CHAPTER III

DATA AND RESEARCH METHODOLOGY

A. Research Object

This study aims to test the proposed hypothesis that is about The fed rate, the price of gold, inflation and the money supply against JII. The objects in the thorough are Variable Independent and Variable dependent. Variable is in use as many as five variables.

1. Dependent Variable

    a. Jakarta Islamic Index (JII)

2. Independent Variable

    a. The Fed Rate denoted by denoted by (TFR)

    b. Gold Price denoted by (GP)

    c. Inflation denoted by (INF)

    d. Money Supply denoted by (M2)

B. Data Types

This research is a quantitative analysis using secondary data type and is time series data. The data used in the form of monthly data taken from 2011 to 2016. Data Collection Techniques The data used in this research is secondary data. Secondary data is data obtained from the second source or secondary source (Bungin, Burhan, 2013). The secondary data in this study was obtained from the publication of various related agencies taken from the agency's website and also from other websites related to this research.

The related agencies and websites are:

1. www.bi.go.id

2. www.idx.co.id

3. www.duniainvestasi.com

4. www.federalreserve.gov

5. www.goldprice.org

6. www.bps.go.id

Data were taken based on the classification of periods in this study, ie from January 2011 to December 2016.

C. Operational Definition of Research Variables

Variables used in this study includes two types of variables, namely the dependent variable and independent variables. The object of the dependent variable in this research is JII index, while independent variables include The Fed Rate, Gold Price, Inflation, Money supply. In detail the variables in this study as follows:

1. Dependent Variable.

a. Jakarta Islamic Index

Jakarta Islamic Index (JII) is one of the stock indices in Indonesia that calculates the average stock price index for the type of stocks that meet the criteria of sharia. The establishment of JII cannot be separated from the cooperation between Indonesia capital market (in this case PT Bursa Efek Jakarta) with

PT Danarksa Investment Management (PT IDM). JII has been developed since July 3, 2000. The establishment of this sharia instrument to support the establishment of sharia capital market which was then launched in Jakarta on March 14, 2003.

Sharia capital market mechanisms imitate similar patterns in Malaysia combined with the Jakarta and Surabaya Stock Exchanges. Each period of JII stocks totals 30 stocks that meet the criteria of sharia. In the election of shares that meet the qualification to enter the JII index must meet the sharia criteria. In addition to the criteria of sharia, liquidity criteria and market capitalization are also considered in the selection of the issuer. In this research will be used data movement JII index every month obtained from website www.duniainvestasi.com. And on synchronize with website www.idx.co.id The period used is from January 2011 to December 2016.

2. **Independent Variables**

a. The Fed rate

The Fed is one of the central banks of institutions designed to oversee the banking system and regulate the amount of money circulating in the economy. Meanwhile, according to Mankiw (2002), the Fed finance agency responsible for regulating banks and regulating the money supply in the economy is the Federal Reserve (Fed of the US) which is often abbreviated as the Fed.

Meanwhile, according to Misgiyanti and Zuhroh (2009), The fed rate is the benchmark interest rate of US state banks set by The Federal Open Market Committee (FOMC), the Fed which is the central bank in the United States responsible for monitoring and responding to the overall economic development , and the stock market is part of the economy.

In this study will be used the Fed rate data every month obtained from the website www.federalreserve.gov Period used is starting from January 2011 to December 2016.

b. Gold Price

Gold is a solid, soft, shiny metal, and one of the most flexible metals among other metals. Compared to other metal types, gold has several advantages, such as the opinion of the Weatherford jack "wherever people want to touch it, wear it, play with it and also have it, because unlike copper turned green, the iron is easily rusted and the silver is faded, pure gold remains pure and unchanging ". It is this natural nature that causes the value or price of gold to be very valuable (Dipraha, 2011).

Gold is a kind of precious metal known throughout the history of human life, not just for jewelry, gold is also widely used as an investment alternative. In addition, gold is also an indicator of the level of wealth of individuals and a nation

(Anwar, 2009). Gold has long been used as an asset to protect the value of a wealth (Romadhan, 2010).

