Double Linear Regression Method to Analyze Factors Affecting the Enemployment Level in West Java Province

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Abstract

This study discusses the factors that influence the unemployment rate in West Java Province in 2018. The method used is the multiple linear regression method. The results show that poverty, Regency / City Minimum Wage (MSE), and Labor Force Participation Rate (TPAK) significantly influence the unemployment rate with a significance level of 5%. The regression model is Ln Y = 10.338 + 0.240$LnX1$ + 0.519$LnX2$ - 2.222$LnX3$.

Keywords:
Multiple linear regression, unemployment.

1. Introduction

Indonesia is the fourth most populous country in the world. Indonesia's population in 2018 will reach 265 million. Three provinces on the island of Java dominate the population in Indonesia. One of the three provinces that dominates is West Java. West Java ranks first with the province which has the largest population in Indonesia. In 2018, the population in West Java Province has reached 48.68 million of the total population in Indonesia. In addition, the rate of population growth in West Java was quite high. According to the Central Statistics Agency (BPS) the rate of population growth is a number that shows the percentage of population growth over a period of time. The rate of population growth in West Java is not only caused by natural population growth, but is also caused by residents outside the provinces that enter West Java. In fact high population growth brings several benefits, such as the availability of abundant labor. However, if high population growth is not accompanied by good government policies, it will cause considerable problems, resulting in negative impacts. One of the negative impacts that occur due to high population growth is the difficulty of finding work resulting in increased unemployment.

Unemployment is people who have not gotten a job, people who are looking for work, and people who have worked but have not been able to produce in large numbers. Unemployment is divided into several types, one of which is open unemployment. According to the Central Statistics Agency (BPS) open unemployment consists of those who do not have a job and are looking for work, those who do not have a job and prepare a business, those who do not have a job and are not looking for work because they feel it is impossible to get a job, those who already have a job but not yet started working. Several factors cause high unemployment rates 2 including poverty, minimum wages, and Labor Force Participation Rate (TPAK) figures.

At present, the problem of poverty in Indonesia is already familiar. Poverty is a problem that is always faced by humans. The problem of poverty is indeed as old as humanity itself and the implications of the problem can involve various aspects of human life. In other words, that poverty is a global social problem, meaning that the problem of poverty has become a global concern, and the problem exists in all countries, although the impact of

poverty varies (Nurwati: 2008: 2). One country that has poverty problems is Indonesia. Poverty is a multidimensional problem because it is related to the inability to access economically, socially, politically, and to participate in society (Nurwati: 2008: 1).

Problems in employment at this time are indeed very complex. One of the employment problems is the problem of wages. Wages are workers' rights that are received and expressed as money in return from the employer or employer to the worker. To realize an income that fulfills a decent living for humanity, the government sets a wage policy that protects workers / laborers. Each year the Local Government sets a Minimum Wage for Regency / City (Hendrawanto and Fatkhurohman: 2011: 176). The minimum wage is the lowest monthly wage consisting of basic wages including fixed allowances, which applies to workers who have a work period of less than one year. The stipulation of minimum wages can be done at the Regency / city level, where the governor determines the Regency / City Minimum Wage amount, based on a proposal from the Regency / City Wage Council (DPK) taking into account the welfare of workers and the economic conditions of the region (Merdekawaty, Ispriyanti, and Sugito: 2016: 525). This minimum wage is one of the factors causing unemployment, this is because if a company has to increase the wages they have to pay to its workers, the company's costs will increase. In conditions where economic growth is low and high level 3 inflation will result in companies doing Termination of Employment (FLE).

Furthermore, besides poverty and minimum wages, the Labor Force Participation Rate (TPAK) also becomes one of the unemployment factors, because if the TPAK rate is low, then employment opportunities for the labor force are small, on the other hand if the TPAK rate is high, then employment opportunities for the labor force work is great. This TPAK can be used to determine labor supply, so by knowing the level of labor supply, it can be adjusted for a reasonable wage for workers because wages are usually calculated based on labor supply. The limited number of jobs can reduce TPAK, so the level of labor supply will increase. If labor supply increases, the excess supply of labor will be absorbed by the informal sector whose wage levels are not regulated by regulations, which in turn will reduce the level of wages (Armidi, Erfit, and Yulmardi: 2018: 34).

Associated with the unemployment rate and factors that can cause unemployment, the authors are interested in making research on the factors that affect the unemployment rate in West Java Province, especially in 2018 using regression analysis.

