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IMPLEMENTATION OF THE SEM-PLS APPROACH TO ANALYZE THE IMPACT OF SOCIAL AID AND APBD ON POVERTY IN THE BOJONEGORO DISTRICT

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ABSTRACT

Poverty is the socio-economic condition of individuals or groups whose fundamental rights to maintain and develop a decent life are unmet. The poverty rate in Bojonegoro was 12.21% in 2022. In order to solve this problem, a poverty model is needed to serve as a reference for the further development of Bojonegoro district. This study aimed to determine the impact of social aid and APBD on poverty in Bojonegoro district. The methodology used in this study is his SEM-PLS quantitative research modeling of poverty using the WarpPLS application. The data sources for this study are the following secondary data in the form of Bojonegoro District Poverty Data, Area Appropriations Budget (APBD), and Social Aid (Bansos) from 2019 to 2022. Survey data were accessed online through the official website. Information from the Central Bureau of Statistics (BPS) and Satu Data Bojonegoro website. The results of this study show that SEM-PLS was applied correctly, and satisfactory results were obtained in terms of overall fit size, measured fit size, and structural fit size. The analysis results show that the variable APBD significantly impacts poverty with a proportion of -0.91. It means that the higher the realization of APBD, the lower the existing poverty rate. Social Aid variables up to -0.09 do not significantly impact poverty. It means that the amount of social benefits you receive does not affect poverty. The conclusion is that the factors that influence poverty in Bojonegoro district are its APBD variables.

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1. INTRODUCTION

Poverty is a social problem worldwide, so poverty is a humanitarian problem that can hinder the welfare of society [1]. Poverty is the state of being below the threshold line of minimum requirements for both food and non-food items, also known as the poverty line or the poverty threshold [2]. According to Indonesian Law No. 24 of 2004, poverty refers to the socio-economic condition of individuals or groups in which their fundamental rights to maintain and develop a decent life are not fulfilled [3]. One way to alleviate poverty is by providing Social Aid to people with a low economy or below the GK (poverty line). Social Aid is an aid in the form of money or goods given to people with a low economy [4].

Social aid is the provision of ongoing, non-selective support in the form of money or goods to a community, with the aim of improving welfare [5]. Community welfare is not only a matter of material; sometimes it can be seen from the results of changes created by the village or district government, which can be seen from the implementation of the Regional Budget (APBD). APBD is a government work plan that reflects local revenue and expenditure resources to finance local activities and projects within one year and is usually expressed quantitatively in monetary units [6]. The APBD describes the calculation of the estimated and actual expenditure of regional income in financing regional programs and activities in one budget [7].

Indonesia is one of the developing countries faced with the problem of poverty that cannot be ignored. The number of people living in poverty yearly does not decrease. The increase in the poverty rate is closely related to inflation; in this case, the Indonesian economy in 2022 faced inflationary pressures from an increase in global commodity prices, especially energy and food, causing the poverty rate to rise slightly but successfully restrained [8]. Indonesia's poverty rate was 9.57% as of September 2022, or 26.36 million people were below the poverty line. This poverty rate slightly increased to 9.54% as of March 2022 but was lower than the poverty rate of 9.71% in September 2021 [9]. In Bojonegoro District, several programs were carried out to reduce the poverty rate, resulting in Bojonegoro being ranked 7th as the district with the most significant percentage of extreme poverty reduction in East Java [10]. The poverty rate in Bojonegoro was 12.21% in 2022, which is a decrease of 1.06% from 13.27% in 2021 [11]. In order to solve this problem, poverty modeling is needed to serve as a reference for the further development of Bojonegoro district in the future. Problem poverty in the District Bojonegoro still occurs, especially in regions with difficult access to reach [12]. Even some types of Social Aid provided in Bojonegoro district still need to be evenly distributed in each sub-district each year [13].

Poverty is an issue that requires immediate attention, prompting many researchers to explore related case studies. One such study investigates whether social assistance (Bansos) and capital expenditure influence poverty levels in the regions of South Sumatra Province [14]. In another study, the impact of population and human development index on poverty rates needs to be analyzed in East Java Province [15]. In another approach, the Autoregressive Moving Average (ARIMA) method was used for a poverty prediction information system [16]. The SEM (Structural Equation Modeling) method has been widely used in previous studies, such as in the analysis of poverty structure in Central Java province in 2017 [17]. This SEM method can also investigate student acceptance of Microsoft Teams learning [18]. In addition, SEM can also be used to address the clustering of household poverty in Indonesia in 2017 [19].

