The Modeling of The Poverty Rate In Indonesia From 2018 to 2023 Using A Panel Data Regression Approach

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ABSTRAK

Indonesia menduduki peringkat ke 6 dari 11 negara di Asia Tenggara dengan persentase kemiskinan tertinggi, sehingga diperlukan strategi dalam mengurangi masalah kemiskinan. Strategi yang diterapkan oleh pemerintah selaras dengan *Sustainable Development Goals* (SDGs) dengan tujuan utama *zero poverty*. Dalam penelitian ini, persentase kemiskinan di Indonesia tahun 2018-2023 mengalami peningkatan dan penurunan yang bervariatif. Fenomena tersebut membuktikan terjadinya dinamika persentase kemiskinan. Persentase kemiskinan diduga berkaitan erat dengan aspek pendidikan dan perekonomian. Merujuk pernyataan tersebut, penelitian ini melibatkan persentase kemiskinan sebagai variabel dependen serta akses air besih, gini ratio, tingkat pengangguran terbuka, dan angka melek huruf sebagai variabel independen. Bedasarkan struktur data penelitian, terjadinya dinamika persentase kemiskinan tahun 2018-2023 melibatkan struktur data *cross section* dan *time series*. Metode regresi data panel berbasis Random Effect Model dalam hal ini sangatlah tepat dan dapat mengakomodir proses identifikasi hingga perolehan kesimpulan. Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor yang mempengaruhi persentase kemiskinan. Selanjutnya, penelitian ini menunjukkan bahwa seluruh variabel independen berpengaruh secara serempak maupun parsial terhadap persentase kemiskinan.

Kata kunci: Persentase Kemiskinan, Regresi Data Panel, Random Effect Model

ABSTRACT

Indonesia was ranked sixth out of eleven Southeast Asian countries with the highest poverty rate, highlighting the need for effective strategies to address poverty issues. The governmental strategy was aligned with the Sustainable Development Goals (SDGs), with the primary objective of achieving zero poverty. In this study, the poverty rate in Indonesia from 2018-2023 exhibited fluctuating trends, marked by both increases and decreases over the years. This phenomenon reflects the dynamic nature of poverty levels in the country. Poverty rates are assumed to be related to education and the economy. Referring to the statement, this study involves the percentage of poverty as the dependent variable and access to clean water access, gini ratio, open unemployment rate, and literacy rate as independent variables. Based on the structure of the research data, the dynamics of the poverty rate from 2018-2023 involve both cross-sectional and time series data structures. In this case, the panel data regression method based on the Random Effects Model is appropriate and can accommodate the identification process to the conclusion. This study aims to identify the factors that influence the poverty rate. Furthermore, the findings indicate that all independent variables have simultaneous and partial effects on the poverty rate.

Keywords: *Poverty Rate, Panel Data Regression, Random Effects Model*

INTRODUCTION

Indonesia is one of the developing countries that have been constantly working to eradicate poverty. Indonesia is ranked 6th in Southeast Asia for having the highest percentage of people living in poverty at 9.5% [1]. Poverty can be defined as a condition in which basic needs are not adequately met, particularly in the economic aspects. Alleviating poverty is explicitly stated as one of the goals of sustainable development, aligning with the Sustainable Development Goals (SDGs), with the primary objective of achieving zero poverty. Government steps to alleviate poverty are formulated and implemented through various subsidy programs [2]. Referring to the average poverty rate in Indonesia from 2018 to 2023, the governmental steps appear to be suboptimal, as the poverty rate consecutively stood at 10.61%, 10.24%, 10.81%, 10.43%, 10.30%, and 10.09% [3]. This situation has raised concerns within the community regarding the effectiveness of government efforts to alleviate poverty. However, poverty is not an easy problem, but there are approaches to overcome it. Government attention is considered crucial in overcoming poverty. Several efforts to eradicate poverty include the implementation of the *Indonesia Pintar* program, the KIP *Kuliah* program, the *Merdeka Belajar Kampus Merdeka* (MBKM) program, and village funds. These conditions show that the government is trying to eradicate poverty through the education and economic sectors [4].