Regression analysis is a method of analyzing data to find out the relationship between several independent variables with the dependent variable. For this problem, the regression model used is multiple linear regression models. Multiple linear regression (multiple linear regression) is a linear regression model with 1 continuous dependent variable along with k (two or more) continuous and / or categorical independent variables (Harlan: 2018: 13).

2. Materials dan Methods

2.1 Models

The model in this study is analyze factors affecting the enemployment level in west java province according to regency / city in 2018.

2.2 Methods

The method used in this is double linier regression method.

2.3 Basic Theory

According to Makridakis et all (1999) there are 2 types of double exponential smoothing methods, namely:

a) Double exponential smoothing of one brown parameter

In this method the process of determining the forecast starts with determining α by trial and error, which is determining some α values then selecting α which has the smallest error. Looking for data smoothing and trends on this method can be done directly because it only uses one parameter. The steps in determining the forecast are as follows:

1) Determine the first smoothing

$$S_t^{'} = \alpha X_t + (1-\alpha) S_{t-1}^{'}$$

2) Determine the second smoothing

$$S_t^{''} = \alpha X_t + (1-\alpha) S_{t-1}^{''}$$

3) Determine smoothing constants

$$a_t = 2S_t' - S_t''$$

4) Determine the amount of slope

$$b_t = \frac{\alpha}{1-\alpha}\left(S_t' - S_t''\right)$$

5) Determine forecasting

$$F_{t+m} = a_t + b_t m$$

With :

S_t' : Single exponential smoothing value
S_t'' : Double exponential smoothing value
m : Number of periods to be predicted
F_{t+m} : Forecasting for t + m periods
X_t : Actual data for period t

b) Double exponential smoothing of two holt parameters

Unlike the one parameter brown method, data smoothing and trends in this method are not smoothed directly. Smoothing of data and trends is determined using different parameters. For smoothing the data using the parameters α values 0 to 1 and smoothing the trend using the parameters γ values from 0 to 1. The equation used in this method is as follows:

1) Determine the smoothing of the data

$$S_t = \alpha X_t + (1-\alpha)(S_{t-1} + b_{t-1})$$

2) Determine the smoothing of the trend

$$b_t = \gamma(S_t - S_{t-1}) + (1-\gamma)b_{t-1}$$

After data smoothing (St) and trend smoothing (bt) are then forecasted. The equation used in this method is:

$$F_{t+m} = S_t + b_t m$$

With :

S_t : Data smoothing value
b_t : The value of trend smoothing
α : Value data smoothing parameter
γ : Trend smoothing parameter value
X_t : Actual data for period t

3. Result and Discussion

3.1 Multiple Linear Regression Model

Based on poverty data (X_1), MSE (X_2), TPAK (X_3), and unemployment rate (Y), an analysis of the effect of the three independent variables will be analyzed on the dependent variable. The results obtained are:

$$Y = 14{,}094 + 0{,}273X_1 + 1{,}452X_2 - 0{,}189X_3 \quad (3.1)$$

Because there are assumptions that are not met in the regression model (3.1), data transformation is performed, so that new data is obtained from the natural logarithmic transformation.

3.2 Multiple Linear Regression Models for Transformed Data

Based on poverty ($Ln\ X_1$), MSE ($Ln\ X_2$), TPAK ($Ln\ X_3$), and unemployment rate (Ln Y), an analysis of the effect of the approach of three independent variables will be carried out on the dependent variable. The results obtained are:

$$Ln\ Y = 10{,}338 + 0{,}240LnX_1 + 0{,}519LnX_2 - 2{,}226LnX_3 \quad (3.2)$$

3.3 Classical Assumptions

a. *Residual Normality Test*

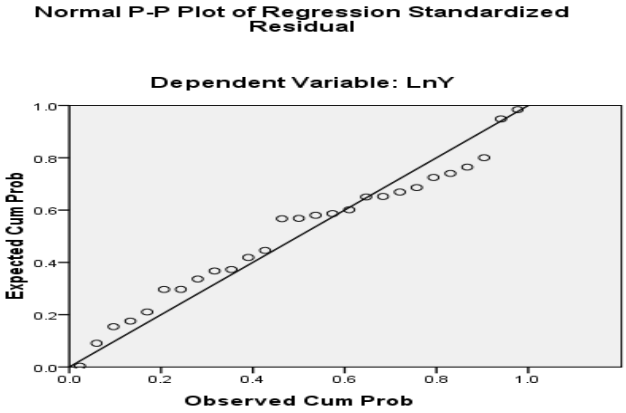

Figure 3.1 Residual normal plot

Based on Figure 3.1 above, it can be seen that the residual normality plot is spread in a linear line. So, it can be concluded that the residual regression model (3.2) has fulfilled the normal distribution assumption.