In this study will be used the gold price data per month obtained from the website www.golprice.org Period used is starting from January 2011 to December 2016.

c. Inflation

Inflation is a general price increase or a decrease in purchasing power by money. The higher increase in price increase produces the value of money down (Sukirno, 2006). Meanwhile, according to Nopirin (2000) Inflation is an increase in the price of goods continuously. Increases that occur only once in a high percentage does not mean it's inflation. In addition According Rahardja (2008) Inflation is the tendency of prices to increase in general and continue.

Inflation is also one of the macro variables that have a major impact on economic activity, both on the real sector, especially in the financial sector. Inflation is a general rise in prices of goods or services over a given period. The inflation rate is measured using a general price level change, usually, the price level used by the consumer price index, the producer price index or the implicit gross domestic product deflator (GDP deflator) which measures the average price all goods are weighted by the quantity of goods actually purchased (Karim, 2008).

In this research will be used inflation data every month obtained from the website www.bps.go.id Period used is starting from January 2011 to December 2016.4)

d. Money supply

Money is the inventory of goods used to make the payment of goods and services. Money, or the money supply, is most commonly defined to cover all coins and coins circulating outside the financial institutions and coffers of the government, together with accounts that can be examined at the depository institutions including commercial banks, savings and credit associations, joint savings banks, and credit unions owned by individuals and companies. Some experts classify money into two categories: Thomas (1997):

1) Narrow Money (M1)

In a simple explanation money in narrow money is all currency and demand deposits in the hands of the public. While the government currency in deposits in commercial banks and central banks does not include M1. While checking accounts is a checkable deposit in the community including M1. Demand deposits represent M1 because the money can be used anytime (Thomas, 1997).

2) Broad Money (M2)

In a broad sense M2 represents the combined money of M2 which includes savings, small deposits, and money market funds. In the monetary system money in the broadest sense is often called economic liquidity (Thomas, 1997).

Money supply (M2) is used to block the money supply including foreign currency deposits. So M2 is a lot of money supply in this country. The increase in the money supply increases the liquidity in the economy so as to generate money for consumption and investment. In this study will be used monthly money supply M2 data obtained from the website www.bi.go.id Period used is starting from January 2011 to December 2016.

D. Hypothesis Testing and Data Analysis.

1. Classic Assumption Test

The linear regression model can be called a good model if it meets the classical assumptions. Therefore, a classical assumption test is needed before conducting a regression analysis. The classical assumption test consists of normality test, heteroscedasticity test, multi-correlation test, linearity test, and autocorrelation test.

The Classical Linear Regression Model (OLS) has several assumptions. Three of these of some classic assumptions are (Basuki, 2017):

a. Non-Autocorrelation.

Non-Autocorrelation is the state where the error in the regression

equation has a constant variant.

b. Homoscedasticity

Homoscedasticity is a state where the error in the regression

equation has a constant variant.

c. Non- Multicolinearity

Non multicollinearity is a condition where there is no relationship

between variables explainers in the regression equation.

Deviations on these assumptions will result in an invalid estimate.

To detect the presence or absence of deviation on the classical

assumption is the test Autocorrelation, Heteroskedastisitas and

Multikolinearitas, and normality.

a. Normality test

According Sarjono, Haryadi, and Julianita, (2011) Normality

test aims to determine whether or not a normal distribution of data.

Basically, the normality test is comparing the data we have and the

normally distributed data having the same mean and standard

deviation to our data. Normality test becomes important because

one of the requirements of testing parametric-test (parametric test)

is the data must have a normal distribution (or normal distribution).

Winarno (2015), One of the assumptions in statistical analysis

is normally distributed data. If the analysis involves 3 variables,

then we need 3 x 30 = 90 data. However, to test more accurately, we need analysis tools and Eviews using two methods, namely Histogram and Jarque-Bera test.

Jarque- Bera is a statistical test to see if the data is normally distributed. This test measures differences in skewness and kurtosis data and compared with normal data. The formula used is Winarno (2015):

$$Jarque - Bera = \frac{N-k}{6}\left(S^2 + \frac{(K-3)}{4}\right)^2 \dotfill (3.1)$$

Information :

S: is akewness

K: is a kurtosisi

k: is the number of coefficients used in the equation.

To determine whether or not a normal data is viewed from the Sig level. Probability Jarque - Bera The criteria in normality testing are:

1) Probability Jaque test - Bera Sig. > 0.05 shows normally distributed data.