Based on the report from the Central Bureau of Statistics, it has been identified that the percentage of poverty in Indonesia from 2018 to 2023 experienced fluctuations. Specifically, in 2019, it decreased by 0.37%; in 2020, it increased by 0.57%; in 2021, it decreased by 0.38%; in 2022, it decreased by 0.13%; and in 2023, it decreased by 0.21%. Fluctuations in the poverty percentage in Indonesia are naturally due to variations in each province. For example, Central Sulawesi Province experienced a decrease of 0.51%, 0.12%, and 0.88%, and an increase of 0.12% and 0.11%, respectively. Furthermore, East Kalimantan Province experienced a decrease of 0.15%, an increase of 0.73%, a decrease of 0.37%, an increase of 0.17%, and a decrease of 0.33%. The province of South Sumatra experienced a decrease of 0.31%, an increase of 0.51%, a decrease of 0.65%, 0.16%, and 0.18%, respectively [3]. Based on the programs implemented by the government in the education and economic sectors, poverty in Indonesia fluctuated from 2018 to 2023, representing a crucial issue due to its significant impact on societal welfare as a consequence of persistent poverty. Grounded in this information, this study holds significant relevance, as it utilizes the most recent data, which are assumed to deliver accurate assessments in identifying the factors that influence the poverty rate in Indonesia. Specifically, this study aims to provide valuable insights for the academic community in developing future research and to serve as a foundation for formulating poverty-related policies by the government [5]. One of the assessment approaches related to the factors influencing poverty is considered appropriate using the panel data regression method. It is due to the method's ability to accommodate the combination of cross-sectional and time series data, making it technically well-suited to the structure and framework required by the research.

Previous research in this study has served as the foundation for determining the independent variables, including the provision of access to clean water, which aims to meet basic needs and has the potential to alleviate poverty through improved health outcomes, such as a decrease in morbidity rates and an increase in the Human Development Index [6]. The implementation results of the Ordinary Least Squares (OLS) method stated that the access provision to clean water

contributes to alleviating poverty-related issues [7]. Specifically, poverty is closely related to the gini ratio, where positive and negative correlations may exist. The gini ratio itself essentially indicates income inequality, which impacts poverty. This finding was explored in previous research using the panel data regression method with a Fixed Effects Model [8]. The gini ratio has an indirect relationship with the open unemployment rate, where an increase in the open unemployment rate accompanies an increase in poverty, as evidenced by previous research through the implementation of the OLS method [9]. Economic factors contributing to poverty are highly correlated with educational factors. One of the educational factors examined is the literacy rate, where a previous study using the panel data regression method based on the Random Effects Model concluded that the literacy rate has a negative correlation with poverty.

Building on the previous research outlined above, the poverty rate is specifically hypothesized to be influenced by economic and educational factors, including access to clean water, the gini ratio, the open unemployment rate, and the literacy rate. These factors are examined across provinces in Indonesia as cross-sectional units, with the period from 2018 to 2023 as the time series unit. According to the statement, panel data regression is highly relevant for this study. Panel data can be defined as a dataset that tracks specific individual samples over time, thereby providing multiple observations for each individual in the sample [5]. In this research, the application of panel data regression was simulated using the R programming software.

METHOD

Data and Data Sources

This research is classified as quantitative research involving secondary data from Central Bureau of Statistics publications in 2023 entitled *Indikator Tujuan Pembangunan Berkelanjutan Indonesia* 2023. The data involved in this research are poverty data and its influencing factors, including access to clean water, gini ratio, the open unemployment rate, and the literacy rate from 2018 to 2023. The data involved as the research implementor is from 34 provinces in Indonesia. [3].

