

CHAPTER III

RESEARCH METHOD

A. Type of Research

This research use quantitative approach that emphasizes on hypotheses testing. According to Greener & Martelli (2015:22), quantitative is likely to be associated with a deductive approach to testing theory, often using number or fact and therefore a positivist or natural science model, and an objectivist view of the objects studied. Examining the impact of political event that is British Exit on GBP against US Dollar and US Dollar against Rupiah the event study methodology was used by researcher.

Event study refers to measure the impact of economic and political event (Baldas, Oran: 2014). Besides the event study methodology used, researcher will explore the volatility of exchange rate around the observation period by using ARCH-GARCH model. By using two instruments research, researcher will find the effect of political event on Poundsterling (GBP) against US Dollar, US Dollar against Rupiah and also explore the exchange rate volatility.

In the event study methodology, several periods are used. The periods are estimation period and event window which are consist of pre event, event, post event. The period of event window is ranging from 3 days to 121 days for daily data and 3 months to 121 months for monthly data (Nainggolan, 2010). There is no fixed standard in determining the event window, whether in journals or books. According to Jogiyanto (2009:418):

The length of the event window depends on the type of event. If the event is an event whose economic value can be determined easily (e.g. earning announcement, dividend announcement), the period chosen can be short due to how fast the reaction is. On the contrary for event whose economic value is difficult to define by investor, the window period may be long, for ex: merger announcement.

The even period that is used in this research is fifty days before and fifty days after British exit. The long event period is chosen with determining the global effect of this event. Because United Kingdom not only has the relation with European Union, but also has multilateral relationship with several countries in the world whether in economic, politic and also social relationship. According to research that was done by PwC UK (2016) shows the several future effects that might be realized by United Kingdom:

- 1) In the short-term following a UK vote to leave the EU, there is likely to be significant economic and political uncertainty around the UK's future relationship with other EU countries if the UK voted to the EU. This because it would take at least two years, and perhaps more, before the post-exit relationship between the UK and the UK would be clarified in relation to trade and other matters.
- 2) This uncertainty would be likely to manifest itself in increased financial market and exchange rate volatility, higher risk premia in credit and equity markets, and possible consequential impacts on business confidence and investment.
- 3) A vote to leave the EU would create economic and political uncertainty that could last for several years while the UK government negotiates the term of its exit from the EU as well as new trade arrangements with non-EU countries. The uncertainty is modeled through increased risk premia on the cost of capital that are estimated to have the largest economic impact in the short-term, with UK GDP around 2-2.5% lower in 020 n the two scenarios due to uncertainty. However, by 2030, the impact should be have almost entirely reduced as we assume the terms of the UK's post-exit relationship with the EU and other countries would by then have been agreed and had time to bed down.

B. Location of Research

Research was done by documenting the data sample from websites those are <http://www.bloomberg.com/> and another website that gives the daily, weekly, monthly data about rate, where these websites as the world trusted currency authority. Bloomberg.com is telecommunication media which provide the information especially for financial and business information. Bloomberg also provide data and news that usually used for analyst and also investor in order to get some information related with business and financial. This website is chosen because it provides the complete historical data and diagram about exchange rate movement. All of the movements of daily exchange rate, weekly, monthly are provided on those websites, so researcher will get accurate data to calculate the variables in this research.

C. Research Population and Sample

1. Population

Research population is the whole of research object (Subagyo, 2013: 5). Research population in this research is the closing price data of daily foreign exchange rate movements from January to December 2016.

2. Sample

Research sample was taken of whole research object that is considered as representative of all population, which is taken with certain technic Ali, 1985: 54 in Taniredja, Mustafidah (2011). Sample also means part of population, or small group observed (Furqon, 2005: 193). Samples of this

research are daily exchange rate of Poundsterling (GBP) against US Dollar and US Dollar against Rupiah from 5 work days (Monday to Friday).