This research states that the SEM analysis method has many advantages. Namely, it allows testing of complex models, can check simultaneous hypotheses (together), can take into account the joint effect between variables accurately, take into account measurement error in the analysis so that it can produce more accurate estimates, allows testing models with longitudinal data (data taken over time, can examine mediation and moderation models [20]. From these advantages, SEM is a flexible method, can be used in various fields of science, and can help researchers examine the relationship between variables more accurately and efficiently [21].

In this study, poverty modeling was used with the SEM-PLS approach using WarpPLS software. The novelty of this research is that it analyzes Social Aid and APBD to determine the effect on poverty in Bojonegoro District. The SEM-PLS method has been widely used by previous researchers, such as to get poverty modeling in Papua Province [22]. In addition, SEM-PLS can also be used to analyze the dimension of poverty in Indonesia [23]. The case studies above show that SEM-PLS can be used to examine the relationship between constructs in a model to answer complex questions such as the factors that influence poverty.

This research is fundamental to providing knowledge related to poverty modeling that can help the government evaluate the effectiveness of Social Aid programs and APBD management in overcoming poverty problems. This study aimed to determine the impact of social aid and APBD on poverty in Bojonegoro district. This research is helpful for the government and related agencies. It is expected to provide a reference for the government to determine policies related to Social Aid, Area Appropriation Budget (APBD), and Poverty, especially those in The Bojonegoro District. To overcome the alarming poverty problem in Bojonegoro District, this research is fundamental to provide knowledge related to poverty modeling that can assist the government in evaluating the effectiveness of Social Aid programs and APBD management in overcoming poverty problems. From the explanation above, the research title "Implementation of the SEM-PLS Approach to Analyze the Impact of Social Aid and APBD on Poverty in The Bojonegoro District" will be proposed, which is expected to be used as a reference for the government to advance The Bojonegoro District better.

2. RESEARCH METHODS

2.1 Research Design

The research design is quantitative research in the form of causality research with the SEM-PLS approach. The application of SEM-PLS is carried out with the help of WarpPLS software. This study aims to analyze the effect of the Area Appropriations Budget (APBD) and Social Aid (Bansos) on Poverty. SEM-PLS performance to achieve goodness-of-fit is measured by three measures of fit, namely measurement model fit, structural model fit, and overall fit visualized in the WarpPLS software output. Structural Equation Modeling (SEM) is a statistical technique used to analyze complex relationships between latent and observed variables. PLS-SEM, specifically, focuses on maximizing variance explained in dependent variables and is useful for small sample sizes and non-normal data. In your study, SEM-PLS can assess the effects of the Area Appropriations Budget (APBD) and Social Aid (Bansos) on Poverty, using WarpPLS to evaluate measurement, structural, and overall model fit.

2.2 Data Source

The data sources for this study are the following secondary data in the form of Bojonegoro District Poverty Data, Area Appropriations Budget (APBD), and Social Aid (Bansos) from 2019 to 2022. Survey data were accessed online through the official website. Information from Badan Pusat Statistik (Central Statistics Agency of Indonesia) and Satu Data Bojonegoro website.

2.3 Research Variables

In this study, the research variables used are divided into 2, namely endogenous and exogenous variables. The research variables used in this study are shown in **Table 1** below:

Table 1. Descriptive Statistics of Poverty Data

Variable	Construct	Indicator	Measurement Scale
Endogenous	Poverty	Percentage of poor people (PPM)	Ratio
		Poverty depth index (IKK_1)	Ratio
		Poverty severity index (IKK_2)	Ratio
Exogenous	Social Aid (BANSOS)	Orphan Aid (BAY)	Ratio
		Aid for Displaced Elderly (BALUT)	Ratio
		Regional Non-Cash Food Aid (BPNT-D)	Ratio
		Central Non-Cash Food Aid (BPNT-P)	Ratio
		Social Aid for EKS People with Mental Disorders (BSODGJ)	Ratio
		Productive Disability Social Aid (Tata Boga) (BSTB)	Ratio
		Social Aid for Victims of Violence (BSKTK)	Ratio
		Social Aid for Wheelchairs (BSKR)	Ratio
		Social Aid for Chronically Ill People (BSOSK)	Ratio
		Social Aid for Persons with Severe Disabilities (BSPCB)	Ratio
		Social Aid for EUP for Families of Neglected Children (BSKAT)	Ratio
		Productive Economic Business Aid (BUEP)	Ratio
	Area Appropriations Budget (APBD)	Revenue	Ratio
		Expenditure	Ratio
		Financing	Ratio