2) Probability Jaque test - Bera Sig. <0.05 indicates the data is not normally distributed.

b. Heterokedatisitas test

Basuki (2017), Heteroscedasticity is the situation of his constant variant. Heteroskedasticity Consolidation is its Varian bias so that significant test becomes invalid.

Meanwhile, according to Sarjono, Haryadi and Julianita (2011), Heterokedatisitas showed that variance is not the same for all observations. If the variance of the residual one observation to another observes remains then it is called homoscedasticity. A good regression model is a homoscedasticity in the model, or in other words, there is no heteroscedasticity. There are several ways to detect the presence of heteroscedasticity, ie by looking at the Breusch-Pagan-Godfrey test or by using park test, Glesjer test, Harvey test, ARCH, and White test.

1) Harvey Test

Harvey test in econometric repertoire including multiplicative heteroskedasticity category of Harvey test is based on chi-square statistical table (judge, 1985 and Harvey 1976). A regression model in which disturbances exhibit a certain type of heteroscedasticity is considered. Maximum likelihood methods of estimation are developed and compared with the two-step estimation procedure. A likelihood test for heteroscedasticity is suggested.A general formulation of a regression model with multiplicative heteroscedasticity is:

$$\sigma_i^2 = \sigma^2 X_i^2 \quad \text{...} \quad (3.2)$$

$$y_i = x'_i \beta + u_i \text{...} \quad (3.3)$$

$(i = 1..... \text{ n})$

$$\sigma_i^2 = e^{z'_i \alpha} \text{...} \quad (3.4)$$

$(i = 1..... \text{ n})$

Where x'_i is a k x 1 vector of obeservation on the independent variables, β is a k x 1 vector of parameter, z_i is a p x 1 vector of observation on a set of variables which are usually, though not necessarily, related to the regression and α is a p x 1 vector of parameters. The u_i's are disturbance term which are independently and normally distributed with zero means. The first element in z_i will always be used to be a constant term. One of the condition for estimators to exist.

Is that all the elements in z_i be bounded from below for all i from 1 to n. In model (3.2), which is a special case of (30 with $\alpha' = [\log \sigma^2 \quad \lambda]$ and $z'_i = [1 \quad \log X_i]$, fulfillment of this condition requires that X_i be positive for all it. The two-step estimator of α,

$$\bar{\alpha} = [\sum_{i=1}^{n} z_i z'_i]^{-1} \sum_{i=1}^{n} z_i \log \acute{U}_i^2 \dots\dots\dots\dots\dots\dots\dots \quad (3.5)$$

is based on the equation

$$\log \acute{U}_i^2 = z'_i \alpha + w_i \dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3.6)$$

$(i = 1..... \text{ n})$

Where $\acute{U}_i$ is the i th residual resulting from the application of

OLS to (3.3) and $w_i = \log\left(\acute{U}_i^2 / \sigma_i^2\right)$.

Fpr the regression model from the formula (3.3) in which the disturbances have constant variance and plim $n^{-1} \sum_{i=1}^{n} x_i x'_i$ is equal to a fixed positive definite matrix, it may be shown that the OLS residuals converge in distribution to the true disturbances. This result may be extended to the heteroscedastic case by observing.

$$V(\acute{U}_i - u_i) = n^{-1}\sigma^2 x'_i [n^{-1} \sum_{i=1}^{n} x_i x'_i]^{-1} \quad n^{-1} \sum_{i=1}^{n} \sigma^{-2} x_i x'_i$$

$$[n^{-1} \sum_{i=1}^{n} x_i x'_i]^{-1} x_i \dots\dots\dots\dots\dots\dots\dots \quad (3.7)$$

$(i = 1..... \text{ n})$

The additional assumption that plim $n^{-1} \sum_{i=1}^{n} \sigma^{-2} x_i x'_i$ is a fixed positive definite matrix is then sufficient to ensure that the variance of $\acute{U}_i - u_i$ converges to zero as n as ∞ . since $E(\acute{U}_i - u_i) = 0$

It follows from chebyshev's inequality that $\acute{U}_i - u_i$ converges in probability to zero. Hence $\acute{U}_i$ Converges in

distribution to u_i (which is normally distributed), and so w_i converges in distribution to a variable, $w*_i$, which is distributed as the logarithm of a x^2 variate with one degree of freedom.

