

CHAPTER III

METHODOLOGY

3.1. Types and data sources

Based on the level of exploration, this study goes to a multivariate study, which uses more than one variable. The variables consist of one dependent variable and six independent variables (J Supranto, 2003).

Moreover, it is also a quantitative nature which has the characteristics data in the form of numbers, it is oriented to see the relationship between variables, theory testing, and look for generalizations that have predictive value (Idrus, 2009).

3.2. Data description

In this research using secondary data from 2009 to 2018, it was obtained from the various sources such as Central Statistics Agency (BPS), central Bank Indonesia (SEKI), Financial Services Authority (FSA) and other sources related to this research.

3.3. Dependent variable and measurement

a. Money demand (M2) :

In researching the demand for money, it is difficult to calculate the amount of money demand in society. Assuming the money market in equilibrium which means the money demand equals money supply. Thus, it is used as a proxy for money demand. The definition of money used in Indonesia consists of M1 and M2.

M1 is money in the narrow sense of currency and demand deposit, people use M1 for transaction purposes. M2 is money in the broadest sense. In its current development, the use of non-cash money is growing. Even cash-based non-cash cards like cards are getting liquid and closer to narrower meaning money. In this research will be used money in a broad sense (M2). This research will use M2 as a measure of the money supply that includes all elements of M1. The dependent variable money demand (Y) used by (Amir Kia and Ali F Darrat (2004) and (Ibrahim L Awad and Alaa M Soliman (2016).

3.4. Independent variable

The independent variable are as follows:

a. Industrial production index (IPI) :

The industrial production index (IPI) is an index which shows the growth rates in different industry groups of the economy in a stipulated period of time. The index is computed and published by the central statistical organization (CSO) on a monthly basis. Industrial production index (IPI) is a composite indicator that measures the growth rate of industry groups classified under: first, Broad sectors, namely, mining, manufacturing and electricity. second, use-based sectors, namely Basic Goods, Capital Goods and Intermediate Goods. The federal reserve board (FRB) publishes the industrial production index (IPI) at the middle of every month, and revisions to previous estimates are released at the end of every March. The more people the more needs that must be met, the increase in production activities increase market demand. The increase in industrial production activity is reflected

in the industrial production index. The higher the level of production of an industry, the right management is needed to continue to meet consumer needs.

b. Inflation :

Mankiw (2007), defines inflation as an increase in the level of overall prices in the economy. While Rodoni (2008), defining inflation is a situation where there is an increase in prices continuously. Inflation is an economic shock that is very interesting to note. Inflation is a problem that always gets the attention of the government. The aim is to keep the inflation rate at a very low level. The inflation calculation used in this study is to use CPI. CPI is a calculation of the average price change in a period, from a collection of goods and services consumed by the household population in a certain period of time. This index is one of the economic indicators that can generally describe the level of inflation or deflation in the prices of goods and services (www.bps.go.id). When inflation occurs money demand in the society will be increasing thus, the currency decrease. The relationship between inflation and money demand is positive. If the inflation rise, then money demand will be raised and vice versa.

c. Interest rate :

The interest rate is the amount a lender charges for the use of assets expressed as a percentage of the principal. The interest rate is typically noted on an annual basis known as the annual percentage rate. The assets borrowed could include cash, consumer goods, or large assets such as a vehicle or building. Interest rates also show the return received on saving money in the bank or from an asset like a government bond. The total interest on an amount lent or borrowed depends

on the principal sum, the interest rate, the compounding frequency, and the length of time over which it is lent, deposited or borrowed. It is defined as the proportion of an amount loaned which a lender charges as interest to the borrower. It is the rate a bank or other lender charges to borrow its money, or the rate a bank pays its savers for keeping money in an account.