The SEM-PLS model in this study is given with the inner and outer model structure as follows in **Figure 1**.

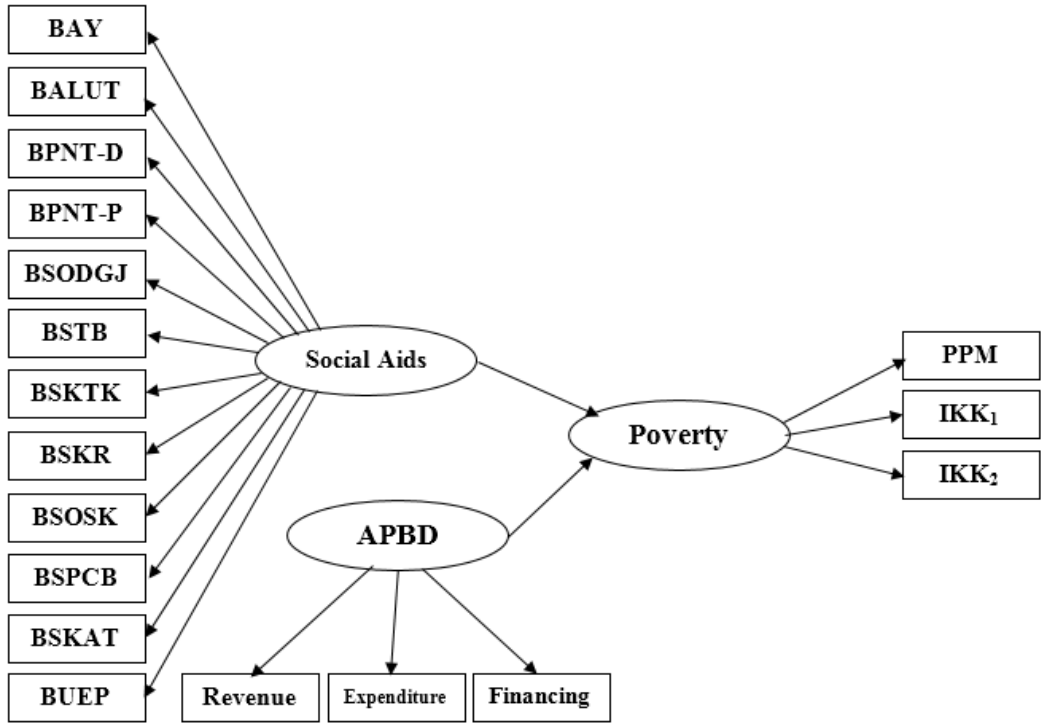

Figure 1. Initial Structural Model of Research

2.4 Data Analysis

Several stages are carried out in the analysis process to explain and describe by reducing the number of parameters using SEM-PLS analysis with the help of WarpSEM-PLS 8.0 software. The analysis steps are as follows:

a. Data Entry: The first stage involves entering data into the software to be analyzed further.

b. Displaying Descriptive Statistics with SPSS: At this stage, an overview or summary of the dataset's characteristics is provided to help understand the observed variables better.

c. Determining Endogenous and Exogenous Variables: It is necessary to identify the variables to be measured and included in the model. These variables are classified into two categories: endogenous (dependent) and exogenous (independent) variables.

d. Designing the Inner and Outer Models: The next step is to design the inner and outer models, which describe the relationships between exogenous and endogenous variables. These models can be simple linear models or more complex ones involving multiple endogenous and exogenous variables. This model serves as the framework for the SEM-PLS analysis.

e. Constructing the Path Diagram: After the model is formed, the next step is to construct a path diagram. A path diagram is essential for visualizing the relationships between latent variables in the model, helping to communicate research concepts clearly and facilitating the understanding of how variables interact.