We find that the expected value of variable distributed as the logarithm of a x^2 divided by its degress of freedom, v, is φ(v/2) − log (v/2),where φ(s) is the psi (digamma) function defined as d log r(s)/d(s)= r'(s)/r(s), r(s) being the gamma function. The second, third, and fourth moments about the mean are $φ^{(1)}(v/2)$, $φ^{(2)}(v/2)$, and $φ^{(3)}(v/2)^2$, respectively ; $φ^{(m)}(s)$ denotes the mth derivative of φ(s).

Maximum likelihood estimation, since the disturbances in the model presented in (3.3) and (3.4) independently and identically distributed, the log-likelihood function is :

$$\log L = \frac{n}{2} log2\pi - \frac{1}{2}\sum_{i=1}^{n} z'_i \alpha - \frac{1}{2}\sum_{i=1}^{n} e^{-z'_i \alpha} (y_i - x'_i\beta)^2 \text{.. (3.8)}$$

The inverse of the information matrix, which is equal to the asymptotic variance- covariance matrix of the maximum likelihood estimator, is therefore:

$$\left\{ E\begin{bmatrix} \frac{\vartheta^2 Log\,L}{\vartheta\beta\,\vartheta\beta'} & \frac{\vartheta^2 Log\,L}{\vartheta\alpha\,\vartheta\alpha'} \\ \frac{\vartheta^2 Log\,L\vartheta}{\vartheta\alpha\,\vartheta\beta'} & \frac{\vartheta^2 Log\,L}{\vartheta\alpha\,\vartheta x'} \end{bmatrix} \beta = \beta' \; \alpha = \tilde{\alpha} \right\}^2 =$$

$$\left[\frac{\left(\sum_{i=1}^n \sigma_i^{-2} x_i x'_i\right)^{-1}}{0} \quad \frac{0}{2\left(\sum_{i=1}^n z_i z'_i\right)^{-1}} \right] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3.9)$$

The iterative equations for estimating β and α may in vie of (3.9) be written separately as

$$\beta^{(t+1)} = \beta'^{(t)} + \left\{ E\left[\frac{\vartheta^2 LOG\,L}{\vartheta\beta\vartheta\beta'}\right] \beta = \beta'^{(t)} \; \alpha = \vartheta^{(t)} \right\}^{-1}$$

$$\left[\frac{\vartheta\log L}{\vartheta\beta}\right] \beta = \beta'^{(t)} \; \alpha = \vartheta^{(t)}$$

$$= \beta'^{(t)} \left(\sum_{i=1}^n e^{-z_i\tilde{\alpha}^{(t)}} x_i x'_i\right)^{-1} \sum_{i=1}^n x_i \, e^{-z'_i\tilde{\alpha}^{(t)}}$$

$$(y_i - x'_i\beta'^{(t)}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3.10)$$

and

$$\vartheta^{(t+1)} = \vartheta^t + \left\{ E\left[\frac{\vartheta^2 Log\,L}{\vartheta_\alpha \alpha'_\alpha}\right] \beta = \beta'^{(t)} \; \alpha = \vartheta^{(t)} \right\}^{-1} \left[\frac{\vartheta\log L}{\vartheta\alpha}\right] \beta =$$

$$\beta'^{(t)} \; \alpha = \vartheta^{(t)} = \vartheta^{(t)} + \left(\sum_{i=1}^n z_i z'_i\right)^{-1} \sum_{i=1}^n z_i \left[e^{-z'_i\tilde{\alpha}^{(t)}} (y_i - \right.$$

$$\left. x'_i\beta'^{(t)})^2 - 1\right] \dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3.11)$$

By making the assumption that the disturbances in the regression model (3.2) are normally distributed it is possible to obtain estimates of the heteroscedasticity oarameters, α, which are considerable more efficient than those obtained by a two-step procedure. This means that more powerful test can be carried out on the estimates of α and in addition, the small

sample properties of the estimator of β are likely to be improved.