The central bank base rate is the interest rate which the central bank lend money to the commercial banks, this base rate is the most important interest rate because it tends to influence into the other interest rate in the economy. If the central bank increases the base rate, commercial banks find it more expensive to borrow from the central bank. Therefore, they pass this onto their consumers. Indirectly, the central bank rate affects all interest rates in the economy from mortgage rates to the saving rate you get in a savings account. Interest rates are a benchmark of a country's financial activities impacting on the circulation of banking financial flows, changes, investments and currency movements in a country. Required by large countries such as America, the United Kingdom and countries that are members of the European Union are the countries that have the largest currencies in exchange transactions. Economic activity that occurs in countries has a fundamental influence on the improvement of the world.

The amount of money spent is positively related to Indonesia's economic growth. This means that the more money spent, the more Indonesia's economic growth will increase. the amount of money has a positive and significant impact on economic growth. Based on Keynes's hypothesis, that is, the supply of money has a positive influence on output and economic growth. When excess money is issued,

Bank Indonesia will adopt a policy to raise or lower interest rates. This condition encourages investors to make investments, which will ultimately result in increased output and support economic growth. money demand will have a negative relationship to output, money demand will increase at the interest rate and ultimately result in a decrease in output. The stability of the value of the currency, Bank Indonesia as a monetary authority is given some authority in carrying out its duties. By formulating and implementing monetary policy to control money and interest rates in order to support it can support the goal of stability, the value of money should not be done flexibly. This will complicate and cause economic activities to become constrained and lethargic if Bank Indonesia intervenes too much in terms of controlling the amount of money spent. Reject, change money and interest rates should not be questioned too much because it will not maintain the value of money, which will encourage the decline of public confidence and make business plans for entrepreneurs difficult. The results of the analysis and evaluation carried out by the central bank will then be used in good monetary policy through the calculation of the amount of money spent and interest rates.

A research was done by Hasanah et al (2008). Shows that the shocks in interest rate caused the negative relationship to the money demand. The study said interest rate gave an impact of about 20% in the behaviour of money demand. Therefore, money demand affected by the volatility of interest rate.

d. Equivalent rate:

Equivalent rate is the rate of return from an investment or fund raising by a bank. Equivalent rate also means the rate of return on investment that has been

invested. The role of the equivalent rate is the same as the interest in conventional banks, which gives an idea of how much the return on investment is invested. The equivalent rate is calculated at the end of every month after the investment carried out yields. Customers can find out the amount of equivalent rates of a bank last month, to estimate equivalent rate in the following month. One important role of a bank is the ability to collect third party funds, in the form of savings, deposits, or current accounts. In this case, Islamic banks use the profit sharing ratio instrument which is stated as equivalent rate.

Equivalent instruments in Islamic banks differ from interest. Conventional banks compete very competitive in setting deposit rates, to attract prospective customers. the distribution of profits is determined at the beginning by calculating the amount of interest expense from funds deposited or borrowed and is greatly influenced by interest rates. The higher interest rates will be followed by rising deposit and loan interest rates. In its application, it is not allowed to equate the profit sharing with the equivalent rate, unless it is a past result. For example, a Sharia Bank stated that the profit sharing for the previous month was equal to 12%, but it still could not determine the profit sharing amount in the coming month. If the profit sharing ratio is for example 60:40, the results of future revenue sharing may be less or more than 12%, it all depends on the income of Islamic banks. This is a common practice in Indonesian Islamic banks. Naming equivalent rates to facilitate customers in estimating the profit sharing, and not the results. If the equivalent rate is equal to the profit sharing of future results, means that it has been confirmed at the beginning and that means usury. Accordingly, the equivalent value

is a calculation for results by converting profit sharing for each of the third party fund products in the form of a percentage.

e. Exchange rate

An exchange rate is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency. For example, an interbank exchange rate of Indonesia rupiah to the United States dollar means that Rp.13.000 will be exchanged for each US\$1 or that US\$1 will be exchanged for each Rp.13000. In this case it is said that the price of a dollar in relation to Indonesia is Rp.13000, or equivalently that the price of a rupiah in relation to dollars is \$1/13000. The government has the authority to change exchange rate when needed. Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers, and where currency trading is continuous: 24 hours a day except weekends, i.e. trading from 20:15 GMT on Sunday until 22:00 GMT Friday.