Variables

The variables used in this study are divided into independent and dependent variables, which are described in detail as follows:

Table 1. Variables

Dependent Variable	Y	Poverty Percentage (%)
Independent Variable	X_1	Clean Water Access (%)
	X_2	Gini Ratio (%)
	X_3	Open Unemployment Rate (%)
	X_4	Literacy Rate (%)

The dependent variable is based on the aim of this study, which focuses on the poverty rate. The determination of the independent variables is grounded in previous research, which assumed that they affect the poverty rate, particularly in education and economics aspects.

Descriptive Statistics

In this study, the implementation of descriptive statistics aims to describe the research variables, complemented by visualizations and analysis results, which are fundamental components of the research. The description of the research variables is intended to provide a data summary that helps facilitate a clearer understanding of the research data presentation [10].

Panel Data Regression

Panel data regression is an identification method implemented through cross-sectional and time-series data integration within a single equation [5]. In general, the panel data regression model can be expressed as follows [11]:

$$Y_{it} = \alpha_{it} + \boldsymbol{X}_{it}\boldsymbol{\beta} + u_{it};\ i = 1,2,\ldots,\mathrm{N};\ t = 1,2,\ldots,\mathrm{T}$$

Based on the equation above, the panel data regression model is classified into five types, which can be expressed as follows [12]:

(1) All slope coefficients and intercepts are constant across individuals and time

$$Y_{it} = \alpha^* + \sum_{k=1}^{K} \beta_k X_{kit} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

(2) The slope coefficients are constant, while the intercepts vary across individuals

$$Y_{it} = a_i^* + \sum_{k=1}^{K} \beta_k X_{kit} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

(3) The slope coefficients are constant, while the intercepts vary across individuals and time

$$Y_{it} = a_{it}^* + \sum_{k=1}^{K} \beta_k X_{kit} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

(4) All coefficients vary across individuals

$$Y_{it} = a_i^* + \sum_{k=1}^{K} \beta_{ki} X_{kit} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

(5) All coefficients vary across time and individuals

$$Y_{it} = a_{it}^* + \sum_{k=1}^{K} \beta_{kit} X_{kit} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

In its implementation, the panel data regression method generally uses three approaches, including [13]:

Common Effect Model (CEM)

The Common Effect Model assumes that the intercept values for each variable are the same, as are the slope coefficients for all cross-sectional units and time series, which can be expressed through the following equation [14]:

$$Y_{it} = \alpha + \boldsymbol{X}_{it}\boldsymbol{\beta} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

Fixed Effect Model (FEM)

The Fixed Effect Model assumes that the intercept values for each variable are different for each cross-sectional unit, and the slope is presumed to be constant, which can be expressed through the following equation [11]:

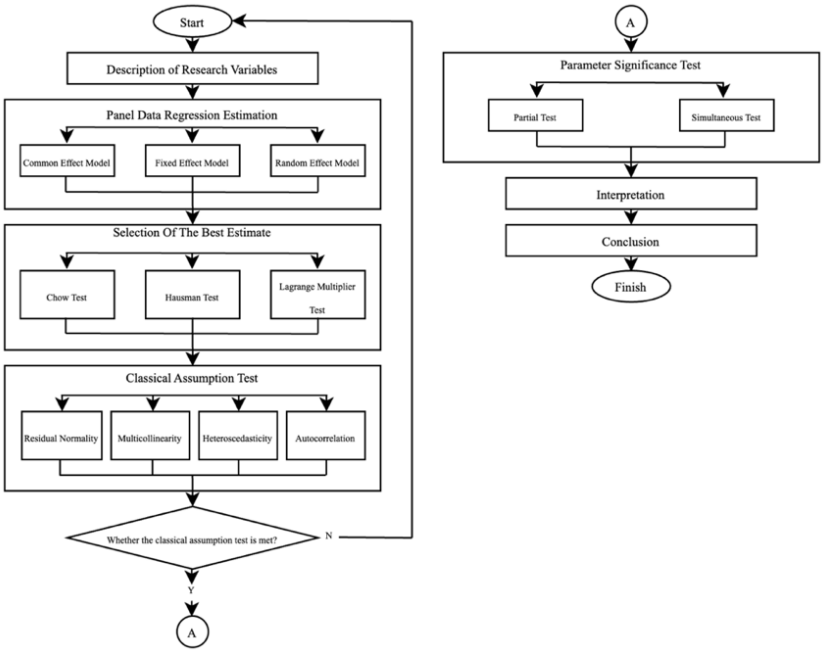
$$Y_{it} = \alpha_i + \boldsymbol{X}_{it}\boldsymbol{\beta} + u_{it};\ i = 1, 2, \ldots, \mathrm{N};\ t = 1, 2, \ldots, \mathrm{T}$$