Purposive sampling was used to determine the sample. This is technique that allows the researcher to use cases which have the required information with respect to the objectives of the study (Mugenda & Mugenda, 2003). US Dollar and Rupiah are selected as sample because:

- a. US Dollar in the most liquid currencies in the world (Bank of International settlement, 2013) and also number one in most used currencies in international trade (Liputan6.com news, 2015).
- b. United State is country which most aimed for goods export of United Kingdom, and it is means that the exchange of currency with another currency is more often.
- c. Rupiah is chosen because the appreciation of US Dollar Value will give impacts on Rupiah currencies, because US Dollar is one of safe asset intended by investor and also trader especially in unstable condition.

D. Concept, Research Variable and Measurement

1. Concept

According to Effendi in Singarimbun and Effendi (ed. 1995) concept and definitions is a term used to describe in the abstract occurrences, circumstances, of groups or individuals who became the center of attention of the social sciences. After the concept formulated it will be examined appropriately and can be executed. The concepts used in this research are:

a. Political event

Political event is event that occurs in a certain place during a particular interval of time in term of politic decision that lead on political event. Some of political event can caused the effect which can be interpreted as risk.

b. Exchange rate volatility

Exchange rate volatility is a fluctuate movement of one currencies against another currencies. Exchange rate volatility is simply the standard deviation of the error term (Frankel and Rose, 1995; Rogoff, 1999, p. F655–F659).

2. Variable

According to Hatch and Farhady in Sugiyono (2007) said that variable is the attribute of a person or object that have variation from one person to another or one object with another object. According to Creswell (2009:50), a variable refers to a characteristics or attributes of an individual or an organization that can be measured or observed and that varies among the people or organization being studied. Based on the concept, it can be mentioned the variables of concept, that are:

a. British Exit Event (Political event)

The political event that was used in this research is British Exit. British exit. British Ext is event that happened in 23rd June, 2016. This event resulted from voted of British people to exit European Union (EU).

b. Daily Closing Price of exchange rate

1. Poundsterling (GBP) against US Dollar

Poundsterling (GBP) against US Dollar means the amount of value or price of that Poundsterling (GBP) needed to get US Dollar currencies. For example GBP/USD 1.564 means that 1 Euro was exchanged for 1.564 US Dollar.

2. US Dollar against Rupiah

US Dollar against Rupiah means the amount of value or price of that US Dollar needed to get Rupiah (IDR) currencies. For example USD/IDR 13,450 means that 1 Dollar was exchanged for 13,450 Rupiah.

3. Operation Definition and Measurement

According to Effendi in Singarimbun and Effendi (ed. 1995) defines that “operational research element tells about how to measure a variable”. In order to examine the concept and turn into variables, the summary of Concept, variables and definition operation will be given in table 3.

Table 3 Concepts, Variables and Operation Definition and Measurement

No	Concepts	Variables	Indicator	Ratio
1	Political event	British Exit event		
2	Exchange rate volatility	Poundsterling (GBP) against US Dollar	Daily closing Price of Poundsterling (GBP) against US Dollar (GBP/USD)	Ratio Scale

		US Dollar against Rupiah.	Daily closing Price of US Dollar against Rupiah (USD/IDR)	Ratio Scale
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Source: Data Processed by researcher, June 2017

E. Data Collecting Technique

Documentation is technique using in this research. The nature of data collected was secondary data where secondary data is primary data which is processed into number, graphic, diagram, picture so the data will be informative for needed party. The data used in this research are daily closing price exchange rate of Poundsterling (GBP) against US Dollar and US Dollar against rupiah from January to December 2016. The data was collected from official website of www.bloomberg.com, where that website is place to trade and provide analyzing of the foreign exchange rate market.

F. Data Analysis Technique

This research uses two instrument researches in order to explore the change of Poundsterling (GBP) exchange rate movement against US Dollar and US Dollar against Rupiah. The first instrument is differences test, where the instrument used is paired sample test to describe the exchange rate differences before and after British exit. The second instrument is ARCH-GARCH model analysis to explore the volatility as instrument research in around the observation time. Steps in conduct the research as follows:

1. Descriptive Statistics Analysis

Descriptive statistical analysis has function to describe general picture of the data. There are two data that tested in this research, first is Poundsterling (GBP) against US Dollar and the second is US Dollar against Rupiah. Descriptive statistical analysis is consists of some information, that are mean, maximum value, minimum value, standard deviation, median and N (The amount of sample used in research).