The spot exchange rate refers to the current exchange rate. The forward exchange rate refers to an exchange rate that is quoted and traded today but for delivery and payment on a specific future date. In the retail currency exchange market, different buying and selling rates will be quoted by money dealers. Most trades are to or from the local currency. The buying rate is the rate at which money dealers will buy foreign currency, and the selling rate is the rate at which they will sell that currency. The quoted rates will incorporate an allowance for a dealer's margin (or profit) in trading, or else the margin may be recovered in the form of a commission or in some other way. Different rates may also be quoted for cash, a

documentary form or electronically. The higher rate on documentary transactions has been justified as compensating for the additional time and cost of clearing the document. On the other hand, cash is available for resale immediately, but brings security, storage, and transportation costs, and the cost of tying up capital in a stock of banknotes (bills).

f. Third party fund (DPK) :

According to Lukman Dendawijaya (2009: 24), third party fund is as follows: Third party funds are originating from the community, the largest source of funds that the bank relied on. Banks can utilize these funds into income by channelling them to the public in the form of financing. The greater the income generated by banks means the greater the opportunity for banks to generate profits. Thus, banks will be increasingly interested in increasing the amount of distribution of funds to the society.

3.5. Method of data analysis

The research used an error correction model (ECM), which is an error correction model belongs to a category of multiple time series models most commonly used for data where the underlying variables have a long-run stochastic trend, also known as a co-integration. Error correction model (ECM) is an approach useful for estimating short-term and long-term effects of one-time series on another. The term error-correction relates to the fact that last-periods deviation from a long-run equilibrium, the error, influences its short-run dynamics. Thus, error correction

model (ECM) directly estimates the speed at which a dependent variable returns to equilibrium after a change in other variables.

3.6. Technique of analysis data

At this stage will be through various tests, testing the data are as follows:

3.6.1. Test data behavior

Data behaviour test is a test performed on time series data before modelling, this test includes a stationarity test, integration degree test, and cointegration test. The data behaviour test is done to see the linearity of the data that shows the model specifications and stationary or not the data at the level that shows a balanced or not related in the short term and to see a long-term relationship in the research data. The stages of testing this data behavior are:

3.6.2. Stationarity test

A random or stochastic process is a collection of random variables in the order of time. Every time series data that we have is data from the results of the stochastic process. A data from a random process is said to be stationary if it meets the criteria, namely: if the average and constant variants over time and covariance between the two-time series data only depend on the lag between two specific time periods (Widarjono, 2009: 354).

Stationary data basically does not have a large variation during the observation period and has a tendency to approach the average value (Insukindro, 2001: 121). To view stationary data or not, in the research using a unit root test. If the unit root test results show that the data has not been stationary at the level, the

research data will be carried out at the first level of differentiation until the data becomes stationary (integration degree test) and free from taper regression.

3.6.3. Unit root test

The unit root test is a formal test and was introduced by David Dickey and Wayne Fuller. According to Nachrowi (2006: 353), to facilitate understanding of the unit root test, it is necessary to understand the following models:

$$Y_t = \rho Y_{t-1} + u_t$$

If $\rho = 1$, then the model becomes a random walk without a trend. Here it will face a problem where the Y_t variant is not stationary. Thus, Y_t can be called having a root unit or data not stationary.

Unit root testing aims to find out whether the data used is stationary or not. Data can be said to be stationary if it does not contain unit roots and vice versa. It can be done with the Dickey-Fuller test and the Philips-Peron (PP) test which is part of the unit root test. To find out whether it is containing of unit root, the research using Augmented Dick-Fuller test. The advantage of this method is to assume that the process of forming an error term of a variable does not follow a certain function. This means that the ADF test procedure can be widely applied as long as there is no obligation to assume that the error term has a certain functional form. ADF testing includes the element of autocorrelation in the disturbance variable by entering an independent variable in the form of differentiation lag (Widarjono, 2009: 322) and can be formulated as follows:

$$\Delta Y_t = \gamma Y_{t-1} + e_t \dots \dots \dots (1)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + e_t \dots \dots \dots (2)$$