f. Checking Model Fit Assumptions: In WarpPLS, model fit is evaluated to see how well the structural equation model aligns with the observed data. This includes metrics such as Average Variance Extracted (AVE) for convergent validity, Composite Reliability (CR) for internal consistency, and discriminant validity, which is checked by comparing AVE with inter-construct correlations. Overall model fit is further assessed using the Goodness-of-Fit Index (GFI) and Adjusted GFI.

g. Model Fit Evaluation: If the model fit results meet the required standards, proceed to step h. If not, return to step c.

h. Testing Parameter Significance: After confirming the model is good, the next step is hypothesis testing to check the validity and statistical significance of the relationships between the latent variables proposed in the model. This tests the model's suitability and the significance of the influence between latent variables.

i. Interpreting Results: After evaluating and validating the model, the final step is to interpret the results. This involves interpreting the path coefficients to understand the relationships between variables, analyzing the statistical significance of the identified relationships, and assessing the overall goodness-of-fit of the model.

The following is a flowchart for the stages in the analysis until the last stage, which is as follows:

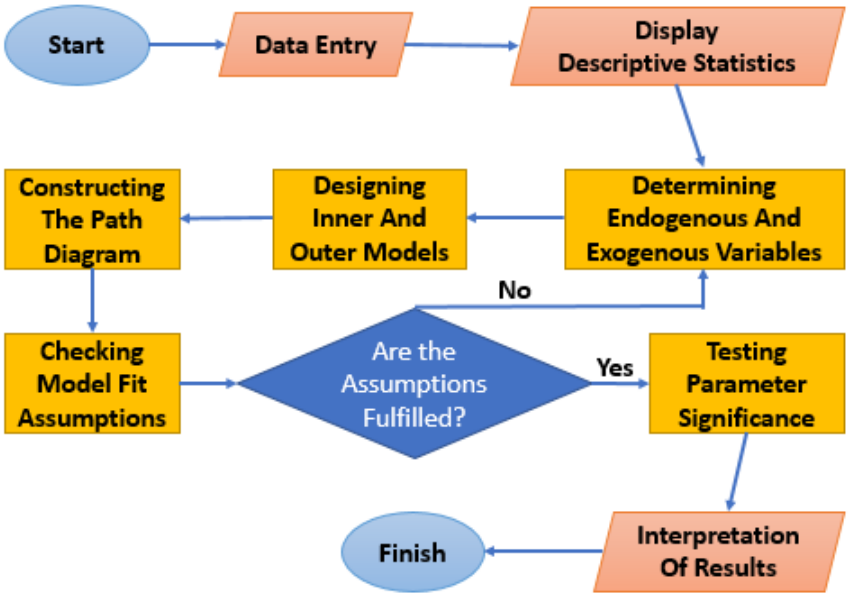

Figure 2. Flowchart of SEM-PLS Analysis

Based on **Figure 2**, SEM-PLS analysis begins with entering data and then generates a descriptive statistical display. The next step determines the endogenous and exogenous variables and then designs the inner and outer models. The SEM-PLS analysis was done by applying the design to the path diagram with the help of WarpPLS software. After the SEM-PLS model estimation process, the model fit assumption is checked. If the assumptions are not fulfilled, then the process returns to determining endogenous and

exogenous variables; but if the assumptions are fulfilled, then the process is to test the significance of the SEM-PLS model parameters. Furthermore, the output of the WarpPLS software results is then interpreted and completed.

3. RESULTS AND DISCUSSION

3.1 Descriptive Statistics

Before further analysis is carried out using the Structural Equation Modeling-Patrial Least Squares (SEM-PLS) method, descriptive statistical analysis is carried out first to see the data overview of each variable studied. In this study, the tool used in conducting descriptive statistical analysis is SPSS software version 24. **Table 2** below summarises the descriptive statistical results of the poverty data.