2. Event Study Test to Measures the Level of Political Event Effect

Before conducting a paired sample test, the normality of the data should be tested. Kolmogorov Smirnov is instrument that is used to measure the normality level of the data in this research.

a. Normality Test

The basic concept of Kolmogorov Smirnov normality test is comparing the distribution of the data (which will be tested the normality level) with a standard normal distribution. Standard normal distribution is the data that has been transformed into Z-score form and it is assumed as a normal data. So, basically the Kolmogorov Smirnov normality test is difference test between distribution of the data (which will be tested the normality level) with Standard normal distribution. There are some steps in conducting the normality test (Ghozali, 2016:158), that are:

1) Formulate the Hypotheses

H_0 = The data does has normal distribution

H_1 = The data does not has normal distribution

2) Determining the level of significance

Significance level which is used in this research is 5% or 0.05 ($\alpha = 5\%$)

3) Making Test Criteria

- a. P value $\geq \alpha$ (0.05) means that data distribution is normal
- b. P value $< \alpha$ (0.05) means that data distribution is abnormal

4) Conclusion

- a) H_0 is accepted so H_a is rejected, it is means that the data have normal distribution and the researcher can continue to next step that is paired test by using paired sample test.
- b) H_0 is rejected so H_a is accepted, it is means that the data does not have normal distribution the researcher can continue to next paired test by using Wilcoxon paired test.

b. Paired Sample T-test

Paired sample test is used to measures two paired data samples. Two paired data samples have same subject but different treatment. Treatment in this research means the data before and after British Exit. This measurement is used to analyze the data with normal distribution. In this research, the data are analyzed before and after British exit. Steps in conduct Paired Samples Test as follows (Thoifah, 2015:133):

1) Formulate the Hypotheses

H_0 = There is no difference of exchange rate value before and after British Exit

H_1 = There is difference of exchange rate value before and after British Exit

2) Determining the level of significance

Significance level which is used in this research is 5% or 0.05 ($\alpha = 5\%$)

3) Making Test Criteria

a. H_0 is accepted and H_1 is rejected if T-calculation < T-table or Significance value > α

b. H_0 is rejected and H_1 is accepted if T-calculation > T-table or significance value < α

c. Measuring T-table

this research, T-table calculation comes from Table T as a manual measurement. The first step in finding the T-table is calculates the df (degree of freedom). The formula is describes below:

$$df = n - k, \alpha (5\%)$$

Source: Thoifah, 2015:94

Where:

df = T-table

n = amount of observation

k = amount of variable (dependent and independent)

4) Conclusion

a) H_0 is accepted so H_a is rejected, it means that there is no significance difference in exchange rate value (GBP against US Dollar and US Dollar against Rupiah) before and after British Exit.

b) H_0 is rejected so H_a is accepted, it means that there is significance difference in exchange rate value (GBP against US Dollar and US Dollar against Rupiah) before and after British Exit.

c. Wilcoxon Paired Test

Basically, the nature of this test is same with paired sample test. This test is used for the two paired data samples in not normal distribution. In this research, the data are analyzed before and after British exit. Steps in conduct Wilcoxon paired Test as follows Misbahudin and Hasan (2013:177):

1) Formulate the Hypotheses

H_0 = There is no difference of exchange rate value before and after British Exit

H_1 = There is difference of exchange rate value before and after British Exit

2) Determining the level of significance

Significance level which is used in this research is 5% or 0.05 (α =5%)

3) Making Test Criteria

H_0 is accepted if sig. (2-tailed) < Significant level (0.05)

H_0 is rejected if sig. (2-tailed) > Significant level (0.05)

4) Conclusion

a. H_0 is accepted so H_a is rejected, it means that there is no significance difference in exchange rate value (GBP against US Dollar and US Dollar against Rupiah) before and after British Exit.

b. H_0 is rejected so H_a is accepted, it means that there is significance difference in exchange rate value (GBP against US Dollar and US Dollar against Rupiah) before and after British Exit.