Random Effect Model (REM)

The Random Effect Model approach assumes that the individual effects are random for all cross-sectional units, which can be expressed through the following equation [11]:

$$Y_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{kit} + u_{it} ; i = 1, 2, \dots, \mathrm{N} ; t = 1, 2, \dots, \mathrm{T}$$

Flowchart



Picture 1. Flowchart

RESULT AND DISCUSSION

Based on the research data used, further analysis is carried out with the following test results:

Description of Research Variables

The description of the research variables related to the poverty rate in Indonesia, along with the variables presumed to have an influence, can be identified using descriptive statistical methods, as shown in **Table 2.** to **Table 6.** below:

Table 2. Poverty Percentage

Year	Mean	Minimum	Province of Minimum Value	Maximum	Province of Maximum Value
2018	10.61%	3.55%	Jakarta	27.43%	Papua
2019	10.24%	3.42%	Jakarta	26.55%	Papua
2020	10.81%	4.45%	Bali	26.80%	Papua
2021	10.43%	4.56%	South Kalimantan	27.38%	Papua
2022	10.30%	4.53%	Bali	26.80%	Papua
2023	10.09%	4.25%	Bali	26.03%	Papua

Table 3. Clean Water Access

Year	Mean	Minimum	Province of Minimum Value	Maximum	Province of Maximum Value
2018	72.95%	49.37%	Bengkulu	90.90%	Bali
2019	84.23%	57.60%	Bengkulu	99.82%	Jakarta
2020	85.41%	64.47%	Bengkulu	99.84%	Jakarta
2021	86.68%	64.92%	Papua	99.86%	Jakarta
2022	87.64%	65.39%	Papua	98.42%	Bali
2023	88.19%	66.49%	Papua	99.42%	Jakarta

Table 4. Gini Ratio

Year	Mean	Minimum	Province of Minimum Value	Maximum	Province of Maximum Value
2018	0.35%	0.272%	Bangka Belitung Islands	0.422%	Yogyakarta
2019	0.35%	0.262%	Bangka Belitung Islands	0.428%	Yogyakarta
2020	0.38%	0.257%	Bangka Belitung Islands	0.437%	Yogyakarta
2021	0.35%	0.247%	Bangka Belitung Islands	0.436%	Yogyakarta
2022	0.34%	0.255%	Bangka Belitung Islands	0.459%	Yogyakarta
2023	0.34%	0.245%	Bangka Belitung Islands	0.245%	Yogyakarta

Table 5. Open Unemployment Rate

Year	Mean	Minimum	Province of Minimum Value	Maximum	Province of Maximum Value
2018	4.8%	1.40%	Bali	8.47%	Banten
2019	4.7%	1.57%	Bali	8.11%	Banten
2020	6.0%	1.32%	West Sulawesi	10.95%	Jakarta
2021	5.5%	3.01%	West Nusa Tenggara Gorontalo	9.91%	Riau Islands
2022	5.0%	2.34%	West Sulawesi	8.31%	West Java
2023	4.6%	2.27%	West Sulawesi	7.52%	Banten

