

Prediction of Bank Indonesia Interest Rates By Analyzing Inflation Rate in Indonesia From 2003 – 2016

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Abstract

Inflation is a tendency to increase the price level continuously, which can affect individuals, businesses, and government, while the amount of capital goods demanded (investment) is highly dependent on the interest rate (interest) as a measure of the cost of funds used to finance the investment. That is why if interest rates are high, then investment or projects are less compared to when interest rates are low. This study uses simple linear regression analysis to predict and predict changes in the value of certain variables when other variables change. Correlation is one of the statistical analysis techniques used to find the relationship of how strong the relationship between one variable with other variables that are quantitative. By using a linearity test where $f_{count} > f_{tabel}$ is $26.70046 > 3.885$ Then, H_0 is rejected. This means that a simple linear regression analysis can be used to predict Bank Indonesia interest rate fluctuations by analyzing the inflation rate in Indonesia. Obtained a simple linear regression equation is $Y = 4.4292 + 0.479694X$, the relationship of the independent variables and the dependent variable above is 0.830618 with the relationship is superior correlation, the scale ranges from 0.76 to 1.00 . ie where $t_{count} > t_{table} = 5.1672 > 2.179$, then H_0 is rejected, meaning that there is a large (significant) influence between the BI interest rate on the inflation rate in Indonesia, the higher the BI interest rate, the greater the inflation in the State of Indonesia.

Keywords: Inflation Rate • BI Interest Rate • Simple Linear Regression • Correlation

Introduction

In conventional economic theory, the amount of capital goods demanded (investment) is highly dependent on the interest rate as a measure of the cost of the funds used to finance the investment. That is why if interest rates are high, then investment or projects are less compared to when interest rates are low. In the classical theory, that "interest" is the price of capital, where if the demand for capital (money) rises, interest will rise too, but people ask for money or borrow money not solely for investment but also for transactions (consumption) and speculation. Even so the borrower still bears interest. That is why in the capitalist economy, more economic transaction activities in the financial sector compared to the real sector [1].

Literature Review

Simple Linear Regression Analysis

Simple linear regression analysis can be used to predict changes in the value of certain variables when other variables change. It is said simple regression, because it consists of one independent variable (independent) as a predictor, it uses a simple linear regression equation. Regression analysis is a relationship that is obtained and expressed in the form of mathematical equations which states the functional relationship between variables. According to Drapper and Smith [2] regression analysis is an analytical method that can be used to analyze data and draw meaningful conclusions about the relationship of one variable's dependence on another. Regression is divided into 2 namely, simple linear regression analysis and multiple linear regression. Simple linear regression analysis is used to get a mathematical relationship in the form of an equation between the dependent variable and the single independent variable. Simple linear regression analysis is a linear relationship between the

independent variable (X) and the dependent variable (Y). This analysis is to determine the direction of the relationship between the independent variable with the dependent variable whether each independent variable is positively or negatively related and to predict the value of the dependent variable if the value of the independent variable has increased or decreased. The data used is usually interval or ratio scale.

The simple linear regression equation is as follows:

$$Y = \alpha + bX$$

Information:

Y = Dependent variable (predicted value)

X = Independent variable

α = Constant (Y value is equal to α if $X = 0$)

b = Regression coefficient (increase or decrease value).

The method that can be used to estimate the parameters of a simple linear regression model or a simple linear regression model is the least squares method and the likelihood method [3].

Simple Linear Correlation

Correlation coefficient is a number that states the strength of the relationship between two or more variables, can also determine the direction of the relationship of the two variables, the correlation value is $(r) = (-1 \leq 0 \leq 1)$. Simple correlation analysis is an extension of simple correlation analysis. In a simple correlation analysis aims to find out how the degree of relationship between several independent variables (Variable X), with the dependent variable (Variable Y) together. For the strength of the relationship, the value of the correlation coefficient is between -1 to 1 , while for the direction expressed in the form of positive (+) and negative (-). The Pearson product moment coefficient of correlation, is a measure of the strength of the linear relationship between two variables x and y. it is computed (for a sample of n measurements on x and y) as follows:

$$r = \frac{SS_{xy}}{\sqrt{SS_{xx} \cdot SS_{yy}}}$$

Where ;

$$SS_{xy} = \sum(x - x^{\wedge})(y - y^{\wedge})$$

$$SS_{xx} = \sum(x - x^{\wedge})^2$$

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$$SS_{yy} = \sum (y - \hat{y})^2$$