3. ARCH-GARCH Model Analysis to Explore the Exchange Rate Volatility

Economic time series data is often shows the high volatility, especially in financial sector data. The high volatility is showed by a phase where level of price is change randomly. Even the movement of price in financial market could move randomly in short-time period. The price is move from high price to low price, in another word is the average of financial data has not constant mean and variance.

The example of cases before economic crisis in 1990-1997 shows the relatively stable condition. But since 1997, the unstable economic condition made the movement of currencies value is fluctuates either the composite

stock price index indicates showed the fluctuation. The nature of financial data is unstable and it makes a researcher to estimates proper model and to predict the movement of each variables.

Therefore, in analyzing the behavior of time series data for financial sector like stock prices, exchange rates, inflation and other similar financial data require different method. Because in some cases, there are error in forecast the time series data. The variability is caused by data movement in financial market that are sensitive to change on economic variables such as monetary policy, fiscal policy, and non-economic variables like political uncertainty even that is just a rumor or news.

In order to explore the volatility of exchange rate data in this research, ARCH-GARCH approach is used. Especially the exchange rate data are around the British Exit event. According to Widarjono (2016:267) there are some steps in doing analysis using ARCH-GARCH approach, and will explain below. The steps are:

A. Plot of Time Series Data

The plot data analysis is used to observe the trend of the data. The plot data of time series data is also used as supporting data especially for fluctuating data. The plot data can show the increasing and decreasing data. Beside plot of time series data, ACF plot and PACF plot are also used as observe instrument for trend of the data.

B. Stationary test

Stationary test of return data on this research was done by using Augmented Dickey Fuller-test (ADF-test) and using Eviews software as a help. According to (Widarjono, 2016:305), the steps in conduct the stationary test are:

1) Formula of Augmented Dickey-Fuller (ADF) test

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + e_t$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + e_t$$

$$\Delta Y_t = \alpha_0 + \alpha_1 T + \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + e_t$$

Source: Widarjono, 2016

Where:

Y = Variable observed

$\Delta Y_t = Y_t - Y_{t-1}$

T = Trend of time

2) Formulate the Hypotheses

H_0 = The data is not stationer

H_1 = The data is stationer

3) Determining the level of significance

Besides using 5% as a level of significance, the level of critical value is used in Augmented Dickey Fuller-test (ADF-test) as data comparison which are distribution statistic Mackinnon at 1% level, 5% level and 10%.

4) Testing Criteria

Assessment criteria used to see whether the data examined is stationer or not, the requirement values that are used as comparison are:

- a. H_0 is rejected and H_1 is accepted when absolute statistic value $ADF > \text{critical value}$ where absolute statistic value comes from t value form coefficient.
- b. H_0 is accepted and H_1 is rejected when absolute statistic value $ADF < \text{critical value}$ where absolute statistic value comes from t value form coefficient.

5) Conclusion

- a. H_0 is rejected and H_1 is accepted, it is means that the data is stationer and the data does not needs adjustment by doing stationary test in difference level.
- b. H_0 is accepted and H_1 is rejected, it is means data is not stationer and needs adjustment until the data is stationer and could be processed the next steps. To make the data stationer, stationary test in difference level is made. The level of difference is depends on the data, whether the data is stationer or not. If the data was stationary in first difference level, so the process of differencing the data was done.

C. Identify ARMA-ARIMA model by Using Correlogram

ARMA model is used at the stationer data where data has been on average and constant co-variance and variances. But often the data time series stationer on the process of difference. Process of difference is the process of finding the data difference between periods of data with other periods respectively. ARIMA model used in time series data that is stationer on the level of difference.

