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Macroeconomic Analysis of the Poverty Levels on Sumatra Island

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ABSTRACT

This research aims to determine the influence of the Open Unemployment Rate, Gini Ratio and Human Development Index (HDI) on the Poverty Level on Sumatra Island. Research data uses secondary data obtained from the official website of the Central Badan Pusat Statistik (BPS) and Provincial BPS in the form of quantitative data from 10 provinces on the island of Sumatra for the period 2010 - 2023. The research uses the Panel Data Regression Method with the Eviews 12 Student Lite version of the software program. The regression model chosen for this research is the Random Effect Model (REM). The results of data analysis show that the Open Unemployment Rate, Gini Ratio and Human Development Index simultaneously have a significant effect on the Poverty Level on Sumatra Island. Partially, the Open Unemployment Rate has a significant positive effect on the Poverty Rate. Likewise, the Human Development Index has a significant negative effect on Poverty Levels. On the other hand, the Gini Ratio does not have a significant negative effect on the level of poverty on the island of Sumatra during 2010 – 2023.

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INTRODUCTION

Sumatra is the sixth largest island in the world located in Indonesia, with an area of 473,481 km². The people who live on this island is approximately 59.98 million people (Badan Pusat Statistik, 2023a). This island is also called Percha Island, Andalas, or Suwarnadwipa (Sanskrit, meaning "golden island"). Sumatra Island is located in the western part of the Indonesian archipelago. To the north it is bordered by the Andaman Sea, to the east by the Malacca Strait, to the south by the Sunda Strait and to the west by the Indian Ocean. Sumatra Island is an island rich in agricultural products. Of the 5 rich provinces in Indonesia, 3 provinces are on the island of Sumatra, namely the provinces of Aceh, Riau and South Sumatra. The main products of the island of Sumatra are palm oil, tobacco, petroleum, tin, bauxite and coal and natural gas. Most of these agricultural products are processed by foreign companies. Some cities on the island of Sumatra are categorized as quite important commercial cities. Medan is the largest city on the island of Sumatra, known as the main commercial city on this island. Many large national companies have their headquarters in the city of Medan (Wikipedia, 2024).

The other side behind the abundant natural energy resources and the attractiveness of the Sumatra Island, is that it's not free from social problems caused by economic aspects, namely the problem of poverty levels which have always been a serious problem, even though they have struggled for decades to escape poverty, reality shows that until currently, Indonesia has not been able to free itself from the shackles of poverty. This issue of course doesn't escape the problems that must be faced by every province on the Sumatra Island, starting

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from the provinces of Aceh, North Sumatra, West Sumatra, Riau, Jambi, Bengkulu, South Sumatra, Lampung, Riau Islands and Bangka Belitung Islands.

According to Badan Pusat Statistik (2022), the number of poor people on Sumatra Island as of March 2022 is 5.737 million people. Of the 10 provinces on Sumatra Island, four provinces are included in the category of provinces with the highest percentage of poverty rates on the island of Sumatra according to (Badan Pusat Statistik, 2023b), namely: Aceh province 14.45%, Bengkulu province 14.04%, South Sumatra province 11 .78%, and Lampung province 11.11%.

The Central Statistics Agency in Kompas.com/Skola (2022) states that poverty is the inability to meet minimum standards for basic needs which include food and non-food needs. Poor people are people who are below a certain limit or what is known as the poverty line. The poverty line is the amount of rupiah that must be spent to meet life's needs, both minimum food and non-food minimum needs. A group of people is said to be below the poverty line if the group's income is not sufficient to meet basic needs such as food, clothing and shelter.

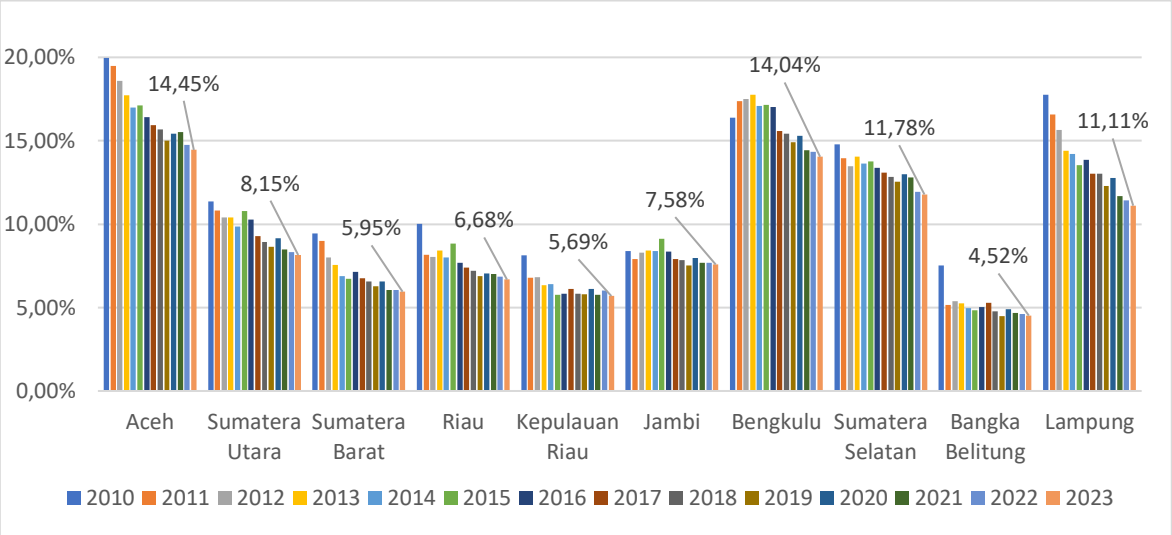

Figure-1. Percentage of Poverty Levels on Sumatra Island for the period 2010 – 2023
Source: Central Statistics Agency www.bps.go.id (Data processed)