Recall that a bivariate relationship describes a relationship – or correlation – between two variables, x and y. scattergrams are used to graphically describe a bivariate relationship (Table 1). The concept of correlation and how it can be used to measure the linear relationship between two variables, x and y. a numerical descriptive measure of correlation is provided by the pearson product moment coefficient of correlation, r.

The intervals for the strength of the relationship (correlation) are as follows:

Simple Correlation is a correlation that intends to see the relationship between variables (the dependent variable and one independent variable). Simple correlations relate to the inter-isolation of independent variables as well as their correlation with the dependent variable. In addition, according to Akdon and Ridwan [4] a simple correlation is a value that gives a strong influence of variables together with other variables.

The assumptions related to the simple regression analysis are:

1. The independent variables and the dependent variable have a linear relationship
2. All variables, both independent and dependent variables, are continuous random variables.
3. Conditional distribution of values of each variable with normal distribution (multivariate normal distribution)
4. For various combinations of one variable's value, the variance of the conditional distribution of each variable is homogeneous (assuming homoscedasticity applies to all variables).

For each variable, the observed values are not related. Simple correlation (single correlation) is a correlation consisting of one independent variable (X), and one dependent variable (Y). As for the relationship between variables can be described as follows:

From the picture above the problem formulation consists of three or more problems, so simple linear correlation is used (Figure 1).

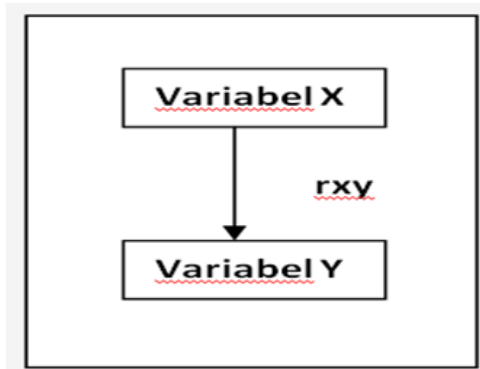


Figure 1: Simple Linear Correlation.

Research Methodology

Research Types and Approaches

This research is an Explanatory Research with a Quantitative approach, using a simple linear analysis method due to more than one independent variable. The influencing variable is called the independent variable (the independent variable) and the affected variable is called the dependent variable (the dependent variable).

Variables in Measurement

This study consists of two independent variables, namely the Indonesian State Inflation Rate (X) and the Interest Rate (Y), while the dependent variable.

Data Source

The data source used is a secondary data source that is the source of research data obtained indirectly through intermediary media or related agencies / agencies [5]. In this case the researchers took data from the Central Statistics Agency in 2017 concerning Fluctuations in Bank Indonesia Interest Rate Movements, inflation and Interest Rates in the World Development Indicators, 2019.

Data collection technique

Data collection techniques used to obtain relevant data from the problem under study is through library research (Library Research), namely by reading and studying the literature contained in the library, with a view to placing a theoretical foundation on the main problem being discussed (Table 2).

Is the price of capital (price of capital), where if the demand for capital (money) rises, interest will rise too, but people ask for money or borrow money not solely for investment but also for transactions (consumption) and speculation (Table 3).

Table 1: Pearson Correlation Value.

Value of Correlation (r)	Interpretation (r)
0,00 – 0,25	Doubful Correlation
0,26 – 0,50	Fair Correlation
0,51 – 0,75	Good Correlation
0,76 – 1,00	Superior Correlation

Source: Kelley WD et al. [9]

Table 2: Indonesian Inflation Data 2003 – 2016.