Table 6. Literacy Rate

Year	Mean	Minimum	Province of Minimum Value	Maximum	Province of Maximum Value
2018	99.45%	88.44%	Papua	100%	Yogyakarta East Kalimantan
2019	99.56%	90.39%	Papua	100%	Yogyakarta East Kalimantan
2020	99.58%	90.78%	Papua	99.98%	Aceh
2021	99.59%	91.13%	Papua	99.99%	Aceh
2022	99.63%	92.04%	Papua	99.97%	West Java
2023	99.68%	93.57%	Papua	99.97%	Bangka Belitung Islands West Java

Based on the results of the identification of the description of the research variables, information was obtained that each independent and dependent variable from 2018 to 2023 experienced fluctuations identified through decreases and increases each year, thus creating dynamics for each research variable.

Panel Data Regression Estimation

This study implements the panel data regression method to estimate the effect of independent variables on the dependent variable using three approaches, namely CEM, FEM, and REM, as shown in **Table 7.** below:

Table 7. Panel Data Regression Estimation

	R-Squared	*p-value*
CEM	40.046%	< 0.05
FEM	33.031%	< 0.05
REM	28.568%	< 0.05

Selection of the Best Estimate

According to the panel data regression assessment, a suitable approach is needed to analyze the research data through the Chow, Hausman, and Lagrange Multiplier tests. Specifically, the Chow test determines the estimation between CEM and FEM, the Hausman test is aimed at choosing the estimation between FEM and REM, and the Lagrange Multiplier test determines the estimation between REM and CEM [12]. Meanwhile, the test results are informed through **Table 8**. as follows:

Table 8. Selection of the Best Estimate

	p-value	**Decision**	
Chow	< 0.05	Reject H_0	FEM
Hausman	> 0.05	Accept H_0	REM
Lagrange Multiplier	< 0.05	Reject H_0	REM

Based on the best estimation selection tests, the REM is the most appropriate approach to implement.

Classical Assumption Test

The classical assumption test is a requirement that must be fulfilled in conducting a test so that the estimation results are the Best Linear Unbiased Estimator (BLUE). The classical assumption tests include the residual normality, multicollinearity, heteroscedasticity, and autocorrelation test [12].

Residual Normality Test

The residual normality test can be implemented through the Kolmogorov-Smirnov test [12]. The test results state that the p-value is 0.3929 which underlies the decision to accept H_0. Therefore, it can be concluded that the test data residuals fulfill the assumption of residual normality.

Multicollinearity Test

The multicollinearity test for each independent variable can be determined using the VIF value [12]. The results of the VIF test are presented in **Table 9.** as follows:

Table 9. VIF

	VIF
Clean Water Access (X_1)	1.17
Gini Ratio (X_2)	1.14
Open Unemployment Rate (X_3)	1.03
Literacy Rate (X_4)	1.04

Heteroscedasticity Test

The heteroscedasticity test is used to identify differences in the variance of residuals [15]. The results showed a p-value < 0.05, indicating the presence of heteroscedasticity in the estimation process.

Autocorrelation Test

The autocorrelation test is intended to examine the correlation between the standard error at a specific lag time and its previous value. This test aims to avoid serial correlation issues, which can affect the efficiency of the test results [16]. The test results showed a p-value < 0.05, indicating that the estimation process faces autocorrelation issues.

Addressing Violations of Classical Assumptions

Based on the tests and analysis conducted, it was found that the estimation using the REM approach faced issues of heteroscedasticity and autocorrelation. Therefore, corrective measures were applied by using robust estimation methods. The results from the robust estimation are presented in **Table 10.** as follows:

Table 10. Robust Estimation

	p-value
Clean Water Access (X_1)	< 0.05
Gini Ratio (X_2)	< 0.05
Open Unemployment Rate (X_3)	< 0.05
Literacy Rate (X_4)	< 0.05

Significance Test

A significance test for parameters is necessary to analyze the effect of independent variables on the dependent variable simultaneously and partially. The significance test is divided into two types: simultaneous test and partial test [12].