Figure-1 above is an illustration of the percentage fluctuation in poverty levels on the Sumatra Island for the period 2010 - 2023. From this figure, it can be seen that Aceh province has the highest poverty rate percentage in 2023 at 14.45%. while Bangka Belitung Province has the lowest poverty rate, namely 4.52%.

The high and low levels of poverty in a region, region or country are caused by many factors and elements that influence it. Many previous studies have discussed the problem of poverty levels in a region and region, including: Anggraini et al. (2023) regarding The Influence of Economic Growth, HDI (Human Development Index) and Poverty on the Open Unemployment Rate in Jambi province during 2017-2021, Pasaribu et al. (2023) regarding The Study of Factors that Influence Poverty Levels in Seruyan Regency, Wicaksono & Hutajulu (2023) regarding Analysis of Factors that Influence Poverty in Indonesia, Permana & Pasaribu (2023) regarding The Effect of Inflation, Human Development Index, Provincial Minimum Wage and Gross Regional Domestic Product on Poverty on Sumatra Island, Karolinska et al. (2023) regarding The Influence of the Open Unemployment Rate and the Human Development Index (HDI) on Poverty in North Sumatra Province, Gunawan et al. (2022) regarding The Influence of Economic Growth, Poverty Levels and Regional Minimum Wages on the Human Development Index in Sumatra Island Province, Maulana & Desmawan (2023) Concerning the Analysis of Factors that Influence Poverty Levels on the Island of Java, Rahmadi & Parmadi (2019) About the Influence of Income Inequality and Poverty on Growth between Islands in Indonesia, and Hamzah (2022) Thesis on the Determinants of Poverty in 10 Provinces on the Island of Sumatra.

Related to the above, this research aims to analyze the influence of the variables Open Unemployment Rate, Gini Ratio and Human Development Index on the Poverty Level on Sumatra Island, which consists of 10 provinces during the period 2010 - 2023.

METHOD

This research uses secondary data from the official website of the Central Bureau of Statistics (BPS), BPS of each province and other sources in the form of journal articles and thesis journals. The secondary data used is panel data consisting of cross section data in the form of Open Unemployment Rate, Gini Ratio, Human Development Index and Poverty Rate data from 10 provinces on the Sumatra Island. The time series data is in the form of annual periodic data from 2010 to 2023 totaling 140 pieces of data.

The data analysis used in this research is quantitative data analysis to determine the effect of Open Unemployment Rate, Gini Ratio and HDI on Poverty Levels on the Sumatra Island, using the Eviews 12 Software Student Lite version. Next, data processing uses the Panel Data Regression Method. Panel Data Regression is a development of linear regression with the Ordinary Least Square (OLS) method which has specificities in terms of the type of data and the purpose of the data analysis (Riswan & Dunan, 2019).

The Panel Data regression equation is written as follows:

$$Yit = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + e_{it}$$

Which thing:

Y = Dependent Variable (Poverty Level)
X_1 = Independent variable (Open Unemployment Rate / TPT)
X_2 = Independent variable (Gini Ratio)
X_3 = Independent variable (Human Development Index / IPM)
α = Constant
i = i entity
t = t period
β = Regression coefficient (slope)
e = variables outside the model

The stages of using the Panel Data Regression Method are described as follows (Widarjono in Riswan & Dunan (2019)):

1. Panel Data Regression Model Estimation, consisting of:
   a. Common Effect Model (CEM), the simplest model combines cross section and time series data as a unit without looking at time and individual differences.
   b. Fixed Effect Model, models that estimate panel data use dummy variables to capture intercept differences. Based on differences in intercept between individuals but the intercept is the same over time. The assumption that the slope remains constant between individuals and over time is also used in this model.
   c. Random Effect Model (REM), a model that estimates panel data by accommodating interrelated disturbance variables over time and between individuals/populations. Differences between times and between individuals are accommodated through error.

2. Regression Data Model Selection Technique, in the form of:
   a. Test Chow, is a test to determine which FEM or CEM is most appropriate to use.
   b. Hausman Test, is a statistical test to select the most appropriate FEM or REM to use.
   c. Lagrange Multiplier (LM) Test, is a test to find out whether REM or CEM is better to use.

3. Classic Assumption Test, includes:
   a. Normality Test, aims to see the normality of the data using the Jarque-bera test. If a model residual is not normally distributed then the t-test becomes less relevant to use to test the regression coefficient.
   b. Multicollinearity Test, using the pairwise correlation method which aims to ensure that multicollinearity problems do not occur in the independent variables which have an impact on many independent variables which do not significantly affect the dependent variable but the coefficient of determination remains high.
   c. Heteroscedasticity test, using the breush-pagan method to see whether the residuals from the model formed have a constant variance or not. Heteroscedasticity problems cause the results of the t-test and F-test to be inaccurate.
   d. Autocorrelation Test, using the REM model with the Durbin-Watson method to see if there is no correlation between observations in one variable. The autocorrelation problem causes the OLS estimator not to produce a BLUE (Best Linear Unbias Estimator) estimator.