The hypothesis used in this test is:

Ho: $\gamma = 0$ = data is not stationary

H1: $\gamma \neq 0$ = data is stationary

The above hypothesis explains that if the Augmented Dicky-Fuller test results state that the ADF statistic value is more negative or greater than the critical value at a certain degree of trust ($\alpha = 1\%$, 5% , and 10%), the null hypothesis that data it is not stationary rejected. And vice versa, if the ADF statistic value is smaller on the critical value at a certain degree of trust ($\alpha = 1\%$, 5% , and 10%), then the null hypothesis is accepted. If it is known that the data is not stationary, then the data must be stationary through the process of data differentiation, otherwise known as the degree of integration test.

3.6.4. Integration test

Testing the degree of integration can be done if stationarity using the unit root test at the level indicates that the data is not stationary, so it needs to be stationary by differentiating the research variable data. As the unit root test above, even the integration degree test is seen using the Augmented Dicky-Fuller test with a basic formulation:

$$\Delta^2 Y_t = y \Delta Y_{t-1} + e_t \dots \dots \dots (3)$$

$$\Delta^2 Y_t = a_0 + y \Delta Y_{t-1} + e_t \dots \dots \dots (4)$$

$$\Delta^2 Y_t = a_0 + a_1 T + y \Delta Y_{t-1} + e_t \dots \dots \dots (5)$$

where :

$$\Delta^2 Y_t = \Delta Y_t - \Delta Y_{t-1} \dots \dots \dots (6)$$

As in the previous unit root test, the decision on the degree to which data will be stationary can be seen by comparing the ADF (PP) statistical value obtained from the coefficient γ with the critical value of the Mackinnon statistical distribution (A. Widarjono, 2009: 324). With the hypothesis:

Ho: $\gamma = 0 = \text{ADF (PP) value} < \text{Critical value} = \text{data not stationary}$
H1: $\gamma \neq 0 = \text{ADF (PP) value} > \text{Critical value} = \text{stationary data}.$

If the ADF (PP) statistic value is greater or more negative than the critical value (critical value) on the first level differentiation (first difference) then H0 is rejected, meaning that the data is stationary. However, if the ADF (PP) statistic value is smaller than the critical value at the first level differentiation then H0 is accepted and shows that the data is not stationary at first difference, so the higher difference needs to be done so that the data becomes stationary.

3.6.5. Cointegration test

Cointegration test is closely related to testing the possibility of a long-term equilibrium relationship between economic variables as desired by economic theory (Insukindro, 2001: 121). The cointegration test of two or more-time series data shows that there is a long term relationship between them. Time series data can be said to be cointegrated if the residue from the regression level is stationary, then the regression level will provide the right estimate for the long-term relationship.

To find out whether a model has cointegration or not, it can be done by running the test as follows: (a). Johansen test, (b). CRDW test and (c) EG test.

In this study, to find out whether there is cointegration or not, it can be done by the Engle-Granger (EG) test or the Augmented Engle-Granger test, which is testing using the Augmented Dicky-Fuller Test by estimating the regression model then calculating the residual value. If the residual value is stationary, the regression is a cointegration regression (Nachrowi, 2006: 367). In other words, the Augmented Dicky Fuller test of the residual value produces an estimate of the ADF statistical value then compared with the critical value.

The testing processes are as follows:

- Estimating the regression model
- Look for the residual value and calculate it

After obtaining the residual value, the DF-ADF test will be conducted which is the Engle-Granger test to obtain the results of whether the research model is cointegrated or not, then the hypothesis used is as follows:

$H_0 = \text{ADF value} < \text{Critical Value} = \text{uncointegrated model}$
 $H_1 = \text{ADF value} > \text{Critical Value} = \text{cointegrated model}.$

3.7. Classic assumption test

Testing classical assumptions to find out the results of the regression analysis fulfill the best linear unbiased estimator (BLUE) criteria. The classic assumption test consists of heteroscedasticity test, autocorrelation test, multicollinearity test, and normality test.