The data which has stationer at level uses ARMA as model (p, q) , where p is AR level and q is MA level. For data stationer on difference process the model used is ARIMA (p, d, q) where d is process level make data become stationer. Basically the ARMA and ARIMA modeling process is the same. Steps to make ARMA and ARIMA model will describe below Widarjono (2016:269), those are:

a) Model Identification by using Correlogram

The method used for the selection of the model is analysis the correlogram where correlogram are consists of autocorrelation (ACF) and partial autocorrelation function (PACF). If the coefficient of ACF and PACF are decreasing slowly (exponential) then the suitable model is ARIMA.

The next steps after choosing some of tentative model is estimate the model by using least squares (NLS and ARMA). Tentative model could be formed into equation, that is:

$$DY_t = \beta_0 + \beta_1 ARY_{t-1} + \beta_1 MAe_{t-1}$$

Source: Widarjono, 2016

Where:

DY_t = Difference level of Dependent variable

β_0 = Coefficient of constanta

$\beta_1 ARY_{t-1}$ = Coefficient of AR

$\beta_1 MAe_{t-1}$ = Coefficient of MA

b) Selecting the Best of ARIMA Model

The best tentative model is based on goodness of fit where the level significant of independent variable through determinant coefficient value (R^2). The other criteria to measure the best model can be done by using the comparison of AIC (*Akaike Information Criterion*) where AIC is consist of real coefficient. AIC is criteria that provides the information and could be a measurement for the model efficiency. The best model is chosen based on the smallest AIC value (Nachrowi, 2006 : 129).

D. Detecting the Heteroskedasticity element by using ARCH-LM Test

Time series data are often experiencing volatility and cause the residual variance is not constant and changeable. It is also caused the data time series contain elements of heterocedasticity. To predict the volatility of residual variant it requires a special approach, such as autoregressive model conditionals heterocedasticity (ARCH) which evolved by Engle (1982). The model developed by Engle who assumed

that variance of the residual is not constant especially in time series data.

With simple regression as follows (Widarjono, 2016:289):

$$Y_t = \beta_0 + \beta_1 X_t + e_t$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \sigma_{t-1}^2 + \alpha_1 \sigma_{t-1}^2 + \alpha_p \sigma_{t-p}^2$$

Source: Widarjono, 2016

Where:

Y = Dependent Variable

X = Independent Variable

e = error variable

e_t^2 = Equation of error variable

Detecting the ARCH element is this research using Lagrange Multiplier test. The form of Lagrange Multiplier test as follows (Widarjono, 2016:333):

- a. Formulate the Hypotheses

H_0 = The data do not contain ARCH element

H_1 = The data contain ARCH element

- b. Determining the level of significance

Significance level which is used in this research is 5% or 0.05 ($\alpha = 5\%$)

- c. Testing Criteria

If the value of Probability chi-square $< \alpha$ so, H_0 is rejected and H_1 is accepted

If the value of Probability chi-square $> \alpha$ so, H_0 is accepted and H_1 is rejected

E. ARCH-GARCH Mode Estimation by using Maximum Likelihood

Later, the ARCH model of Engle (1982) was developed by Tim Bollerslev (1986). Tim state that the variance of error variable is not only depends on residual of past period, but also error variable of past period. This model is called Generalized Autoregressive Conditional heterocedasticity (GARCH). Estimating the ARCH-GARCH model should be over iterative process until the best model is obtained. This model can be estimated by using Maximum Likelihood method. The equation GARCH model as follows (Widarjono, 2016:295):

$$Y_t = \beta_0 + \beta_1 X_t + e_t$$

$$e_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \lambda_1 \sigma_{t-1}^2$$

Source: Widarjono, 2016

Where:

$$Y = \text{Dependent Variable}$$

$$X = \text{Independent Variable}$$

$$e = \text{Residual}$$

Generally, the GARCH model (p,q) can be equates as follows:

$$\sigma_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \dots + \alpha_p \sigma_{t-p}^2 + \lambda_1 \sigma_{t-1}^2 + \dots + \lambda_q \sigma_{t-q}^2$$

Where:

$$\sigma_t^2 = \text{Variance of residual}$$

$$p = \text{ARCH element}$$

$$q = \text{GARCH element}$$

F. Flow of Doing Research

Flow of doing research is provided the plot and how the researcher starts the research to prove the hypotheses by using some of measurement's instrument. First steps are collect data by using documentation technique, and then doing paired simple test. If the paired simple test proves the difference before and after event, the researcher tries to figure out the volatility by using ARCH/GARCH Model.