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4. Regression Model Feasibility Test (Goodness of Fit), is carried out to identify the regression model formed which is suitable or not suitable for explaining the influence of the independent variable on the dependent variable.
   a. Analysis of the Coefficient of Determination
   The coefficient of determination value describes how much variation in the dependent variable (Y) can be explained by the independent variable (X). This research uses Adjusted R-Squares (adjusted R2) considering the weakness of R2 which has an increasingly large value and never decreases due to the more independent variables included in the model.
   b. Hypothesis testing
   Aims to test the significance of the regression coefficients obtained. Hypothesis decision making is carried out by comparing t-statistics to t-tables, comparing probability values to specified significance levels and using Test Curves, with 2 types of testing:
   1. F-test: Used to test the regression coefficient (slope) hypothesis simultaneously (simultaneously) and ensure that the selected model is suitable for interpreting the influence of the independent variable on the dependent variable.
   2. T-test: Used to test partial (individual) regression coefficients.

5. Data Interpretation

Interpretation is carried out on the regression coefficients which include magnitude and sign. The magnitude shows the coefficient value in the regression equation and the sign explains the direction of the relationship which is positive (unidirectional influence) or negative (opposite influence).

Poverty

According to Suparlan in Khomsan et al. (2015), the definition of poverty is a low standard of living, namely the level of material deprivation among some or groups of people compared to the general standard of living among the population. This low standard of living will have an impact on the level of health, moral life and sense of self-esteem of those who are categorized as poor people.

Chambers in Nasikum states, Poverty is divided into 4 forms, namely: 1) Absolute poverty: if the income is below the poverty line or is not adequate to meet minimum living needs or basic needs including food, clothing, shelter, health and education needed to be able to afford live and work. 2) Relative Poverty: a condition of poverty due to the influence of development policies that have not reached the entire population, resulting in inequality in income or it could be said that the person is actually living above the poverty line but is still below the means of the surrounding community. 3) Cultural Poverty: refers to behavioral problems of a person or group of people which are caused by cultural aspects, such as not wanting to try to improve their standard of living, being lazy, being wasteful, not being creative even though there is support from outside parties. 4) Structural Poverty: a poor atmosphere resulting from low access to energy sources that occurs in a socio-cultural and socio-political system that doesn't support the liberation of poverty, always giving rise to the proliferation of poverty (Khomsan et al., 2015).

Open Unemployment Rate (TPT)

According to Badan Pusat Statistik (BPS), in terms of employment indicators, unemployment is people aged 15 years and over who are not working but are looking for work or are preparing for a new business or people who aren't looking for work because they have been accepted for work but haven't yet started working. The definition of the Open Unemployment Rate is the percentage of the population who are looking for work, who are preparing for business, who aren't looking for work, because they feel it is impossible to get a job, who already have a job but haven't yet started working from several of the available workforce.

Dharmayanti in Hamzah (2022) states that the Open Unemployment Rate indicates the working age population who are classified as unemployed. The percentage of the number of unemployed to the total workforce is the result of measuring the job unemployment rate. The level of open unemployment in a region can be measured by the percentage division of the number of unemployed by the number of the workforce and expressed in percent.

$$\text{Open Unemployyment Rate} = \frac{\text{Unemployment Number}}{\text{Number of Workforce}} \times 100\%$$

Open unemployment is a workforce that truly doesn't have a job. Due to not having found a job even though you have tried your best or being lazy about looking for a job or being lazy about working, this is the cause of unemployment.

Gini Ratio

The Gini Ratio or Gini Index or Gini Coefficient is an indicator measuring the distribution of income in a population which was developed by the Italian statistician Corrado Gini in 1912. This indicator is always used as a measure of economic inequality, measuring the distribution of income or, more rarely, the distribution of wealth in a population. The coefficient is between zero (0%) to one (100%), with 0 representing perfect equality and 1 representing perfect inequality. In theory, values greater than 1 are possible due to negative income or wealth. If every resident of a country earned the same income, it would have an income Gini coefficient of 0. On the other hand, if a country only has one resident who gets all the income, while the others get no income at all, it will have an income Gini coefficient of 1 (Hayes et al., 2024).

According to Alesina and Rodrik in Rahmadi & Parmadi (2019), People's purchasing power for goods or services will decrease due to income inequality. Economic activities to produce output will be hampered due to low people's purchasing power. As a result, economic growth in a region is also hampered due to delays in increasing output. The output production (goods and services) produced is limited, causing the jobs that can be created and the wages (income) received to be limited as well. Limited employment opportunities mean that people will not earn income which will ultimately lead to poverty.

Human Development Index (HDI)

The Human Development Index (HDI) measures achieving human development based on a number of basic components of quality of life. There are 3 basic dimensional approaches that build HDI as a measure of quality of life, namely: including long and healthy life, knowledge, and a decent life. Life expectancy at birth is used to measure the health dimension. The combined indicators of literacy rate and average years of schooling are used to measure the dimensions of knowledge. Next, to measure the dimensions of a decent life, we use indicators of people's purchasing power for a number of basic needs which are seen from the average amount of expenditure per capita as an income approach which represents development achievements for a decent life (BPS Kabupaten Tanjung Jabung Timur, 2024).