Table 2. Descriptive Statistics of Poverty Data

Variable	Minimum	Median	Mean	Maximum	Standard Deviation
PPM	12.21	12.6250	12.6825	13.27	0.48134
IKK₁	1.72	1.8900	1.8625	1.95	0.09946
IKK₂	0.35	0.4150	0.4075	0.45	0.04349

From **Table 2**, it is obtained that the average value of the presentation of the poor (*PPM*) in Kabupaten Bojonegoro in the last 4 years or from 2019-2022 is 12.6825 people, with the lowest value of 12.21 people while the highest PPM reached 13.27 people. In addition, the mean value of the Poverty Depth Index (IKK_1) is 1.8625, with the lowest value of 1.72%, while the highest IKK_1 reaches 1.95%. The Poverty Severity Index (IKK_2) from the calculation results presented in **Table 2** above obtained an average value for the Poverty Severity Index (IKK_2) data of 0.4075%, with the lowest value at 0.35% and the highest value of 0.45%. From the explanation above, information related to descriptive statistics on poverty data can be known, then it will be explained again about descriptive statistics for APBD data in **Table 3** below:

Table 3. Descriptive Statistics of APBD Data

Variable	Minimum	Median	Mean	Maximum	Standard Deviation
Revenue	4.7698	449.559	373.574	590.410	256.103
Expenditure	4.5851	173.219	196.721	435.862	224.904
Financing	201.0516	211.063	226.505	282.843	38.601

Table 3 shows that the average value of revenue in Bojonegoro District in 2019-2022 is 373.574 trillion, with the lowest value of 4.76983 trillion and the highest value reaching 590.410 trillion. In the Expenditure variable, the average value is 196.72 trillion, with a minimum expenditure of 4.58507 trillion and a maximum of 435.862 trillion. In addition, the average value for the Financing variable is 226.505 trillion, with the lowest value of 201.051 trillion and the highest value reaching 282.843 trillion. From the explanation above, information related to descriptive statistics on APBD data can be known, then it will be explained again about descriptive statistics for Social Aid (Bansos) data in **Table 4** below:

Table 4. Descriptive Statistics of Bansos Data

Variable	Minimum	Median	Mean	Maximum	Standard Deviation
BAY	22	201	212.01	488	121.275
BALUT	0	0	11.59	289	46.837
BPNT-D	0	106.50	145.13	533	142.662
BPNT-P	1.254	3.914	27.378	970	140.3390
BSODGJ	0	0	0.36	32	3.066
BSTB	0	0	0.63	36	3.501

Variable	Minimum	Median	Mean	Maximum	Standard Deviation
BSKTK	0	0	0.08	2	0.333
BSKR	0	0	9.78	81	15.699
BSOSK	0	18	30.87	164	36.213
BSPCB	0	3	5.14	35	6.080
BSKAT	0	0	1.07	46	5.245
BUEP	0	0	6.09	150	16.950

Table 4 shows that the Social Aid variables used are 12 types, and the highest number of Social Aid recipients is 970, namely the BPNT-P Social Aid in the Kedungadem sub-district.

3.2 Modelling Poverty in Bojonegoro District with the SEM-PLS Method

SEM-PLS evaluation provides measurement fit such as outer model fit, inner model fit, and overall model fit. SEM-PLS evaluation is first presented in measurement. The results of the presentation given in this paper are the results of modifying the SEM-PLS model by removing invalid indicators based on Convergent Validity and Discriminant Validity, such as the indicators on Social Aid that were removed were BAY, BALUT, BPNT-D, BPNT-P, BSODGJ, BSKTK, BSKR, BSOSK, and BSPCB. The deleted Social Aid was not included because it was invalid or the Social Aid was not evenly distributed in each subdistrict. In the Poverty variable, there is also one invalid indicator and the indicator is not included, namely PPM. The following will provide output from the suitability of the outer model:

a. Convergent Validity

The AVE (average variance extracted) value can identify convergent validity tests. The indicator is considered valid if the AVE value is more significant than 0.50. The results are shown in **Table 5** below.

Table 5. Results of The AVE Values

Variable	AVE Value	Caption
Social Aid	0.834	Valid
APBD	0.621	Valid
Poverty	0.909	Valid

b. Discriminant Validity

The loading value of each indicator measures discriminant validity within a study. The indicator is activated if a load value greater than 0.5 is achieved. The research results of stress values for each index are shown in **Table 6** below.