b. *Multicollinearity Test*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	10.338	3.093		3.343	.003		
	LnX1	.240	.111	.370	2.162	.041	.636	1.571
	LnX2	.519	.149	.613	3.489	.002	.602	1.661
	LnX3	-2.226	.722	-.440	-3.085	.005	.912	1.096

a. Dependent Variable: LnY

Figure 3.2 VIF value

In Figure 3.2 above, each predictor variable has a VIF value of less than 10. So, it can be concluded that there is no multicollinearity between the predictor variables.

c. *Heteroscedasticity Test*

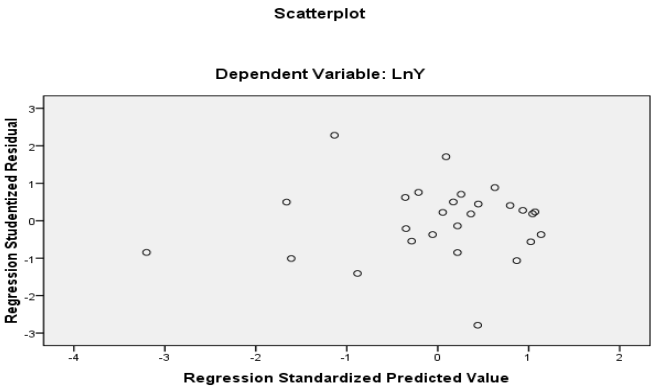

Figure 3.3 Scatterplot Residual vs Predicted Value

In Figure 3.3 above the residuals that have points on the scatterplot do not form a particular pattern or the distribution of points spread evenly. This means that residual variance is still considered constant or tends to be homogeneous. So, it can be concluded that the regression model (3.2) does not occur heteroscedasticity.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.757[a]	.572	.517	.18818	2.140

a. Predictors: (Constant), LnX3, LnX1, LnX2

b. Dependent Variable: LnY

d. ***Autocorrelation Test***

Figure 3.4 Durbin-Watson value

Based on the 3.4 output above, a Durbin-Watson value of 2,140 was obtained. While for k = 4, n = 27 obtained *dU* table value of 1,7527 and *dL* table of 1,0836. Then dU ≤ d ≤ (4-dU) = 1,7527 ≤ 2,140 ≤ (4-1,7527) = 1,7527 ≤ 2,140 ≤ 2,2473. It can be concluded that there is no positive / negative correlation because 1,7527 ≤ 2,140 ≤ 2,2473.

3.4 Hypothesis Testing

3.4.1 F Test / Concurrent Test

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.090	3	.363	10.261	.000[a]
	Residual	.814	23	.035		
	Total	1.905	26			

a. Predictors: (Constant), LnX3, LnX1, LnX2

b. Dependent Variable: LnY

Figure 3.5 F Test

(i) Hypothesis

H_0: $\beta_1 = \beta_2 = \beta_3 = 0$: All independent variables did not significantly influence the model.

H_1: $\beta_i \neq 0$, i = 1,2,3 : There is at least one independent variable that significantly influences the model.

(ii) Significance level : α = 5% = 0.05

F_{table} = F(k ; n-k) = F(3 ; 27-3) = F(3,24) = 3,0088

(iii) Areas of refusal

H_0 is rejected if $F_{count} > F_{table}$

H_0 is accepted if $F_{count} < F_{table}$

(iv) Decision
In the Appendix above, obtained the test results F. From the attachment it is known that F_{count} = 10,261 > F_{table} = 3,0088, then H_0 is rejected.

(v) Conclusions
H_0 is rejected, it means $\beta_i \neq 0$. Thus, it can be concluded that the independent variable simultaneously significantly influences the unemployment rate.