Human development measurement was first introduced by the UNDP (United Nations Development Program) in 1990. A new idea in measuring human development introduced by the UNDP is called the Human Development Index (HDI). Since that time, the Human Development Report (HDR) has published the HDI regularly in annual reports. According to UNDP, the Human Development Index (HDI) measures human development achievements based on a number of basic components of quality of life. The Human Development Index (HDI) is a simple composite index that explains how residents of an area can access development results in obtaining income, health, education and so on. As a single and simple measuring tool, HDI is very suitable to be used as a tool for measuring quality of life and development performance, especially human development carried out in a region at a certain time or more specifically, HDI is a performance measuring tool for the government of a region. To see HDI achievements between regions, it can be seen by grouping HDI into several categories, namely: HDI < 60 = low HDI; 60 < HDI < 70 = moderate HDI; 70 < HDI < 80 = high HDI; HDI > 80 = very high HDI (Statistik & Neraca Wilayah, 2018).

Lanjouw, P, et al (2001) stated that a high HDI value accompanied by an increase in the number of poor people is a phenomenon that is not in accordance with the opinion of experts, who state that a high HDI will result in a reduction in poverty. Low HDI will result in an increase in poverty and reduced population productivity (Maulana et al., 2022).

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RESULTS

A. Estimation of Panel Data Regression Models

Dependent Variable: TKT_KEMISKINAN
Method: Panel Least Squares
Date: 02/14/24 Time: 00:24
Sample: 2010 2023
Periods included: 14
Cross-sections included: 10
Total panel (balanced) observations: 140

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.23368	9.377615	5.036855	0.0000
TPT	0.180829	0.186638	0.968871	0.3343
GINI_RASIO	30.53683	10.14298	3.010636	0.0031
IPM	-0.684920	0.115439	-5.933194	0.0000

R-squared	0.294279	Mean dependent var	10.33986
Adjusted R-squared	0.278711	S.D. dependent var	4.153518
S.E. of regression	3.527530	Akaike info criterion	5.387228
Sum squared resid	1692.311	Schwarz criterion	5.471275
Log likelihood	-373.1060	Hannan-Quinn criter.	5.421382
F-statistic	18.90354	Durbin-Watson stat	0.058003
Prob(F-statistic)	0.000000		

Figure-2. Common Effect Model (CEM)

Dependent Variable: TKT_KEMISKINAN
Method: Panel Least Squares
Date: 02/14/24 Time: 14:03
Sample: 2010 2023
Periods included: 14
Cross-sections included: 10
Total panel (balanced) observations: 140

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	40.57620	3.198919	12.68435	0.0000
TPT	0.183088	0.056067	3.265526	0.0014
GINI_RASIO	-2.935769	3.072895	-0.955375	0.3412
IPM	-0.432206	0.033488	-12.90645	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.979400	Mean dependent var	10.33986
Adjusted R-squared	0.977454	S.D. dependent var	4.153518
S.E. of regression	0.623664	Akaike info criterion	1.981849
Sum squared resid	49.39752	Schwarz criterion	2.255002
Log likelihood	-125.7294	Hannan-Quinn criter.	2.092850
F-statistic	503.1815	Durbin-Watson stat	0.791583
Prob(F-statistic)	0.000000		

Figure-3. Fixed Effect Model (FEM)

Dependent Variable: LOG(TKT_KEMISKINAN)
Method: Panel EGLS (Cross-section random effects)
Date: 02/14/24 Time: 15:03
Sample: 2010 2023
Periods included: 14
Cross-sections included: 10
Total panel (balanced) observations: 140
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.07796	0.892566	15.77246	0.0000
LOG(TPT)	0.063908	0.031507	2.028350	0.0445
LOG(GINI_RASIO)	-0.033019	0.095923	-0.344224	0.7312
LOG(IPM)	-2.816605	0.217220	-12.96660	0.0000

Effects Specification

	S.D.	Rho
Cross-section random	0.301146	0.9643
Idiosyncratic random	0.057904	0.0357

Weighted Statistics

R-squared	0.693803	Mean dependent var	0.115693
Adjusted R-squared	0.687049	S.D. dependent var	0.105603
S.E. of regression	0.059076	Sum squared resid	0.474640
F-statistic	102.7195	Durbin-Watson stat	0.972766
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.185541	Mean dependent var	2.254296
Sum squared resid	18.94718	Durbin-Watson stat	0.024368

Figure-4. Random Effect Model (REM)

B. Selection of the Best Regression Mode

Table-1. Criteria and Hypotheses for Selection of Regression Data Models

No.	Test Type	Criteria	Hypotheses
1.	Test Chow	Prob. > 0,05	Ho = CEM is more appropriate to use
		Prob. < 0,05	Ha = FEM is more appropriate to use
2.	Hausman Test	Prob. > 0,05	Ho = REM is more appropriate to use
		Prob. < 0,05	Ha = FEM is more appropriate to use
3.	Lagrange Multiplier (LM) Test	Prob. > 0,05	Ho = CEM is more appropriate to use
		Prob. < 0,05	Ha = REM is more appropriate to use

1.Test Chow

Redundant Fixed Effects Tests
Equation: MODEL_FEM
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	469.321948	(9,127)	0.0000
Cross-section Chi-square	494.753048	9	0.0000

Figure-5. Chow Test Results

Based on the Chow Test output results, the cross-section probability value F = 0.0000 < significance level (α) 0.05 is obtained, so Ha is accepted and Ho is rejected. The decision is that the **FEM** is more appropriate to use than the CEM.