Simultaneous Test

Based on the test using the REM estimation approach, a p-value of less than 0.05 was obtained, indicating that, simultaneously, access to clean water, gini ratio, open unemployment rate, and literacy rate have an impact on the poverty rate.

Partial Test

The partial test provides information on the partial effects on the poverty rate. The results of the partial test are presented in **Table 11.** as follows:

Table 11. Partial test

	p-value	Decision
$\hat{\beta}_1$	< 0.05	Reject H_0
$\hat{\beta}_2$	< 0.05	Reject H_0
$\hat{\beta}_3$	< 0.05	Reject H_0
$\hat{\beta}_4$	< 0.05	Reject H_0

Based on the partial test conducted, it can be concluded that, individually, access to clean water, gini ratio, open unemployment rate, and literacy rate influence the poverty rate.

Interpretation

Based on the tests conducted, the panel data regression equation obtained using the REM approach is as follows:

$$Y_{it} = 32.3479228 - 0.0174982X_{kit} + 9.2621172X_{kit} + 0.2296808X_{kit} - 0.2495794X_{kit}$$

The estimation of the test results can be interpreted as follows:

	Interpretation
$\widehat{\boldsymbol{\beta}}_{\boldsymbol{1}}$	If the percentage of access to clean water increases by 1%, the poverty rate will decrease by 0.0174982%, assuming all other variables remain constant.
$\widehat{\boldsymbol{\beta}}_{\boldsymbol{2}}$	If the percentage of the gini ratio increases by 1%, the poverty rate will increase by 9.2621172%, assuming all other variables remain constant.
$\widehat{\boldsymbol{\beta}}_{\boldsymbol{3}}$	If open unemployment rate increases by 1%, the poverty rate will increase by 0.2296808%, assuming all other variables remain constant.
$\widehat{\boldsymbol{\beta}}_{\boldsymbol{4}}$	If literacy rate increases by 1%, the poverty rate will decrease by 0.2495794%, assuming all other variables remain constant.

Coefficient of Determination

The conducted tests obtained an R-squared value of 28.568%. This R-squared value indicates the independent variables explain 28.568% of the variation in the poverty rate, while the explanation by other variables outside the scope of the study is 71.432%.

CONCLUSION

Based on the analysis results presented, the following conclusions as follows:

1. The poverty rate and its variables influencing it, such as access to clean water, the gini ratio, the unemployment rate, and the literacy rate, fluctuated across provinces in Indonesia from 2018 to 2023.
2. The regression equation estimation using the Random Effect Model approach can be stated as follows:
$$Y_{it} = 32.3479228 - 0.0174982X_{kit} + 9.2621172X_{kit} + 0.2296808X_{kit} - 0.2495794X_{kit}$$
3. Based on the estimation results, all independent variables influence the poverty rate, both simultaneously and partially.
4. The R-squared value of 28.568% indicates that the ability of the independent variables to explain the percentage of poverty is 28.568%. Indirectly, it can be assumed that government programs in the economy and education have contributed to poverty alleviation by optimizing access to clean water, the gini ratio, the open unemployment rate, and the literacy rate.

REFERENCE

[1] Wardhana, A. and Kharisma, B. 2019. Peran Pengeluaran Sektor Pendidikan dan Sektor Kesehatan Terhadap Kemiskinan di Indonesia. *Jurnal Ekonomi dan Bisnis Universitas Udayana*, **8**(12), 1343-1366.

[2] Pramesty, M. H. E., Ibrahim, C. A., Rahmawati, N., Amin, M. I. N. A, Hapsery, A., and Meimela, A., 2023, Pemodelan Kemiskinan di Indonesia dengan Metode Structural Equation Modelling-Partial Least Square (SEM-PLS). *Prosiding Seminar Nasional Hasil Riset dan Pengabdian*, **5**, 746-753.