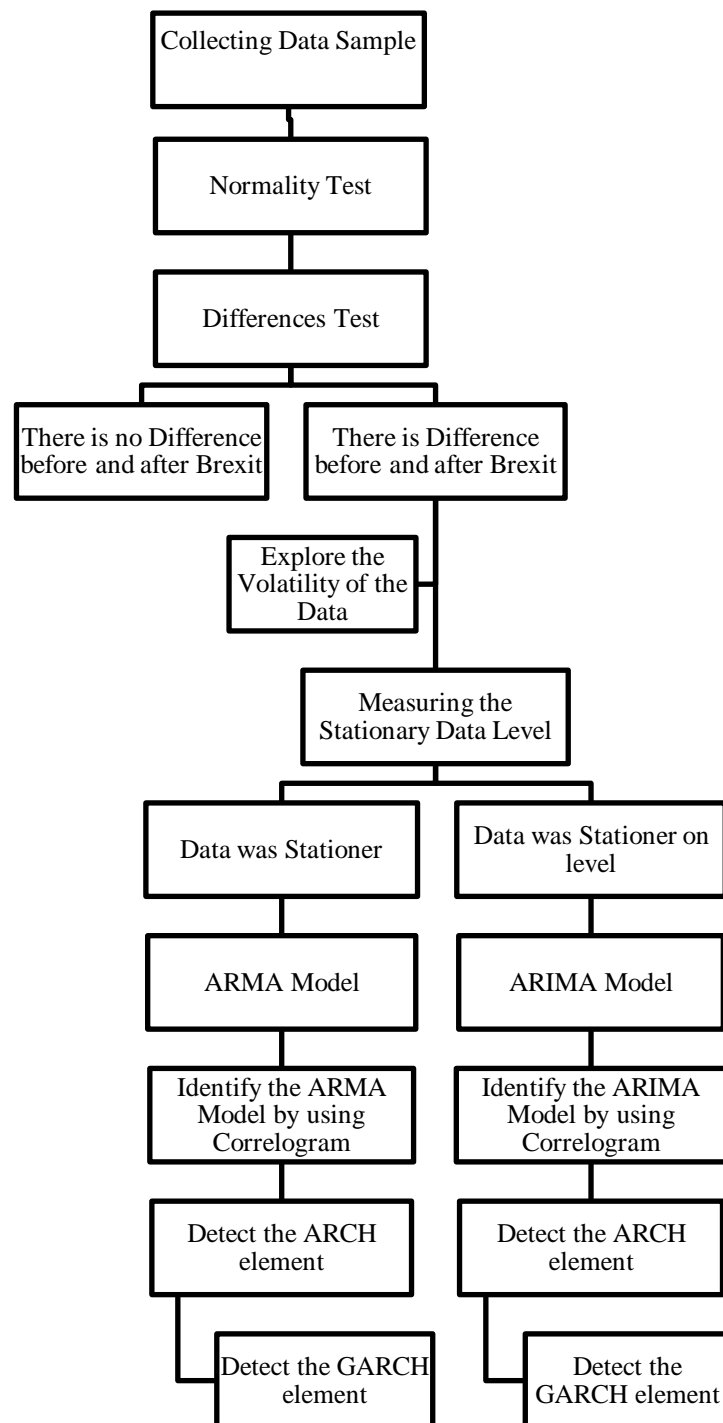


Figure 4 Flow of Research

Source: Data processed by Researcher, June 2017