direction and strength of the relationships between the variables.

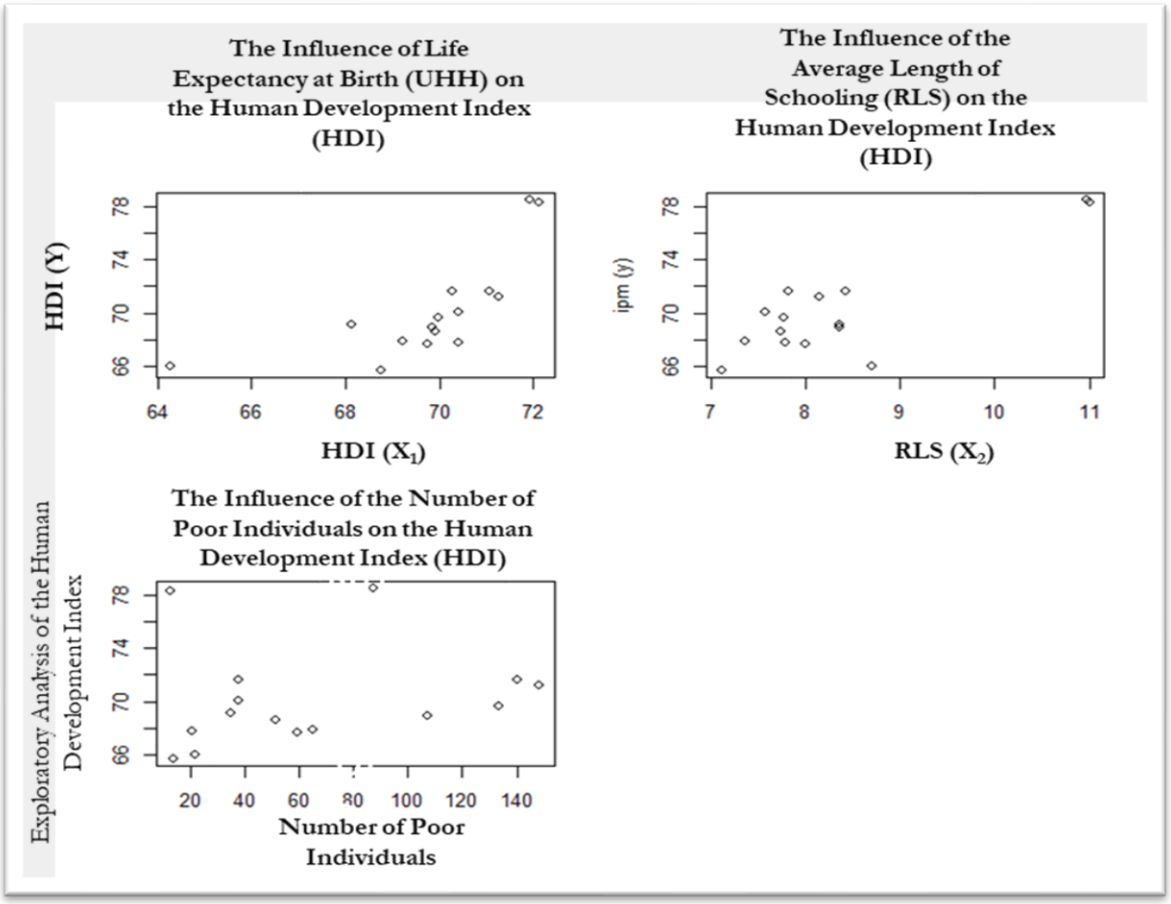

Figure 2. Influence of Independent Variables on the Human Development Index (HDI)

Based on data visualization obtained using RStudio, the Human Development Index (HDI) in Lampung Province continues to rise as life expectancy increases. A higher life expectancy reflects improvements in healthcare services within the province, emphasizing the crucial role of health as an indicator of human development. The education indicator, measured by the average length of schooling, also contributes to the increase in HDI, albeit to a lesser extent.

However, policy efforts aimed at expanding education access are expected to enhance the influence of education on HDI, ultimately improving the quality of human resources in Lampung Province. Conversely, the relationship between the number of poor individuals and HDI is negative, indicating that regions with higher poverty rates tend to have lower HDI scores. This underscores the detrimental impact of poverty on human development in Lampung Province.

Multiple Linear Regression Analysis

To assess the influence of the independent variables on the dependent variable, a multiple linear regression model was estimated as follows:

$$\mathbf{y = -10.367 + 0.858X_1 + 2.405X_2 + 0.009X_3}$$

The results of the multiple linear regression analysis indicate that life expectancy at birth (X_1) and the average length of schooling (X_2) significantly influence the Human Development Index (Y). To assess the feasibility of the model and determine the extent to which the independent variables explain variations in the dependent variable, two hypothesis tests were conducted:

1) Simultaneous Test (F-Test)

Table 3. Simultaneous Test Results

Statistic	Value
Multiple R-squared	0.9392
Adjusted R-squared	0.9226
F-statistic	56.64
p-value	5.629e-07

Based on the regression output, the p-value is extremely small (less than 0.05), leading to the rejection of the null hypothesis (H_0). This suggests

that at least one of the independent variables (X_1, X_2, or X_3) significantly affects the dependent variable (Y). Furthermore, the R-squared value of 93.92% indicates that a substantial proportion of the variation in HDI can be explained by the independent variables included in the model.