[3] Badan Pusat Statistik. 2023. *Indikator Tujuan Pembangunan Berkelanjutan Indonesia 2023*. Indonesia: Badan Pusat Statistik.

[4] Murdiyana and Mulyana. 2017. Analisis Kebijakan Pengentasan Kemiskinan di Indonesia. *Jurnal Politik Pemerintahan*, **10**(1), 73–96.

[5] Ghozi, S. and Hermansyah, H. 2018. Analisis Regresi Data Panel Profitabilitas Bank Pembangunan Daerah (BPD) di Indonesia. *Jurnal Matematika*, **8**(1), 1–12.

[6] Yesi, D. and Juairiyah, O. 2021. Sebaran Tingkat Kemiskinan dan Tingkat Akses Air Bersih di Sumatera Selatan. *Dinamika Lingkungan Indonesia*, **8**(1), 11–16.

[7] Budiono, S. and Purba, J. T. 2022. Reducing Poverty Strategy Through Educational Participation, Clean, Water, and Sanitation in Indonesia. *Jurnal Ekonomi dan Bisnis*, **25**(1), 177–198.

[8] Endrawati, D., Nujum, S., and Selong, A. 2023. Pengaruh Pertumbuhan Ekonomi, Rasio Gini, dan Indeks Pembangunan Manusia Terhadap Tingkat Kemiskinan Indonesia 2017-2022. *Jurnal Pendidikan Tambusai*, **7**(3), 20144–20151.

[9] Sagala, R., Harlen, Utami, B. C. 2023. Pengaruh Pertumbuhan Ekonomi dan Tingkat Pengangguran Terbuka (TPT) Terhadap Kemiskinan di Kabupaten Pelalawan. *Jurnal Niara*, **15**(3), 514–524.

[10] Tarigan, M. and Silaban, D. F. 2024. Statistika Deskriptif. *Jintan: Jurnal Ilmu Keperawatan*, **4**(2), 187-195.

[11] Nandita, D. A., Alamsyah, L. B., Jati, E. P., and Widodo, E. 2019. Regresi Data Panel untuk Mengetahui Faktor-faktor yang Mempengaruhi PDRB di Provinsi DIY Tahun 2011-2015. *Indonesian Journal of Applied Statistics*, **2**(1), 42-52.

[12] Venosia, D., Suliyanto., Sediono., and Chamidah, N. 2022. Pemodelan Persentase Kepesertaan BPJS Non Penerima Bantuan Iuran dengan Pendekatan Regresi Data Panel. *Jurnal Ilmiah Teori dan Aplikasi Statistika*, **15**(1), 116–126.

[13] Firdaus, Y. A., Ngatini., and Wijaya, S. U. 2023. Pemodelan Regresi Data Panel Harga Beras di Wilayah Indonesia Bagian Barat. *Jurnal Ilmiah Teori dan Aplikasi Statistika*, **16**(2), 486–498.

[14] Rahmadeni, R. and Wulandari, N. 2017. Analisis Faktor-faktor yang Mempengaruhi Inflasi pada Kota Metropolitan di Indonesia dengan Menggunakan Analisis Regresi Data Panel. *Jurnal Sains Matematika dan Statistika*, **3**(2), 34–42.

[15] Indri, F. Z. and Putra, G. H. 2022. Pengaruh Ukuran Perusahaan dan Konsentrasi Pasar Terhadap Kualitas Laporan Keuangan pada Perusahaan Sektor Industri Barang Konsumsi yang Terdaftar di Bursa Efek Indonesia pada Tahun 2016-2020. *Jurnal Ilmu Manajemen Ekonomi dan Kewirausahaan*, **2**(2), 1-17.

[16] Khosropour, A. 2017. A Panel Data Analysis of The Relationship Between Corporate Social Responsibility and Earnings Management: Evidence from Iran. *Revista Quid*, 2423–2431.