CHAPTER 3

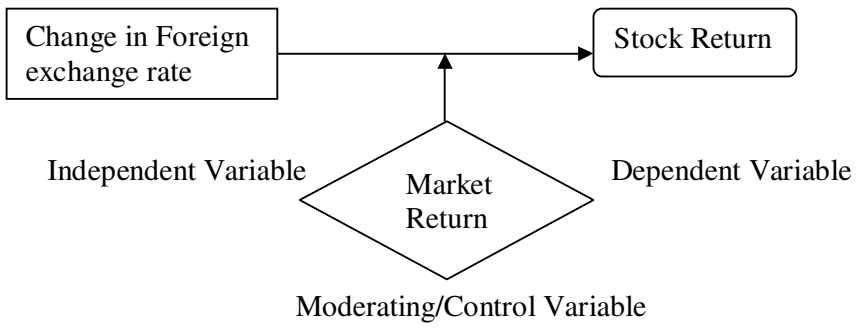
RESEARCH METHODOLOGY

This chapter discusses the research methodology employed in the study. First, the research framework is developed with stock return and foreign exchange rate as the main variables of the study. After that, hypotheses are established to express the relationship between the variables in the form of a testable statement. Then, the research model is determined to measure the data, followed by a demonstration of the sampling design and the method used to collect data. Finally, the technique in analyzing the data is presented.

3.1 Development of Hypotheses

Based on the research objective and questions mentioned in Chapter 1 and the support literature in Chapter 2, a theoretical framework is adopted to investigate the relationship between stock return and foreign exchange rate changes as illustrated in Figure 3.1.1 below.

Figure 3.1.1: Research Framework



Two research hypotheses (in alternative form) for the purpose of this study, along with its explanation, have been formulated as below:-

$H1_A$: The relationship between stock return and foreign exchange rate changes is significant.

The first hypothesis is developed to investigate whether stock return of Malaysian firms is significantly influenced by foreign exchange rate changes. This is done by measuring the coefficient estimates of foreign exchange rate changes against stock return. Based on the literature review, the foreign exchange rate exposure is significant but the influence depends on associating factors such as the firm's size as well as the nature of business. However, past empirical studies found no strong evidence that proves the instability of foreign exchange rate significantly affects a firm's stock return, resulting in a decrease in the firm's value. Nevertheless, this study makes the assumption that stock return of Malaysian firms is significantly exposed to exchange rate because of globalisation and the level of Malaysia's involvement in international trade. Malaysia has many export and import activities with countries such as the United States, Japan, China and Europe. Subsequently, this will lead to a significant influence on the country as its currency is expected to become volatile against foreign currencies, even if they are managed under a float regime. Apart from that, firms – particularly multinationals or large firms – have begun to concentrate on foreign exchange risk management such as hedging using forward, option or futures in business transactions. This is done to mitigate risk while stabilizing a firm's value (Yazid

and Muda, 2006). Therefore, statistical testing on measuring the significance is necessary to prove the first hypothesis.

$H2_A$: There is a difference in exchange rate exposure between the pre- and post-crisis period

The second hypothesis is developed to test whether there is a coefficient difference before and after the U.S. credit crisis in 2007. Several studies (for example, Dominguez and Tesar, 2006; Verschoor and Muller, 2007) have found that the estimated exposure changes as time evolves. After the unpegging in 2005, firms in Malaysia are no longer protected by the peg against the U.S. dollar, although it is a managed float. However, the exposure risk was still at a manageable level during the period. Following the U.S. crisis, firms tend to worry about the foreign exchange rate fluctuation. They began to monitor the exchange rate movement – whether daily, weekly or monthly – to avoid any foreign exchange losses. The stock market has been tremendously volatile and is expected to be vulnerable to the fluctuation of foreign exchange judging by the instability of foreign currencies, specifically the U.S. Dollar. Thus, the second hypothesis is established to determine the difference in the exchange rate exposure between the pre- and post- crisis period, and whether the coefficient estimates for both period changes.