Years	Inflation (X)
2003	5.1
2004	6.4
2005	17.1
2006	6.6
2007	6.6
2008	11.1
2009	2.8
2010	7
2011	3.8
2012	4.3
2013	8.4
2014	8.4
2015	3.4
2016	3

Source: World Development Indicators, 2019

Table 3: Table of BI Interest Rates (Y) 2003 - 2016.

Years	Bank Indonesia Interest Rates (Y)
2003	8.3
2004	7.4
2005	12.8
2006	9.8
2007	8
2008	10.8
2009	6.5
2010	6.6
2011	5
2012	4.8
2013	7.2
2014	6.9
2015	7.1
2016	5.9

Source: World Development Indicators, 2019

Results and Discussion

This study predicts the independent variable (Y), which is the interest rate in the future by processing and analyzing data in the past, as the dependent variable, which is Indonesia's inflation rate data. From 2003 to 2016 (Table 4). Simple linear regression analysis with the dependent variable is the BI Rate abbreviated with (Y), and the independent variable is Indonesian inflation (X). Data from the variables above are as follows:

In a study when analyzing data, simple linear regression is a development of simple linear regression, which can be used to predict future demand based on data analysis in the past or to determine the effect of one or more independent variables on an independent variable. Free (dependent) used. Application of a simple method the number of independent variables used is more than one that affects the independent independent variable [6] (Table 5). From the dependent and dependent variable data table above we get a simple linear regression equation with two predictors. Start by creating a helper table as follows:

Simple Linear Regression Correlation Rate

The Pearson Correlation Coefficient can be used to express the large linear relationship between two or more variables when the data is quantitative data (interval scale or ratio data) and both variables are normally distributed bivariates [7]. The simple linear regression correlation is obtained as follows:

Table 4: Data (Y) of Indonesian Inflation and (X) Bank Indonesia Interest Rates.

Years	Inflation (X)	BI Rate (Y)
2003	5.1	8.3
2004	6.4	7.4
2005	17.1	12.8
2006	6.6	9.8
2007	6.6	8
2008	11.1	10.8
2009	2.8	6.5
2010	7	6.6
2011	3.8	5
2012	4.3	4.8
2013	8.4	7.2
2014	8.4	6.9
2015	3.4	7.1
2016	3	5.9

Source: World Development Indicators, 2019

Table 5: Helper Data Tables for finding Simple Linear Regression Equations.

Years	X	Y	X ²	Y ²	XY
2003	5.1	8.3	26.01	68.89	42.33
2004	6.4	7.4	40.96	54.76	47.36
2005	17.1	12.8	292.41	163.84	218.88
2006	6.6	9.8	43.56	96.04	64.68
2007	6.6	8	43.56	64	52.8
2008	11.1	10.8	123.21	116.64	119.88
2009	2.8	6.5	7.84	42.25	18.2
2010	7	6.6	49	43.56	46.2
2011	3.8	5	14.44	25	19
2012	4.3	4.8	18.49	23.04	20.64
2013	8.4	7.2	70.56	51.84	60.48
2014	8.4	6.9	70.56	47.61	57.96
2015	3.4	7.1	11.56	50.41	24.14
2016	3	5.9	9	34.81	17.7
Σ	107.1	94	810.25	821.16	882.69

$$R_{x,y} = \frac{SS_{xy}}{\sqrt{SS_{xx} \cdot SS_{yy}}}$$

From the analysis of the simple linear regression correlation rate equation in predicting fluctuations in Bank Indonesia interest rate movements by analyzing inflation growth [8]. From 2003 - 2016. With interpretation is superior, ranging from 0.76 to 1.00.

Linearity Test (F-Test) Simple Regression

Make a Hypothesis:

H₀: Linear regression analysis cannot be used in analyzing the influence of Bank Indonesia Interest Rate Fluctuations by Analyzing Inflation growth. From 2003 - 2016.

H_a: Linear regression analysis can be used in analyzing the influence of Bank Indonesia interest rate fluctuations by analyzing inflation growth from 2003-2016.