From the point of the view estimation, the multiplicative heteroskedasticity model considered here appears to be rather more attractive than the "additive" model in which either the variance or standard deviation of the ith disturbance term is assumed to be related to linear combination. There are the three reason for this . firtly the likelihood function is bounded and no problem arise due to estimated variance being negative zero, secondly the error term in the two-step equation (3.5) are (asymptotically) homoscedastic and so the estimated covariance matrix of two-step estimator, $\bar{\alpha}$, in constant. Finnaly the likehood ratio test has much simpler from the multiplicative model.

In this study will be used Harvey test to see whether or not heteroskedasticity problem.

c. Multicollinearity Test

The term multicollinearity was first introduced by Ragner Frisch in 1934. According to Frisch, a regression model is said to be multicolinearity when a perfect or exact relationship exists between some or all independent variables of a regression model as a result of difficulty to be able to see the

influence of explanatory variables on the variables explained (Basuki 2017).

Basuki (2017), if our model contains a serious multicollinearity that is a high correlation between independent variables, there are two options that we let the model still contain multicollinearity and we will improve the model to be free from multicollinearity problems.

According to Sarjono, Haryadi, and Julianita, (2011), multicollinearity test aims to determine whether the relationship between independent variables have multicollinearity problems (symptoms multicollinearity) or not. Multicorelation is a very high or very low correlation that occurs in relationships between independent variables. A multicollinearity test is necessary if the number of independent variables (independent variables) is more than one.

Basuki (2017), in Multicollinearity test there are 3 things that must be discussed first:

1) Multicollinearity is essentially a sampling phenomenon.

   In the population regression function model (assumed by PRF) it is assumed that all independent variables included in the model have an individual effect on the dependent variable Y, but it may happen that in a particular sample.

2) Multicollinearity is a matter of degree and not a matter of kind.

   This means that the problem of multicollinearity is not a matter of whether the correlation between the negative or possessive free variables, but is a matter of the correlation of free variables.

3) The problem of multicollinearity hanaya relates to the existence of linear relationships among the independent variables.

   This means that the multicollinearity problem will not occur in a regression model whose form of the function is non-linear, but the multicollinearity problem will appear in the regression model whose function is linear in the independent variables. Multicollinearity is the existence of a linear exact relationship between explanatory variables. Multicollinearity is assumed to occur when the Rsquare value is high, the value of t of all explanatory variables is not significant, and the value of f is high.

   The consequence of multicollinearity is an invalid signification of variable and variable of the coefficient of variable and constant. The multicollinearity is suspected to occur when the estimate yields a high quadratic R-value

(greater than 0.8), a high F value, and a t-statistic value of all or almost all explanatory variables are not significant (Gudjarati, 2003).

Consequences of Multicollinearity:

a) Errors around tend to increase the level of correlation between variables.

b) Due to the magnitude of the approx, the beliefs for the relevant population parameters tend to be larger.

c) The estimated coefficients and errors around the regression become very sensitive to the few changes in the data.

Sarjono, et al (2011), there are several ways to detect the presence or absence of multicollinearity, as follows:

a) The value of R^2 generated by an estimate of the empirical regression model is very high, but individually many independent variables that do not significantly affect the dependent variable.

b) Analyze correlation between independent variables. If among the independent variables there is a high enough correlation (greater than 0.9), this is an indication of the presence of multicollinearity.

c) Multicollinearity can also be seen from the value of free variable correlation, If VIF <10, high collinearity can be tolerated.

As for the multicollinearity testing formula with the equation calculate the value of F each is as follows (Winarno, 2015):

$$F = \frac{\frac{R^2_{x_1 x_2 \dots x_k}}{(k-2)}}{\left(\frac{1 - R^2_{x_1 x_2 \dots x_k}}{n-k+1}\right)} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.12)$$

In this research will be used multicollinearity test by looking at the correlation between the independent variables because the way is felt most easy and practical and the value of multicollinearity test benchmark in this study using the assumption by Gujarati, that is the correlation between the free variable value below 0.8 (<0.8). The basic decision-making is as follows:

1) If the correlation value of variable <0.8 then there is no symptoms of multicollinearity among independent variables.

2) If the value of correlation variable > 0.8 then there is multicollinearity among independent variables.

d. Autocorrelation Test

According to Wijaya in Sarjono, Haryadi and Julianita, (2011), the autocorrelation test aims to test whether in the linear regression model there is a correlation between the disturbance term in period t and the disturbance error in the previous period (t-1). If there is a correlation then it indicates an autocorrelation problem. Autocorrelation problems often occur in time series data (time series data). The following provisions of the decision whether or not there is autocorrelation:

1) If the DW value is between dU to 4 - dU, the correlation coefficient is zero. That is, there is no autocorrelation.