3.2 Selections of Measures (Model)

This study adopts two factor models or the augmented market model introduced by Jorion (1990), which was later adopted by many researchers such as Bodnar and Wong, (2000) and Chan (2002), to measure the exposure of foreign exchange changes against a firm's stock returns. The initial model illustrated below is also called the two-factor Arbitrage Pricing Theory ("APT").

$$R_{it} = \alpha_i + \beta_m R_{mt} + \gamma_i \Delta X_t + e_{it}$$

Where,

α_i = constant term

R_{it} = Stock return for firm i at time t

R_{mt} = Return on the market index

ΔX_t = Percentage change in exchange rate at time t

Due to the lack of contemporaneous effect (as explained in the literature), the lag effect variable is included by extending the above model into the below regression. Bartov and Bodnar (2004) also found significance in exposure when they documented the lag exchange rate effect using U.S. multinationals as samples, covering the period from 1978 to 1989. However, they found no effect on the contemporaneous change in the exchange rate variable. The reason could be that the stock price takes time to react to the changes of foreign exchange (Chan, 2002).

$$R_{it} = \alpha_i + \beta_m R_{mt} + \gamma_i \Delta X_t + \Sigma \delta_i \Delta X_{t-k} + e_t$$

ΔX_{t-k} = Percentage change in exchange rate with time lag, k

Therefore, to measure the coefficients of exposure to test the hypotheses, the above model will be adopted as the main regression in the study. The explanation for each variable used in the model is presented below.

3.2.1 Stock Return

The stock return, $R_{it,}$ which is the dependent variable, designates the total return of firm *i* in the period *t.* Stock return comprises the change in the stock price at time t compared to time, t-1 regardless of a positive (favorable) or negative (unfavorable) change. Stock return basically represents the firm value as a comprehensive measure of corporate performance, business condition and macroeconomic return. Thus, the variability of stock return is important to a firm or investors. The changes in stock return are economically affected by many factors such as profitability of the firms, dividend policy and cash flows. In this study, the stock return is hypothesized to be significantly affected by foreign exchange movement. Past empirical studies on the relationship between stock return and foreign exchange rates have shown mixed results. Schena (2005) and Tulay (2003) have evidence that stock returns of a firm is significantly impacted by the foreign exchange exposure but Chan (2002) found that stock return does not appear to be correlated with the change. Later, researchers claim that stock return is probably not an

appropriate variable in representing a firm's value and have replaced the stock return variable with the cash flow variable (Martin and Mauer, 2003).

3.2.2 Changes in Foreign Exchange Rate

The exchange rate is defined as units of domestic currency per unit of foreign currency. Movements in foreign exchange rates can be measured either in nominal or real terms as they have a similar impact on the stock exchange (El-Masry, 2006). Similar to stock return, the change of exchange rate denotes the first difference or lag between rate in time t and t-1. A positive change of exchange rate means that the domestic currency is depreciating meanwhile a negative change shows an appreciation of domestic currency. The sensitivity of a firm's stock returns to the unanticipated exchange rate movement is represented by the coefficient, γ_i where a positive coefficient shows that a percentage change of exchange rate will actually increase the stock return. On the other hand, a negative coefficient signifies that a change of exchange rate percentage decreases a percentage of stock return. Generally, the statement concludes that if the appreciation of home currency increases the stock return, a positive coefficient is observed but if the currency has a negative effect on the return, thus a negative coefficient is reflected. This summary of an appreciation or depreciation in foreign currencies is expected to have both positive (increase) and negative (decrease) impact on stock return depending on the circumstances and underlying factors.

The extended variable for foreign exchange changes denoted with ΔX_{t-k} represents the change with time lag, k. The lag effect of currency changes on stock return used in the regression is expected to provide a better result and implication which is consistent with previous studies (Doidge et al., 2006).

3.2.3 Market Return and Regression Residual

The market return or index, R_{mt} represents the overall stock market return in the period *t*. It is included in the model as the control variable as it is correlated to stock return. The sensitivity of the returns to the market fluctuation is denoted by $\beta_{m,}$ which is also known as the stock beta. It is obtained by regressing the changes in market returns against stock return.

Finally, error term, e_t is the regression residual which is assumed to follow a normal distribution with zero mean and a constant variance. It is also defined as the white noise error and the disturbance term. Besides that, the residual also represents other variables that are assumed to have a relationship and effect on stock returns.

3.3 Sampling Design and Data Collection Procedure

The study focuses on secondary data. The data set analyzed is a daily series (Senteney et al., 2003; Guo, Neely and Higbee, 2007; Bartram, 2007) for the period of 1 July 2005 to 30 June 2009 (4-year period). A total of 83,440 observations contributed to the entire sample. Daily data is used to evaluate

the impact on a daily basis, including the lag. The history of the daily closing stock price of listed firms, which is needed to calculate stock return, was obtained from the Yahoo! Finance and Bloomberg websites. The study is restricted to all non-financial firms quoted on Bursa Malaysia. The financial firms were not chosen based on its complexity in the foreign currency exposure. The firm is assumed to have full data covering the observation period.