2.Hausman Test

Correlated Random Effects - Hausman Test
Equation: MODEL_REM
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.166765	3	0.1038

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
TPT	0.183088	0.182455	0.000023	0.8950
GINI_RASIO	-2.935769	-2.771189	0.062688	0.5110
IPM	-0.432206	-0.432818	0.000009	0.8355

Figure-6. Hausman Test Results

Based on the Hausman Test Output Results, the Probability Value (Chi-Squares-Statistics) = 0.1038 > Significance level (α) 0.05, then Ho is Accepted and Ha is Rejected. The decision is that the **REM** is more appropriate to use than the FEM.

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3.Lagrange Multiplier (LM) Test

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	676.2988 (0.0000)	0.212945 (0.6445)	676.5117 (0.0000)
Honda	26.00575 (0.0000)	-0.461460 (0.6778)	18.06254 (0.0000)
King-Wu	26.00575 (0.0000)	-0.461460 (0.6778)	19.69562 (0.0000)
Standardized Honda	30.97652 (0.0000)	-0.159744 (0.5635)	17.16307 (0.0000)
Standardized King-Wu	30.97652 (0.0000)	-0.159744 (0.5635)	19.25387 (0.0000)
Gourieroux, et al.	--	--	676.2988 (0.0000)

Figure-7. LM Test Results

Based on the output results of the Lagrange Multiplier Test, the Breush Pagan Probability Value (Both) = 0.0000 < significance level (α) 0.05, then Ha is accepted and Ho is rejected. The decision is that the **REM** is more appropriate to use than the CEM.

Referring to the 3 Test Models analyzed, the Selected (Best) Model is **The REM (Random Effect Model)**

Election Basis: Test Chow : Selected **FEM**
Hausman Test : Selected **REM**
LM Test : Selected **REM**

C. Classic Assumption Test

1.Normality Test

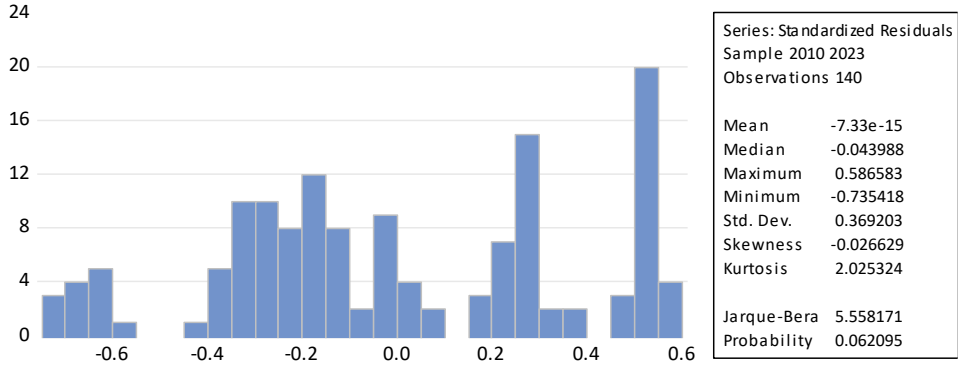

Figure-8. Normality Test Results after Data Transformation

Table-2. Hypothesis and Normality Test Criteria

	Hypothesis	Criteria	Decision
Ho =	Residual Data is normally distributed	Jarque-Berra Probability Values > Level of significance (α) 5% atau 0,05	Ho Accepted
Ha =	Residual data is not normally distributed	Jarque-Berra Probability Values < Level of significance (α) 5% atau 0,05	Ha Accepted

Based on the Normality Test Results, the Jarque-Berra Probability Value is 0.062095 > Significance Level (α) of 5% or 0.05 so that Ho is Accepted.

Decision: Residual Data in the Regression Model is Normally Distributed.

2.Multicollinearity Test

	TPT	GINI_RASIO	IPM
TPT	1.000000	0.054948	0.149004
GINI_R...	0.054948	1.000000	-0.237377
IPM	0.149004	-0.237377	1.000000

Figure-9. Multicollinearity Test Results

Table-3. Hypothesis and Multicollinearity Test Criteria

	Hypothesis	Criteria	Decision
Ho =	There is no multicollinearity between independent variables in the regression model	Correlation value between independent variables < 0,85	Ho Accepted
Ha =	Multicollinearity occurs between independent variables in the regression model	Correlation value between independent variables > 0,85	Ha Accepted

Based on the Multicollinearity Test Results, the results obtained are in the form of Correlation Values between independent variables each < 0.85 so that Ho is Accepted.

Decision: There is no multicollinearity problem between independent variables in the Regression Model.