2) If the DW value is smaller than dL, the correlation coefficient is greater than zero. That is, there is a positive autocorrelation.

3) If the DW value is greater than 4 - dL, the correlation coefficient is less than zero. That is, there is a negative autocorrelation.

4) If the DW value is between 4 - dU and 4 - dL, the result cannot be concluded.

There are several ways that can be used to detect the presence or absence of autocorrelation. First, Durbin-Watson Test (DW test). Second, the Lagrange Multiplier Test (LM) is

the Breusch-Godfrey statistic. Third, Test autocorrelation with statistic Q that is Box-Pierce and Liung Box.

Winarno (2015) Dw test is one of the most widely used tests to determine whether or not there is autocorrelation. Almost all statistical programs already provide facilities to calculate the value of d (which describes the value of the DW coefficient). The value of d will range from 0 to 4 as in the table below:

Table 3. 1 Durbin- Watson

rejected Ho (there is autocorellation)	Cannot decided	Accepted Ho (free from autocorellation)	Cannot decided	rejected Ho (there is autocorellation)

0   Dl = 1.10   Du = 1.54   2   4-Du= 2.46   4 Dl=2.90   4

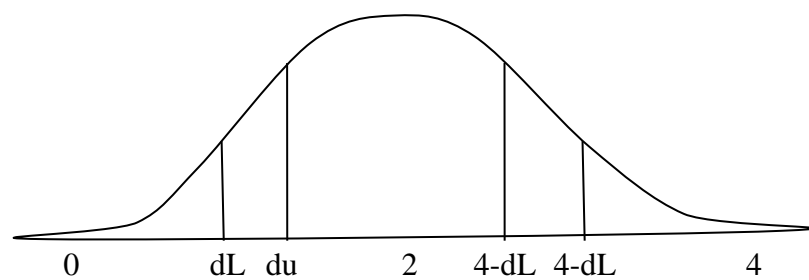0   dL   du   2   4-dL   4-dL   4

Figure 3.1 Durbin- Watson curve

If d is between 1.54 and 2.46 then there is no autocorrelation, and if the value d is between 0 to 1.10, it can be concluded that the data contains positive autocorrelation. And so on.

According to Basuki (2017), the DW test was introduced by comparing the DW statistical value with DW counting table. The Dw test mechanism is as follows:

1) Perform OLS regression and get the residual.

2) Calculate indigo d (DW)

3) Get the critical values dL and dU

4) If the null hypothesis is that there is no positive correlation serial, then if :

   d < dL, reject Ho.

   d <dU accept Ho

   dL = d = dU, the submission is inconclusive

5) If the null hypothesis is that no serial correlation is either negative, then if :

   d> 4-dL, reject Ho

   d <4-dU receive Ho

   4 - dU = d = 4 - dL, the test is inconclusive.

6) When Ho is two ends, ie that there is no serial correlation either positive or negative, then if :

   d <dL reject Ho

d> 4 - dL reject Ho

dU <d <4-dU, accept Ho

dL = d = dU Tests are not convincing

4 - dU = d = 4-dL The test is inconclusive

Widarjono (2013), the healing problem of autocorrelation depends on the nature of the relationship between residuals. Or in other words how to form autocorrelation structure.Residual follows the AR model (1) as follows:

$$e_t = Pe_{t-1} + v_t \text{ .... (3.13)}$$

Where: -1 <p <1

The autocorrelation healing in this model depends on the first two, if the p or the coefficient model AR (1) is known, the second if the model AR (1) is unknown but can be searched through estimation.