3.4.2 Test *t*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	10.338	3.093		3.343	.003
	LnX1	.240	.111	.370	2.162	.041
	LnX2	.519	.149	.613	3.489	.002
	LnX3	-2.226	.722	-.440	-3.085	.005

a. Dependent Variable: LnY

Figure 3.6 *t Test*

a. Test t for variable x_1 with respect to y

(i) Hypothesis
H_0: $\beta_1 = 0$, it means that the poverty free variable does not significantly influence the unemployment rate
H_1: $\beta_1 \neq 0$, it means that the poverty free variable significantly influences the unemployment rate.Taraf signifikansi

(ii) Significance level
α = 5% = 0.05
$T_{table} = t(\frac{\alpha}{2} ; n - k - 1) = t(0{,}025 ; 27\text{-}3\text{-}1) = t(0{,}025 ; 23) = 2{,}0687$

(iii) Areas of refusal
H_0 is rejected if $T_{count} < -Tt_{able}$ atau $T_{count} > Tt_{able}$
H_0 is accepted if $-Tt_{able} < T_{count} < Tt_{able}$

(iv) Decision
From the data in the appendix, t test results obtained using SPSS 17.0 software were obtained namely $T_{count} > Tt_{able}$ 2,162 > 2,0687, then H_0 was rejected.

(v) Conclusions
Thus, it can be concluded that the poverty free variable significantly influences the unemployment rate.

b. Test *t* for the variable x_2 with respect to *y*

(i) Hypothesis
H_0: $\beta_2 = 0$, it means that the MSE independent variable does not significantly influence the unemployment rate.
H_1: $\beta_2 \neq 0$, it means that the MSE independent variable significantly influences the unemployment rate.

(ii) Significance level
α = 5% = 0.05
$T_{table} = t(\frac{\alpha}{2} ; n - k - 1) = t(0{,}025 ; 27\text{-}3\text{-}1) = t(0{,}025 ; 23) = 2{,}0687$

(iii) Areas of refusal
H_0 is rejected if $T_{hitung} < -Tt_{abel}$ atau $T_{hitung} > Tt_{abel}$
H_0 is accepted if $-Tt_{abel} < T_{hitung} < Tt_{abel}$

(iv) Decision

From the data in the appendix, the results of t test using SPSS 17.0 software were obtained namely $T_{count} > Tt_{able}$ namely 3,489> 2,0687, then H_0 was rejected.

(vi) Conclusions
Thus, it can be concluded that the MSE independent variable significantly influences the unemployment rate.

c. T test for variable x_3 with respect to y

(i) Hypothesis
H_0: $\beta_3 = 0$, it means that the TPAK independent variable does not significantly influence the unemployment rate.
H_1: $\beta_3 \neq 0$, it means that the TPAK independent variable significantly influences the unemployment rate.

(ii) Significance level
α = 5% = 0.05
$T_{table} = t\left(\frac{\alpha}{2} ; n - k - 1\right) = t\ (0{,}025 ; 27\text{-}3\text{-}1) = t\ (0{,}025 ; 23) = 2{,}0687$

(iii) Areas of refusal
H_0 is rejected if $T_{count} < -Tt_{able}$ atau $T_{count} > Tt_{able}$
H_0 is accepted if $-Tt_{able} < T_{count} < Tt_{able}$

(iv) Decision
From the data in the appendix, the results of t test using SPSS 17.0 software were obtained namely $T_{count} < -Tt_{able}$ -3,085 <-2,0687, then H_0 was rejected.

(v) Conclusions
Thus, it can be concluded that the TPAK independent variable significantly influences the unemployment rate.

3.5 Analysis of the Regression Model

Based on Figure 2.6 above, the regression model is obtained as follows:

$$\text{Ln } Y = 10{,}338 + 0{,}240\ LnX_1 + 0{,}519\ LnX_2 - 2{,}226\ LnX_3 \quad (3.3)$$

Equation (3.3) states a constant of 10,338, meaning that if the value of poverty (X_1), MSE (X_2), TPAK (X_3), each value is constant (fixed), then the unemployment rate (Y) is 10,338%. If other independent variables remain and poverty increases 1%, the unemployment rate increases by 0,240%. If the MSE increases 1 million, it will increase the unemployment rate by 0,519 million. If TPAK has increased 1%, the unemployment rate has decreased by 2,226%.

4. Conclusion

Based on the results of research and discussion in this study, it can be concluded that poverty, MSE, and TPAK significantly influence the level of unemployment. Regression model obtained for unemployment is

$$\text{Ln } Y = 10{,}338 + 0{,}240LnX_1 + 0{,}519LnX_2 - 2{,}226LnX_3$$

The above model states a constant of 10,338, meaning that if the value of poverty (X_1), MSE (X_2), TPAK (X_3), each value is constant (fixed), then the unemployment rate (Y) is 10,338%. If other independent variables remain and poverty increases 1%, the unemployment rate increases by 0,240%. If the MSE increases 1 million, it will increase the unemployment rate by 0,519 million. If TPAK has increased 1%, the unemployment rate has decreased by 2,226%.

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