2) Partial Test (t-Test)

Table 4. Partial Test Results

Parameter	Estimate	Standard Error	t-value	Pr(>|t|)
Y	-10.367	11.147677	-0.930	0.37233
X_1	0.857	0.170893	5.020	0.00039 *
X_2	2.4049	0.266908	9.010	2.07e-06 *
X_3	0.009	0.006393	1.426	0.18158

From the multiple linear regression output, the significance of each independent variable is determined as follows:

- X_1 (Life Expectancy): Since the p-value (0.00039) is less than 0.05, we reject H_0 and accept H_1, indicating that X_1 has a significant effect on Y.
- X_2 (Average Length of Schooling): The p-value (2.07e-06) is also less than 0.05, leading to the rejection of H_0, confirming that X_2 has a significant effect on Y.
- X_3 (Number of Poor Individuals): The p-value (0.18158) is greater than 0.05, meaning H_0 is not rejected, indicating that X_3 does not have a statistically significant effect on Y.

Based on both hypothesis tests, the results indicate that life expectancy (X_1) and the average length of schooling (X_2) significantly influence the Human Development Index (Y). However, the number of poor individuals (X_3) does not exhibit a statistically significant effect on HDI.

Classical Assumption Test

The classical assumption test, conducted using RStudio software, includes the normality test, multicollinearity test, autocorrelation test, and heteroscedasticity test. The results are presented in the following table:

Table 5. Classical Assumption Test

	Shapiro-Wilk normality test	VIF Multicollinearity Test	Durbin-Watson autocorrelation test	Studentized Breusch-Pagan heteroscedasticity test
Nilai p-value	0.4677	X_1 = 1.278478 X_2 = 1.182499 X_3 = 1.145825	0.9391	0.5524

The classical assumption tests, conducted as part of the multiple linear regression analysis, are crucial for ensuring the reliability of the regression results (Yuliana, 2024). The results of each test are as follows:

1) Normality Test: The p-value of 0.4677 is greater than 0.05, indicating insufficient evidence to reject the null hypothesis (H0). This suggests that the regression model follows a normal distribution and meets the assumption of normality.
2) Multicollinearity Test: All variance inflation factor (VIF) values are below the threshold of 10, indicating no multicollinearity issues. This means that the independent variables are not highly correlated with each other.
3) Autocorrelation Test: The p-value of 0.9391 is greater than 0.05, suggesting no significant evidence to reject the null hypothesis. Thus, there is no significant autocorrelation in the residuals of this regression model.
4) Heteroscedasticity Test: The p-value of 0.5524 is greater than 0.05, indicating no significant heteroscedasticity. This confirms that the regression model meets the assumption of homoscedasticity, where the variance of residuals remains constant.

Since all classical assumption tests are satisfied, the multiple linear regression model is considered valid. These findings provide a strong foundation for analyzing the Human Development Index (HDI) and offer valuable insights for policymakers in Lampung Province to improve population quality.

Multiple Linear Regression Model and Interpretation

Based on the regression analysis, the following regression model was obtained:

$$\mathbf{y = -10.367 + 0.858X_1 + 2.405X_2 + 0.009X_3}$$

The interpretation of each variable is as follows:

- Life Expectancy at Birth (X1) = 0.858: A one-year increase in life expectancy at birth is associated with an increase of 0.858 in the HDI, assuming all other variables remain constant. Since the p-value is 0.00039 (less than 0.05), this variable has a significant effect on the HDI.
- Average Length of Schooling (X2) = 2.405: A one-year increase in the average length of schooling results in a 2.405 increase in the HDI, assuming other variables remain constant. This variable is significant, as indicated by its p-value of 2.07e-06 (less than 0.05).
- Number of Poor Individuals (X3) = 0.009: An increase of 1,000 poor individuals is associated with an increase of 0.009 in the HDI, assuming other variables remain constant. However, this coefficient is not statistically significant, as its p-value is 0.18158 (greater than 0.05).

Conclusion

The results of the multiple linear regression analysis, along with the classical assumption and hypothesis tests, lead to the following conclusions: 1) Significant Variables: Life expectancy (X1) and average length of schooling (X2) have a significant effect on the HDI. This indicates that these variables are strong predictors of HDI variations in Lampung Province. The significance of these relationships is confirmed through multiple regression analysis, as well as partial and simultaneous tests. 2) Non-Significant Variable: The number of poor individuals (X3) does not have a significant effect on the HDI in this model. This highlights that poverty remains a major challenge for the government. Although poverty levels influence human development, they do not directly correlate with HDI variations in this regression model. 3) Policy Implications: Given the findings, policymakers should prioritize strategies to enhance economic growth, improve access to healthcare services, and strengthen educational opportunities. These efforts are essential for ensuring that human resources in Lampung Province can contribute more effectively to overall development, thereby improving the HDI. By addressing these factors, the government can implement policies aimed at increasing the well-being of the population, reducing poverty, and fostering sustainable human development in Lampung Province.

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