Table 6. Results of The Loading Values

Variable	Loading Value	Caption
BSTB	0.946	Valid
BSKAT	0.893	Valid
BUEP	0.900	Valid
Revenue	0.634	Valid
Expenditure	0.855	Valid
Financing	0.854	Valid
IKK_1	0.954	Valid
IKK_2	0.954	Valid

Based on **Table 5** and **Table 6**, the research indicators are valid. So, testing latent variables against indicators in research can be understood well.

c. Internal Consistency

The internal consistency value of the variables in this study can be said to be reliable if the composite reliability value is ($CR > 0.70$). The calculation results are shown in **Table 7** below.

Table 7. Results of The CR Values.

Variable	CR Value	Caption
Social Aid	0.938	Reliable
APBD	0.828	Reliable
Poverty	0.953	Reliable

Based on **Table 6**, it can be seen that the composite reliability value is more significant than 0.70; this indicates that the indicator has good reliability on its latent variable. After the inner model fit assumption is met, the second is to evaluate the outer model.

The following will provide output from the suitability of the inner model (structural model):

a. The coefficient of determination (R^2) obtained is 0.88, which means that the diversity of endogenous constructs (Y) that can be explained by exogenous constructs (X) is 88%. The remaining 12% is explained by other constructs that are not included, which is represented by structural error. After evaluating the structural model, then evaluate the overall model.

b. Internal model testing essentially tests the hypotheses in your research. Hypothesis testing is performed in part using t-tests (t-statistics) for each direct effect path.

Table 8. Results of Hypothesis Testing with The t-Test

Hypothesis	Path Coefficient	P-value	Caption
H_1: *Social Aid* -> *Poverty*	-0.09	0.16	Not Significant
H_2: *APBD* -> *Poverty*	-0.91	<0.001	Significant

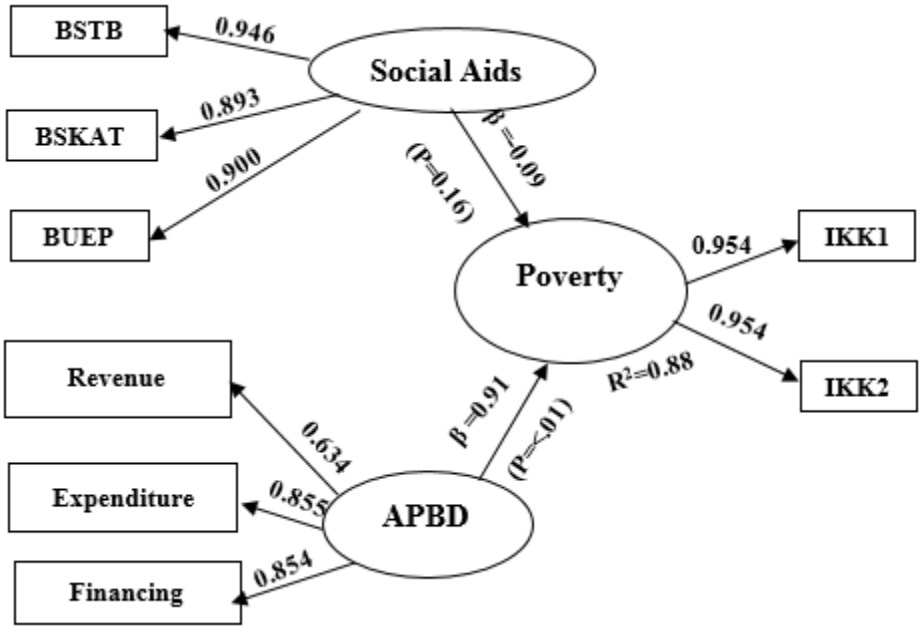

Figure 3. Structural Model of Research

Based on **Table 8** and **Figure 3**, the following are the hypothesis testing results:

a. When testing the direct effect of social aid on poverty, we found a path coefficient of -0.09 with a p-value of 0.16. Since the p-value is > 0.05, there is no significant direct effect between welfare and poverty. It means the amount of social aid benefits received does not affect poverty.

b. Testing the direct effect of regional budget (APBD) on poverty yielded a path coefficient value of -0.91 with a p-value < 0.001. There is a significant direct effect between APBD expenditure

and poverty level as the p-value < 0.05. The value of the path coefficient is negative, indicating that the relationship between the two is negative. In other words, the higher the APBD expenditure, the lower the poverty line.