3.Heteroscedasticity Test

Dependent Variable: RESABS
Method: Panel EGLS (Cross-section random effects)
Date: 02/15/24 Time: 00:54
Sample: 2010 2023
Periods included: 14
Cross-sections included: 10
Total panel (balanced) observations: 140
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.378520	0.293198	1.291007	0.1989
TPT	-0.004536	0.005022	-0.903143	0.3680
GINI_RASIO	-0.277770	0.275454	-1.008410	0.3150
IPM	0.000789	0.002998	0.263148	0.7928

Effects Specification	S.D.	Rho
Cross-section random	0.204871	0.9298
Idiosyncratic random	0.056305	0.0702

Figure-10. Heteroscedasticity Test Results

Table-4. Hypothesis and Heteroscedasticity Test Criteria

	Hypothesis	Criteria – Model Glejser	Decision
Ho =	There is no heteroscedasticity problem in the regression model	Prob. t-statistic value for each independent variable > Significance Level (α) 0,05	Ho Accepted
Ha =	There is a heteroscedasticity problem in the regression model	Prob. t-statistic value for each independent variable < Significance Level (α) 0,05	Ha Accepted

Based on the results of the heteroscedasticity test, the probability value for each independent variable is > significance level (α) 5% or 0.05 so that Ho is accepted.

Decision: There is no Heteroscedasticity problem in the Regression Model

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4.Autocorrelation Test

Dependent Variable: LOG(TKT_KEMISKINAN)
Method: Panel EGLS (Cross-section random effects)
Date: 02/14/24 Time: 19:35
Sample: 2010 2023
Periods included: 14
Cross-sections included: 10
Total panel (balanced) observations: 140
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.07796	0.892566	15.77246	0.0000
LOG(TPT)	0.063908	0.031507	2.028350	0.0445
LOG(GINI_RASIO)	-0.033019	0.095923	-0.344224	0.7312
LOG(IPM)	-2.816605	0.217220	-12.96660	0.0000

Effects Specification	S.D.	Rho
Cross-section random	0.301146	0.9643
Idiosyncratic random	0.057904	0.0357

Weighted Statistics

R-squared	0.693803	Mean dependent var	0.115693
Adjusted R-squared	0.687049	S.D. dependent var	0.105603
S.E. of regression	0.059076	Sum squared resid	0.474640
F-statistic	102.7195	Durbin-Watson stat	0.972766
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.185541	Mean dependent var	2.254296
Sum squared resid	18.94718	Durbin-Watson stat	0.024368

Figure-11. Autocorrelation Test Results (REM Model)

Table-5. Hypothesis and Autocorrelation Test Criteria

Hypothesis	Criteria – Durbin-Watson Model	Decision
Ho = Autocorrelation doesn't occur in the regression model	dU < DW < 4 – dU	Ho Accepted
Ha = Autocorrelation occurs in the regression model	DW < dL or DW > 4 – dL	Ha Accepted
There are no certainties or definite conclusions	dL < DW < dU or 4 – dU < DW < 4 – dL	-
Ho = Autocorrelation doesn't occur in the regression model	DW value between -2 and +2 (-2 < DW < +2)	Ho Accepted

To find out the dU and dL values, you must look at the Durbin-Watson Table (Junaidi, n.d.).
Based on the DW table, it is known: dL value = 1.6804 and dU value = 1.7678

Based on the Autocorrelation Test Results, the Durbin-Watson Statistics Results were 0.972766. If this DW value is included in the 3 Autocorrelation Test decision criteria, none of them meet the requirements.

The decision was taken using alternative criteria, namely the DW value between -2 and +2, so that the Durbin Watson test result was -2 < 0.972766 < 2, with the decision that there was no autocorrelation problem.

D. Model Feasibility Test

The Model Feasibility Test is carried out to identify the regression model that is formed as Feasible or Not Feasible to explain the influence of the independent variable on the dependent variable (Riswan & Dunan, 2019)

1.Analysis of the Coefficient of Determination

Based on the REM Model Regression Results, in the Weighted Statistics column the value of the coefficient of determination (Adjusted R-Squared) for the regression model is 0.687049.

It can be concluded that the contribution of the influence of TPT (Open Unemployment Rate), Gini Ratio and IPM (Human Development Index) together on variations in changes/rises and falls in Poverty Levels is 68.70%, while the remaining is 31.3% caused by other factors not included in this research.

2.Test the Research Hypothesis (F-Test and t-Test)

a.F-Test (Simultaneous Significance Test of Regression Coefficients)

1. Research Hypothesis

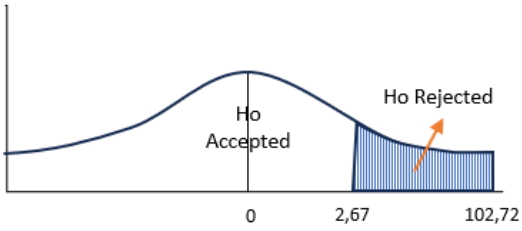
Table-6. Hypothesis and F-Test Criteria

Hypothesis	F-Test Results Criteria	Decision
Ho → β1 = β2 = β3 = 0 ; TPT, Gini Ratio and HDI simultaneously do not have a significant effect on poverty levels	F-Calculated Value < F-Table Value or Prob. Value (F-Statistic) > (α) 0,05	Ho Accepted
Ha → β1 ≠ β2 ≠ β3 ≠ 0 ; TPT, Gini Ratio and HDI simultaneously have a significant effect on Poverty Levels	F-Calculated Value > F-Table Value or Prob. Value (F-Statistic) < (α) 0,05	Ha Accepted