3.7.1. Multicollinearity test

One classic assumption test is the absence of a linear relationship between independent variables. The relationship between independent variables in one regression called multicollinearity (Widarjono, 2009: 103). Thus, it can be interpreted as a linear relationship between independent variables that occur in a regression. The occurrence of multicollinearity in a research regression result is unavoidable, which means it is difficult to find two independent variables that mathematically not correlate even though the substance is uncorrelated.

Multicollinearity is a situation where there is a correlation of independent variables between one another. A linear relationship between independent variables can occur in the form of a perfect linear relationship and imperfect linear relations. One way to detect the presence or absence of multicollinearity is by correlation testing. In the correlation test, we test multicollinearity simply by looking at the relationship individually between one independent variable with one other independent variable. But multicollinearity can also arise because one or more independent variables are linear combinations with other independent variables. In this study, the researcher will multiply by combining the correlation coefficients between independent variables. As a rule (rule of thumb), if the correlation coefficient is quite high above 0.85, it is assumed that there is multicollinearity in the model. Conversely, if the correlation coefficient is relatively low, it is assumed that the model does not contain multicollinearity.

3.7.2. Heteroscedasticity test

It aims to test whether the regression model there is an inequality in the standard deviation of the value of the dependent variable on each independent variable. One of the important assumptions of OLS is that the variance of residuals is constant. But in reality, often residual variants are not constant or called heteroscedasticity. Heteroscedasticity usually found in cross-section data. Meanwhile, time series data rarely contain elements of heteroscedasticity, because when analyzing the behaviour of the same data from time to time the fluctuations will be relatively more stable (Widarjono, 2009: 146).

To identify the presence or absence of heteroscedasticity, it can be done with various tests below, namely:

- Graph Method
- Arch Test
- Glejser test
- Spearman Correlation Test
- Goldfeld-Quandt test
- Bruesch-Pagan-Godfrey test
- White test.

From what was described above, to detect the presence or absence of heteroscedasticity in the model, researchers used the White test.

3.7.3. Autocorrelation test

Literally, autocorrelation means that there is a correlation between members of the observation one with other observations of different times. In relation to the OLS method assumption, autocorrelation is a correlation between one residual and another residual. Whereas one of the important assumptions of the OLS method relating to residuals is the absence of a relationship between one residual and another residual (Widarjono, 2009: 177).

To identify on a model whether there is autocorrelation or cannot use the Durbin-Watson Test, which is one of the many tests used to determine whether or not there is autocorrelation, Durbin Watson is denoted by d , this value will be in the range 0 - 4, decision making on Durbin Watson namely:

- If $(d_u) > DW$ $(4-d_u)$ then the autocorrelation coefficient is zero, meaning there is no autocorrelation.
- If $DW < d_l$, then the autocorrelation coefficient is greater than zero, meaning there is positive autocorrelation.
- If $DW > (4-d_l)$, then the autocorrelation coefficient is smaller than zero meaning there is negative autocorrelation.
- When $(d_u) > DW > (4-d_u)$ or $(4-d_l) > DW > (4-d_l)$, then the result cannot be concluded.

In addition, the Breusch-Godfrey Serial Correlation LM test can be used to determine whether or not autocorrelation exists. If the probability Obs value * R-squared is greater than the real level, there is no autocorrelation in the model. But if

the probability Obs value * R-squared is smaller than the real level, there is autocorrelation in the model.

3.7.4. Normality test

The significance test of the effect of independent variables on the dependent variable through the t-test will only be valid if the residuals obtained are normally distributed. There are several methods that can be used to detect whether the residual has a normal distribution. One of them is the Jarque-Bera test method. The residual normality test of the OLS method can be formally detected from the method developed by Jarque-Bera (J-B). JB method is based on large samples which are assumed to be asymptotic. The statistical test from JB uses skewness and kurtosis.