Determining the Fcount Value

Formula :

$$F_{count} = \frac{(R_{x,y})^2 (n - m - 1)}{m(1 - R_{x,y}^2)}$$

$$F_{count} = 26.70046$$

Information :

R_{x,y} = Simple Linear Regression Correlation

n = Number of Research Samples

m = Number of Free Variables

Determine the Value of F_{table}

Formula :

$$F_{table} = F_{((\alpha)(dk \text{ denominator} = n-m-1), (dk \text{ numerator} = m))}$$

Where :

$$m = 2, n = 13, \alpha = 0,05$$

$$dk = 13 - 2 - 1 = 10$$

Then;

$$F_{table} = F_{((0,05)(11,2))} = 3.885$$

> f_{count} > f_{table}; That is; 26.70046 > 3,885 Then, Ho rejected. So, Simple Linear Regression Analysis can be used in predicting the fluctuation in Bank Indonesia Interest Rate Movements by Analyzing Inflation growth. from 2003 - 2016.

Look for the values of constants

Formula of constants b₁;

$$b = \frac{(n \cdot \sum XY - \sum X \cdot \sum Y)}{n \cdot \sum X^2 - (\sum X)^2}$$

$$= 0.479694$$

The constant value α is :

$$\alpha = \frac{(\sum Y - b \cdot \sum X)}{n}$$

$$= 4.4292$$

From the results of Simple Linear Regression analysis the equation is obtained by the formula is as follows:

$$Y = \alpha + bX$$

The result of simple linear regression analysis is obtained by the equation. Indonesia by analyzing the inflation rate [9]. In Indonesia from 2003 - 2016. Then the simple linear regression equation is obtained as follows:

$$Y = 4.4292 + 0.479694X$$

By using the equation above, we can predict the fluctuation in the movement of Bank Indonesia interest rates by analyzing inflation growth [10]. From 2003 - 2016.

Influence Test or t-test

That is, determine whether there is a partial effect between the Inflation Rate (X) with the Fluctuation of Bank Indonesia Interest Rate Movements (Y) and whether there is an influence on the Interest Rate (X) and Bank Indonesia Interest Rate Fluctuations (Y).

Test of influence (t-test) between X and Y Determine Hypothesis:

H_0 : There is no significant / partially significant effect between the inflation rate of Indonesia (X) and the fluctuation in the movement of Bank Indonesia Interest Rates (Y).

H_a : There is a large / partially significant effect between the Interest Rate (X) and the Fluctuation in the Movement of Bank Indonesia Interest Rates (Y).

$$\text{Value of } t_{\text{count}} = r\sqrt{n-2}/\sqrt{1-(r)^2} = 5.167248$$

Determine the value t_{tabel}

$$\begin{aligned} t_{\text{tabel}} &= t_{(\alpha/2)(n-2)} \\ &= t_{(0,025)(12)} \\ &= 2.179 \end{aligned}$$

➤ So, $t_{\text{count}} > t_{\text{tabel}} = 5.167248 > 2.179$; then H_0 is rejected meaning, there is a large (significant) influence between Bank Indonesia interest rates on the inflation rate in Indonesia from 2003 - 2016.

Conclusion

From the results of this study, it can be concluded that statistical data with Predictions of Fluctuations in Bank Indonesia Interest Rate Movements By Analyzing Inflation Growth. From 2003 - 2016 are as follows:

1. $f_{\text{count}} > f_{\text{tabel}}$; that is, $26.70046 > 3.98$ Then, H_0 is rejected. Thus, linear regression analysis can be used in predicting the fluctuation in Bank Indonesia interest rate movements by analyzing inflation growth from 2003 - 2016.

2. Simple Linear Regression Equations are as follows:

$$Y = 4.4292 + 0.479694X$$

3. Correlation (interrelation) between the relationship of Bank Indonesia

Interest Rate Fluctuations and Analyzing Inflation growth. from 2003 - 2016 the results obtained 0.830618 with interpretation is superior, ranging from 0.76 to 1.00.

4. So, $t_{\text{count}} > t_{\text{tabel}} = 5.167248 > 2.179$; then H_0 is rejected meaning, there is a large (significant) influence between the BI Rate on the inflation rate in Indonesia from 2003 - 2016.

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