2. Compare the F-calculated value with the F-table Value
   Based on the regression results of the REM Model, the F statistical value (F-Calculated) of the Regression Model is obtained at 102.7195. Meanwhile, the F-Table is searched in the F-Statistics Table based on the criteria (α) = 0.05; df1 (total variable -1) = 4 - 1 = 3 and df2 (n – k – 1) = 140 – 3 – 1 = 136, obtained an F-Table value of 2.6712. (See F-Table or search using MS-Excell with the formula =FINV(5%,3,136).
   Test Results and F-Test Decisions:
   F-Calculated value = 102.7195 > F-Table value = 2.6712

   Based on the F-Test Criteria, Ha is Accepted and Ho is Rejected. It can be concluded that TPT, Gini Ratio and HDI together have a significant effect on poverty levels.
3. Comparing the F-Statistic Probability Value with the Significance Level (α)
   • Based on the REM Model regression results in the Prob column. (F-Statistic) obtained a value of 0.000000, with a significance level (α) set at 5% or 0.05.
   • The results of the comparison show that the Prob Value (F-statistic) = 0.000000 < 0.05 so that based on the criteria it can be concluded that the TPT, Gini Ratio and HDI together have a significant effect on the Poverty Level.

4. F-Test Curve



In Figure-12, it can be seen that F Calculation (F-Statistic) = 102.72 is in the Ho Rejected area, so it can be concluded that TPT, Gini Ratio and HDI together have a significant effect on the Poverty Level. In other words, the regression model is significant as a prediction tool.

Figure-12. F-Test Curve

b.t-test (Partial Significance Test of Regression Coefficients)

1. Research Hypothesis

Table-7. Hypothesis and t-test Criteria

Hypothesis	Criteria t-test results	Decision
Ho_1 → β1 = 0 ; TPT doesn't have a significant effect on poverty levels	t calculated value < t table values, or -t calculated value > -t table values, or Probability value > (α) 0,05	Ho_1 Accepted
Ha_1 → β1 ≠ 0 ; TPT has a significant effect on poverty levels	t calculated value > t table values, or -t calculated value < -t table values, or Probability value < (α) 0,05	Ha_1 Accepted
Ho_2 → β2 = 0 ; Gini Ratio doesn't have a significant effect on poverty levels	t calculated value < t table values, or -t calculated value > -t table values, or Probability value > (α) 0,05	Ho_2 Accepted
Ha_2 → β2 ≠ 0 ; Gini Ratio has a significant effect on poverty levels	t calculated value > t table values, or -t calculated value < -t table values, or Probability value < (α) 0,05	Ha_2 Accepted
Ho_3 → β3 ≠ 0 ; IPM doesn't have a significant effect on poverty levels	t calculated value < t table values, or -t calculated value > -t table values, or Probability value > (α) 0,05	Ho_3 Accepted

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Ha_3 →	$\beta 3 \neq 0$; IPM has a significant effect on poverty levels	t calculated value > t table values, or -t calculated value < -t table values, or Probability value < (α) 0,05	Ha_3 Accepted

2. Compare the t-calculated value with the t-table

   Based on the REM Model Regression Results in the t-statistic column, the t-calculated value of the TPT variable is 2.028350, the t-calculated value of the Gini Ratio variable is -0.344224 and the t-calculated value of the HDI variable is -12.96660. Next, the t-table value in the t-statistics table is based on the criteria: (α) = 0.05 and df (n – k – 1) = 140 – 3 – 1 = 136, the t-table value is 1.9776.

   The t-table value can be seen in the t-table or searched using MS-Excell with the formula =TINV(5%,136).

   Testing Results and t-Test Decisions:

   a. The influence of TPT on poverty levels

      The t-calculated value is 2.02835 > t-table 1.9776. Based on the t-test decision criteria, Ha1 is accepted and Ho1 is rejected. It can be concluded that TPT (Open Unemployment Rate) has a positive effect on Poverty Levels.

   b. The influence of Gini Ratio on poverty levels

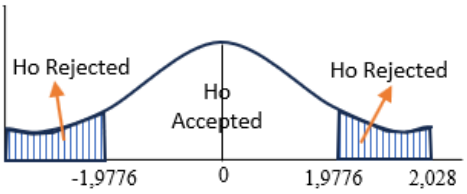
      Negative t-value (-0.344224) > negative t-table (-1.9776). Based on the t-test decision criteria, Ho2 is accepted and Ha2 is rejected. It can be concluded that the Gini Ratio has no negative effect on the Poverty Level.

   c. The Influence of IPM on Poverty Levels

      Negative t-value (-12.9666) < negative t-table (-1.9776). Based on the t-test decision criteria, Ha3 is accepted and Ho3 is rejected. It can be concluded that the HDI (Human Development Index) has a negative effect on the Poverty Level.