To control the size of firm, the sample of stocks were selected based on the market capitalization criteria, which is defined as the average of the product of the number of shares outstanding and share price (Chan, 2002; Bartram, 2007; Vygodina, 2006). Stocks with above RM1 million market capitalization were selected as the sample of this study. The final number of stocks is based on 80 sample firms from the total of 1,015 firms listed on the Main Board at Bursa Malaysia at the end of June 2009. Refer to Appendix A for the list of selected sample firms.

The end-of-period nominal exchange rates were obtained from Government statistics published at the Bank Negara Malaysia website. The exchange rate used for the purpose of this study consisted of MYR/USD, MYR/EURO and MYR/YEN. Regressing against different currencies will enhance our findings and identify the currencies that have the most significant impact on the exposure. Although Malaysia is managing against the U.S. dollar but because the United States is our major trading partner (with the U.S. dollar as the commodities denomination used in most foreign dealings) thus the U.S. dollar

is selected. In addition, Europe and Japan are also our important trading partners. For example, Malaysian firms collaborate with Japanese firms to improve our automobile technology. Apart from that, results by Parsley and Popper (2003) support the fact that most firms in South East Asia such as Malaysia, the Philippines and Indonesia still appear to be exposed to the U.S. dollar besides the Japanese Yen and EURO dollar from 1990 to 2002.

The market return as the market risk factor is the controlling variable in the model. The Kuala Lumpur Stock Exchange ("KLSE") market index, as proxy of the market portfolio, was obtained from the Bursa Malaysia database. The market index is based on the closing index of the day. These data collected were arranged and organised in a time series and cross-sectioned manner for statistical testing purposes.

3.4 Data Analysis Techniques

The series of data collected is first changed into its natural logarithm form. The data is regressed using the Ordinary Least Square ("OLS") model to test the hypotheses and analyse data. OLS is used to understand the statistical relationship between stock return and foreign exchange rate changes. OLS has been predominantly used in previous empirical research and the data for this research fits the OLS model better than other regression models. The software used in this study is EViews, a statistical package for Windows mainly used for econometric analyses such as cross section, panel data analysis, time series estimation and forecasting. It was developed by

Qualitative Micro Software of which version 1.0 was released in 1984 and was recently upgraded to version 5.0.

Prior to the OLS regression, a series of preliminary test statistics had to be gathered. First, the stock prices of individual firms, the KLSE index and foreign exchange rate data series are checked for unit root. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are used. These tests are performed to ensure the variables are stationery at the first difference because standard inference procedures do not apply to a regression that contains integrated variables (unit root).

Once the data is ready for testing, a time series regression is done for each individual firm in the sample to obtain the foreign exchange coefficient estimates as the exposure elasticity. The stock return is regressed against three currencies, namely the U.S. dollar, Japanese Yen and Euro dollar. A maximum of five days lag is incorporated. The significance of coefficient for each firm is determined based on the significant levels of 1% and 5%, which will be summarized into a table in the Appendix. The sign and size of the coefficient is analyzed to explain the behaviour of the exposure. To respond to the first hypothesis in an effective manner, the significance of the exposure is determined by the number of firms that has a significant coefficient towards these currencies with lagged effect. A table summary is prepared to document the results.

Next, the data is divided into sub-period samples of July 2005 to June 2007 and July 2007 to June 2009 to investigate whether the coefficient differs between the two sub-periods, which represent the pre- and post- crisis. Similarly, the regression takes into consideration the lag effect and the three respective currencies. The number of firms with a coefficient that is significantly exposed to foreign exchange rate changes before and after July 2007 (when the crisis began) are recognized and summarized in a tabular form to demonstrate the differences for the analysis of the second hypothesis. By splitting the sample this way, this study is able to test whether exposure levels or changes in exposure are the highest when the home currency appreciates or depreciates.

3.5 Conclusion

This chapter presents an overview of the research framework and hypotheses developed for the study. This chapter also discusses the data collection procedure, and the methodology. The augmented market model, or two-factor model, is used in analyzing the data. Chapter 4 will discuss the empirical results and analysis of each hypotheses stated in this chapter.