After evaluating the structural model, evaluate the entire model. Model evaluation is evaluated using model fit values and quality metrics. There are several measures to detect model quality in WarpPLS analysis. The model fit and quality index values are shown in Classic indices and Additional Indices in **Table 8**. Classic indices consist of Average path coefficient (APC), Average R-squared (ARS), Average adjusted R-squared (AARS), Average block VIF (AVIF), Average full collinearity VIF (AFVIF), Tenenhaus GoF (GoF), Sympson's paradox ratio (SPR), R-squared contribution ratio (RSCR), Statistical suppression ratio (SSR), and Nonlinear bivariate causality direction ratio (NLBCDR). Additional Indices are Standardized root mean squared residual (SRMR), Standardized mean absolute residual (SMAR), Standardized chi-square with 252 degrees of freedom (SChS), Standardized threshold difference count ratio (STDCR), and Standardized threshold difference sum ratio (STDSR).

Table 9. Result of Model Fit and Quality Indices

Classic Indices	Value	Model Requirement	Caption
APC	< 0.001	P-value < 0.05	close fit
ARS	< 0.001	P-value < 0.05	close fit
AARS	< 0.001	P-value < 0.05	close fit
AVIF	1.091	acceptable if ≤ 5, ideally ≤ 3.3	ideally fit
AFVIF	1.305	acceptable if ≤ 5, ideally ≤ 3.3	ideally fit
GoF	0.831	small ≥ 0.1, medium ≥ 0.25, large ≥ 0.36	close fit
SPR	1.000	acceptable if ≥ 0.7, ideally $= 1$	ideally fit
RSCR	1.000	acceptable if ≥ 0.9, ideally $= 1$	ideally fit
SSR	1.000	acceptable if ≥ 0.7	close fit
NLBCDR	1.000	acceptable if ≥ 0.7	close fit
SRMR	0.184	acceptable if ≤ 0.1	not good fit
SMAR	0.138	acceptable if ≤ 0.1	not good fit
SChS	< 0.001	P-value < 0.05	close fit
STDCR	0.750	acceptable if ≥ 0.7, ideally $= 1$	Acceptable fit
STDSR	0.427	acceptable if ≥ 0.7, ideally $= 1$	not good fit

Based on the output from WarpPLS, the results are obtained in **Table 9** above. Based on the criteria for model goodness, it can be seen that the model formed is suitable from 15 tests of the model goodness index; good results were obtained for 12 tests of the model goodness index (80% good).

4. CONCLUSIONS

Based on the results carried out by researchers, the following conclusions can be drawn: Model evaluation is based on SEM-PLS goodness-of-fit tests: overall goodness of fit, measurement goodness of fit, and structural goodness of fit: Measuring goodness of fit measures the convergent validity, discriminant validity of the obtained test results, and evaluated using internal consistency. Some indicators did not meet the requirements and were excluded from the study. The size of the structural fit can be seen in the coefficient of determination (R-Square, R^2) of this study obtained R^2 of 0.88 or 88%. As for the overall fit test based on the goodness of model criteria, it has been shown that the model formed is suitable from 15 tests of the model goodness index; good results were obtained for 12 tests of the model goodness index (80% good). In other words, the model is suitable for use. The analysis results using WarpPLS obtained factors that affect poverty in Bojonegoro District, namely the APBD variable. The analysis results show that the APBD variable significantly impacts -0.91 on poverty. The value of the path coefficient is negative, indicating that the relationship between the two is negative. In other words, the higher the APBD expenditure, the lower the

poverty line. On the other hand, the value of the variable "social aid" is −0.09, which has no significant effect on poverty, which means that the amount of social aid received does not affect poverty.

The suggestions developed in this study include: For future research, other SEM-PLS methods such as PLS-PM (PLS Path Modeling) and Covariance-Based PLS-SEM (CB-PLS) can be used as a comparison to get a model with the best criteria. The research results obtained can be used as a consideration for the Government and related agencies in reducing the level of Poverty in Bojonegoro District, especially in the provision of Social Aid so that it can be distributed evenly to the poor who need it so that it can help reduce the existing poverty rate. Moreover, it must also consider factors that influence the level of poverty reduction, namely the APBD.

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