3. Comparing t-Statistic Probability Values with Significance Level (α)
   - Probability t-statistic results for the TPT variable obtained Prob Value. (0.0445) < α (0.05). So based on the decision criteria it can be concluded that the TPT (Open Unemployment Rate) has a significant effect on the Poverty Level. In other words, the TPT regression coefficient (Slope) has proven to have a significant influence in predicting poverty levels.
   - Probability t-statistic results for the Gini Ratio variable obtained Prob Value. (0.7312) > α (0.05). So based on the decision criteria it can be concluded that the Gini Ratio has no significant effect on the Poverty Level. In other words, the Gini Ratio regression coefficient (Slope) has proven to have no significant effect in predicting poverty levels.
   - Probability t-statistic results for the HDI variable obtained Prob Value. (0.0000) < α (0.05). So based on the decision criteria it can be concluded that the HDI (Human Development Index) has a significant effect on the level of poverty. In other words, the HDI regression coefficient (Slope) has proven to have a significant influence in predicting poverty levels.
4. t-test Curve

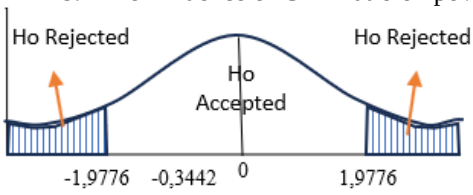
   a. The influence of TPT on poverty levels



In figure-13, it can be seen that the t-Calculation Value (2,028) is in the Ho Rejected area (on the right side), so it is concluded that TPT has a significant positive influence on the Poverty Level.

Figure-13. Test Curve of the Effect of TPT on Poverty Levels

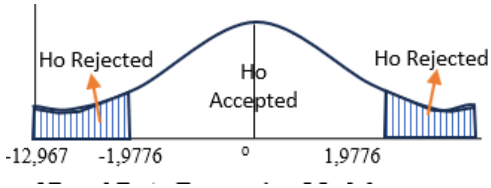
   b. The influence of Gini Ratio on poverty levels



In figure-14, it can be seen that the t-Calculation Value (-0.344224) is in the Ho Accepted area (on the left side), so it can be concluded that the Gini Ratio does not have a significant negative influence on the Poverty Level.

Figure-14. Test Curve of the Gini Ratio on Poverty Levels

c. The influence of HDI on the level of poverty



In figure-15 it can be seen that the t-Calculation Value (-12,967) is in the Rejected Ho area (on the left side), so it can be concluded that the CPI has a significant negative influence on the Poverty Level.

Figure-15. Test Curve of HDI on Poverty Levels

1.Formation of Panel Data Regression Model

Panel Data Regression Model:
$\mathbf{Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3}$
Poverty Level = 14,078 + 0,064TPT – 0,033Gini_Ratio – 2,817IPM

2.Model Interpretation

a. The Constant Coefficient (α) value is positive 14.078, meaning: If the TPT (X1), Gini Ratio (X2) and HDI (X3) are 0 (zero), then the average Poverty Level (Y) = 14.078% (Note: The average size of the Poverty Level remains because it comes from the influence of other variables which also influence the Poverty Level, but are not included in the Regression Model).).
b. The TPT Variable Regression Coefficient (β1) is 0.064 (positive value) meaning: There is a direct relationship between the Independent variable (TPT) and the Dependent Variable (Poverty Level). So, if TPT (X1) increases by 1% then the average Poverty Level (Y) will increase by 0.064% assuming the Gini Ratio Value (X2) and HDI Value (X3) remain/constant.
c. The Regression Coefficient for the Gini Ratio Variable (β2) is -0.033 (negative value) meaning: There is a unidirectional relationship between the Independent variable (Gini Ratio) and the Dependent Variable (Poverty Level). So, if the Gini Ratio (X2) increases by 1% then the average Poverty Level (Y) will decrease by 0.033% assuming the TPT Value (X1) and HDI Value (X3) remain/constant.
d. The Regression Coefficient for the HDI Variable (β3) is -2.817 (negative value) meaning: There is a unidirectional relationship between the Independent variable (HDI) and the Dependent Variable (Poverty Level). So, if the HDI (X3) increases by 1% then the average Poverty Level (Y) will decrease by 2.817% assuming the TPT Value (X1) and Gini Ratio Value (X2) remain constant.

CONCLUSION

Based on research results regarding the influence of macroeconomics on poverty levels on Sumatra Island, the following conclusions were drawn:

1. The Open Unemployment Rate (TPT), Gini Ratio and Human Development Index (HDI) simultaneously have a significant effect on the Poverty Level on Sumatra Island during 2010 - 2023.
2. TPT (Open Unemployment Rate) has a significant positive effect on the Poverty Rate on Sumatra Island during 2010 - 2023, and there is a direct relationship between TPT and the Poverty Level. So, if TPT can be reduced by 1%, the average poverty level will decrease by 0.064%.
3. HDI (Human Development Index) has a significant negative effect on poverty levels on Sumatra Island during 2010 - 2023, and there is a unidirectional relationship between HDI and the Poverty Level. So, if the HDI is increased by 1%, the average Poverty Level (Y) will decrease by 2.817%.
4. On the other hand, the Gini Ratio does not have a significant negative effect on the Poverty Level on Sumatra Island during 2010 - 2023, and there is a unidirectional relationship between the Gini Ratio and the Poverty Level. So, if the Gini Ratio increases by 1%, the average poverty rate will only decrease by 0.033%.

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