1) When the Autocorrelation structure is known:

In this case, the autocorrelation healing can be performed by the transformation of the equation known as the generalize difference equity method. To explain The method of method of generalizing difference equation in case of presence or absence of autocorrelation. For

example we have a simple regression model with its (e_t)

following the first autoregressive pattern (AR) as follows:

$$Y_t = \beta_{0+}\beta_1 X_t + e_t \quad \text{..} \quad (3.14)$$

$$e_t = Pe_{t-1} + v_t \quad \text{..} \quad (3.15)$$

Where: -1 <p <1

Residual v_t satisfies the residual assumption of

the OLS method ie E $v_t = 0$; var $v_t = \sigma^2$ and Cov $(v_t, v_t$

(t-1)) = 0. We substitute equation (3.14) to equation

(3.15) to give the following equation:

$$Y_t = \beta_{0+}\beta_1 X_t + Pe_{t-1} + v_t \quad \text{.................................} \quad (3.16)$$

Performs the first leg of equation (3.14) to obtain e_{t-1} as

follows:

$$Y_{t-1} = \beta_{0+}\beta_1 X_t + e_{t-1} \quad \text{......................................} \quad (3.17)$$

$$e_{t-1} = Ye_{t-1} - \beta_0 - \beta_1 X_{t-1} \quad \text{...............................} \quad (3.18)$$

Then we substitute equation (3.18) into equation

(3.17) to give the following equation:

$$Y_t = \beta_{0+}\beta_1 X_t + P(Y_{t-1} - \beta_0 - \beta_1 X_{t-1} + v_t \quad \text{......} \quad (3.19)$$

$$Y_t = -pY_{t-1} = \beta_0(1 - P) + \beta_1(X_t - pX_{t-1}) +$$

$$v_t \text{..} \quad (3.20)$$

Equation (3.20) can be written to be:

$$Y^*_t = \beta^*_{0+}\beta^*_1 X^*_t + v_t \quad \text{......................................} \quad (3.21)$$

Where:

$$Y^*_t = Y_t - pY_{t-1}; \beta^*_0 = \beta_0(1 - P); \beta^*_1 = \beta_1; X^*_t =$$

$$(X_t - pX_{t-1}) \text{...} (3.22)$$

Residual v_t in equations (3.22) is free from autocorrelation issues so that it meets OLS assumptions.

2) When the autocorrelation structure is unknown:

In the unrecorded autocorrelation structure is when it is difficult to know the value of p. There are several methods developed by econometric experts to estimate p value, as follows:

a) The first level of differentiation method The p value lies between $-1 \leq p \leq 1$. If the value $p = 0$ means no first-order residual correlation AR (1). But if the value $p = \pm 1$ then the model contains both positive and negative autocorrelation. When $p = \pm 1$, the autocorrelation problem can be sealed with the first-order differentiation of the generalized difference equation method. suppose we have a simple regression model as in (3.14) it can be described as follows:

$$Y_t = \beta_{0+}\beta_1 X_t + e_t$$

$$Y_t - pY_{t-1} = \beta_0 (1 - P) + \beta_1 (X_t - pX_{t-1}) +$$

$$(e_t - pe_{t-1}) \text{...}(3.23)$$

If p = + 1 then the equation can be rewritten to:

$$Y_t - Y_{t-1} = \beta_1 (X_t - pX_{t-1}) + (e_t - e_{t-1} \quad ....(3.24)$$

Or it can be written into the following equation:

Where Δ is the differentiation and

$$v_t = e_t - e_{t-1}$$

The residual v_t of equation ($) is now free of autocorrelation problems. This first difference can be applied if the autocorrelation coefficient is high enough or if the statistical value of DW (d) is very low. as rule of thumb if :

R-squared > d, then we can use First difference.

b) The estimation p is based on berenblutt-webb

c) The estimation p is based on the statistics d Dw

d) Estimate the two-step DW method

e) Estimation p by cochrane-orcutt method

f) Newey, whitney and kenneth methods

In this case, the researcher uses DW test whose data has been healed by AR method (1) to test whether there is autocorrelation.

2. Hypothesis Test

a. Multiple Regression Analysis

Multiple regression is a tool that can be used to create an analysis of the influence of various factors independent of the variable dependent (Basuki, 2017). Meanwhile, according to Winarno (2015) Multiple regression is a regression that is used to analyze the regression with one variable dependent and some independent variables. In this research will be used multiple regression analysis because of more than one independent variables. there are The Fed rate, Gold Price, Inflation and money supply as independent variable while JII as a dependent variable.