If the residual is normally distributed, it is expected that the JB statistical value will be equal to zero. JB's statistical value is based on the distribution of chi squares with degrees of freedom (df) = 2. If the probability value p is large or the statistical value of JB is not significant, it fails to reject the hypothesis, the residual has a normal distribution because JB's statistical value approaches zero. Conversely, if the probability value p of the JB statistic is small or significant, then we reject the hypothesis that the residual has an abnormal distribution because the JB statistical value is not equal to zero.

3.8. Error correction model test (ECM)

Error Correction Model is a testing method that can be used to find a balance model in the long run. To state whether the ECM model used valid or not, the Error Correction Term (ECT) coefficient must be significant. If this coefficient is not significant, then the model is not suitable and further specifications need to be changed. (Insukindro, 1993: 12-16). Error correction model used to see the long-term and short-term effects of each independent variable on the dependent variable. According to Sargan, Engel, and Granger, ECM is a technique to correct short-term imbalances towards long-term equilibrium and can explain the relationship between dependent variables and independent variables at present and past time.

In this research, the error correction model (ECM) used has been freed through the stationarity test, integration degree test, cointegration test and classic assumption test, so that the ECM model is feasible to use and analyze. The analysis aims to determine the effect of independent variables on the dependent variable in the short term and long term. The process of an appropriate ECM model is used in this research, to find out the relationships short and long term, the econometric models are as follows:

$$DM2 = a + \beta_1 DINF + \beta_2 IPI + \beta_3 DEX.RATE + \beta_4 DEQ.RATE + \beta_5 DINT.RATE + \beta_6 DDPK + \beta_7 ECT$$

Explanation:

a = Constanta

β = Regression Coefficient

DM2 = $M2 - M2_{t-1}$ (money demand indonesia)

D(INF) = $INF - INF_{t-1}$ (Inflation)

$DIPI = IPI - IPI_{t-1}$ (industrial production index)
 $DEX.RATE = EX. RATE - EX. RATE_{t-1}$ (exchange rate)
 $DEQ. RATE = EQ. RATE - EQ. RATE_{t-1}$ (equivalent rate as a proxy of profit sharing)
 $DINT. RATE = INT. RATE - INT. RATE_{t-1}$ (Interest rate)
 $DDPK = DPK - DPK_{t-1}$ (total of third party fund)
 $ECT =$ error correction term

a. “t “ test

The t test is a test of the independent variables partially (individually) carried out to see the significance of the effect of individual independent variables on the dependent variable. In this study the authors used a one-sided hypothesis test, because it has a theoretical basis or a strong guess on the relationship of each variable. the following forms of hypothesis testing:

$H_0: \beta_1 = 0$: means that the independent variable has no effect on the dependent variable.

$H_a: \beta_1 \neq 0$: means that the independent variable has an effect on the dependent variable.

Then the decision made with α (probability of rejecting the correct hypothesis) 5% is:

- 1) if the value of t count > t table value then H_0 is rejected and accepts H_a , meaning that the independent variable has an effect on the dependent variable.

- 2) if the value of $t_{\text{count}} < t_{\text{table}}$ value then H_0 is accepted and reject H_a , meaning that the independent variable does not affect the dependent variable.

b. F test

The F test is a test to see the effect of independent variables together on the dependent variable. The method of testing is almost the same as the t test:

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$: meaning that the independent variables have no effect on the dependent variable simultaneously

$H_a: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$: meaning that the independent variables have an effect on the dependent variable simultaneously. Hence, the decision made with α (probability of rejecting the correct hypothesis) 5% is:

1. if the value of $F_{\text{calculate}} > \text{value of } F_{\text{table}}$ then H_0 is rejected or accepts H_1 means that the independent variables have an effect on the dependent variable simultaneously.
2. if the value of $F_{\text{calculate}} < \text{value of } F_{\text{table}}$ then H_0 is accepted or rejects H_1 . In this case it means, the independent variables have no effect on the dependent variable simultaneously.

c. Coefficient of Determination (R^2)

is used to calculate the total percentage of the dependent variable explained by the independent variables. In other words, the regression coefficient explains how regression lines are formed conferring to the data (Widarjono, 2009: 38).