The general formula of regression equation as follows (Widarjono, 2013):

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_1 \quad \text{...} \quad (3.25)$$

$$JII = a + b_1 TFR + b_2 GP + b_3 INF + b_4 M2 + e \text{...........} \quad (3.26)$$

In this study, the receptions using the first different because the data consists of percentage data (the number of relatively small data numbers) and amount or million data (the numbers in the data relative large orto much) the small data data such as The fed rate (TFR) and Inflation (INF) because the percentage of data is relatively small then there is no need to log. While the numbers of

data that amount or million such as JII, Gold Price and M2, So this data requires logs. The equations are as below:

$$\text{Log(JII)} = a + b_1\text{TFR} + \text{Log}(b_2\text{GP}) + b_3\text{ INF} +$$

$$\text{Log}(b_4\text{ M2}) + e \quad .... \quad (3.27)$$

Information :

JII : Jakarta Islamic Index

A : Constants

$b_1, b_2, b_3 b_4,$: Regression coefficients

TFR : The Fed rate

GP : Gold Price

INF : Inflation

M2 : Money Supply

e : Error term

b. Partial Test (T Test)

    According to Ghazali, (2013) the T test essentially aims to show how far the influence of an individual explanatory or independent variable in explaining the dependent variable. The hypothesis formulation is used as follows:

Ho : The independent variable does not affect the significance of the dependent variable.

Ha : Independent variables significantly influence the dependent variable.

The test criteria as follows:

Ho is accepted if the significance level > 0.05 (5%)

Ha is accepted if the level of significance <0.05 (5%)

Basuki (2017) calculates the value of t arithmetic for independent variables (in this case β_1 and β_2) and looks for the critical t value of the table t with the formula as follows:

$$t = \frac{\beta\prime_i - \beta*_1}{se(\beta\prime_1)} \text{...} \quad (3.28)$$

Where $\beta *_1$ merupakan nilai dari pada hipotesis nol.

c. Simultaneous Test (F Test)

According to Ghazali, (2013) the F test is basically aimed to show whether all independent or independent variables included in the model have a mutual influence on dependent or dependent variables. Test F is done by using the value of significance. The hypothesis formula is as follows:

The test performance as follows:

Ho : The independent variable simultaneously has no effect on the dependent variable.

Ha : Independent variables simultaneously affect the dependent variable.

Ho accepted if the significance level> 0.05 (5%)

Ha is accepted if the level of significance <0.05 (5%)

Basuki (2017), F test can be used with Analysis of Varian (ANOVA). Here is the exposure to the test formula F:

TSS= ESS +RSS .... (3.29)

TSS has df = n-1, ESS has df of k-1 whereas RSS has df = n-k. With the hypothesis that all independent variables have no effect on the dependent variable ie $\beta_1 = \beta_2 .... \beta_k = 0$ then the F test can be formulated as follows:

$$F = \frac{ESS/(k-1)}{RSS/(n-1)}$$ .... (3.30)

Where

n = number of observations and

k = number of estimation parameters including intercepts or constants.

This F statistic test formula can be compared with other formulas by manipulating equation (3.30) that is:

$$F = \frac{ESS/(k-1)}{(TSS-ESS)/(n-k)} \text{...} (3.31)$$

$$F = \frac{ESS/TSS(k-1)}{(TSS-ESS/TSS)/(n-k)}\text{...} (3.32)$$

Because EES/TSS is R^2 then equation (3.32) can be written as

follows:

$$F = \frac{R^2/(k-1)}{1-R^2/(n-k)} \text{...} (3.33)$$

d. Determination Coefficient Test R^2

According to Ghazali, (2013), the coefficient of determination R^2 measures the extent of the model's ability to explain the variation of the dependent variable. The small value of R^2 means the ability of the independent variable to explain the variation of the dependent variable is very limited. A value close to one means that the independent variable provides almost all the information needed to predict the variation of the dependent variable. In this study, the measurement uses R^2 because it is more accurate to evaluate the regression model.

Basuki (2017) The formula of Coefficient of Determination Test R^2 as follows:

$$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}$$ .... (3.34)

$$= 1 - \frac{(\sum \grave{e}_i^2)}{(\sum y_i^2)}$$ .... (3.35)

$$= 1 - \frac{(\sum \grave{e}_i^2)}{\sum (Y_i - Y\prime_i)^2}$$ .... (3.36)