CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This chapter discuss on methodology employed for the research. The chapter is outline with three criteria. Firstly, the development of hypotheses by empirically estimating the relationship between firm value and contemporaneous debt in an OLS framework as predicted by Modigliani and Miller theorem. Secondly, to employ Hausman (1978) test to document endogeneity of contemporaneous debt, and finally using a Two-Stage Least Square specification to correct the endogeneity and empirically estimate the relation between firm value and debt.

3.1 Development of Hypotheses

Value of a firm can be initiated as capital structure of firms. The foundations of capital structure were laid by seminal work of Modigliani and Miller (1958, 1963). They argues that within a perfect and frictionless world, corporate financial policy is irrelevant to the value of the firm (i.e. value of the levered firm (V_L) is equal to value

of the unlevered firm (V_U)). However imperfection, as taxes and deductibility of interest are introduced, the value of the firm depends on its capital structure. Thus, value of the levered firm (V_L) is no longer equal to the value of the unlevered firm (V_U). Modigliani and Miller (1963) make this point explicit through the following relation:

$$V_L = V_U + \tau_C D$$

Where, τ_C is the corporate income tax rate and D is the value of debt (in perpetuity).

Fama and French (1998) empirically test the equation by regressing firm value on interest expense (their proxy for D) with controls for V_U. They use the excess of market value over book assets as the proxy for V_L. Their controls include earnings, R&D expenditure and dividends. Kemsley and Nissim (2002) reverse the empirical specification used by Fama and French (1998) by regressing future profitability on current debt, with controls for market value. They use subsequent five years profitability as their measurement for future firm performance. Both empirical researches done by Fama and French (1998) and Kemsley and Nissim (2002), did not find the theoretical positive relationship between firm value and debt.

Jayaraman (2006) argue that the failure is due to that they did not consider the endogeneity of contemporaneous debt. He added that capital structure decisions are an endogenous outcome of a myriad of factors that firms give credence to. Thus, one has to consider this endogeneity while empirically estimating the Modigliani and Miller (1963) hypotheses.

This research is design to incorporate Jayaraman (2006) model of a two-stage least squares estimation to correct the endogeneity of contemporaneous debt. Thus, the primary hypothesis is:

H_1: There is a positive relation between firm value and debt, once endogeneity of contemporaneous debt is corrected using a two-stage least squares estimation.

H_{1a}: There is a positive relation between firm value and debt even after controlling for the level of free cash flows.

H_{1b}: There is a positive relation between firm value and debt even after controlling for STD.

H_{1c}: The positive relation between firm value and debt is decreasing in the level of managerial alignment.

3.2 Selection of Measures

3.2.1 OLS Specification

Ordinary Least Square (OLS) specification is use as benchmark to establish comparison with earlier study. This method is inspired by Fama and French (1998), which is the first large sample attempting to empirically estimating Modigliani and Miller (1963). They use a specification that is a combination of levels and changes. In order to keep with Modigliani and Miller (1963) theoretical model and to highlight the distinction between contemporaneous and lagged interest expense, Jayaraman (2006) adopt the levels approach. The primary equation for OLS specification is as follows:

$$VALUE = \alpha_0 + \alpha_1 INT + \alpha_2 EARN + \alpha_3 R\&D + \alpha_4 DIV + \varepsilon$$

In this model the dependent variable is the market value of the firm (*VALUE*). The focal variable is *INT* which represents interest expense. The control variables are earnings (*EARN*), research and development expenses (*R&D*) and dividends (*DIV*). All variables are scaled by total assets.

Jayaraman (2006) predicted that the results from OLS specification are consistent with Fama and French (1998), which shows that the relation between firm value and debt is negative and insignificant.

3.2.2 Hausman (1978) test of endogeneity

In this section the endogeneity of *INT* from primary equation is verify using the Hausman (1978) test. The test is run in two stages. In stage one; the suspected endogeneous variable is regressed on an instrument and the other exogeneous variables from the primary equation. In the second stage, the predicted regression residual from the first stage is used as an additional explanatory variable in the primary regression. Beaver et al (1997) argue that if the residual is statistically significant, then the suspected endogeneous variable is indeed endogeneous (Jayaraman, 2006).

Jayaraman (2006) state that the intuition of the test is; as the regression residual is difference between the actual value and the predicted value, the statistical significance of the residual suggest that the actual value is different from the predicted value and

hence the former cannot be treated as exogeneous. The test requires an instrument that is correlated with the (suspected) endogeneous variable but uncorrelated with the error term. In this study as the suspected endogenous variable is interest expense, following prior research from Jayaraman (2006), lagged interest expense is use as the instrument.

Lagged values of interest expense serve as a good exogenous instrument because today's firm value cannot influence yesterday's interest, thereby avoiding the simultaneity (Jayaraman, 2006). He added that, since firm's value is the present value of future cash flows, lagged values of interest are unlikely to be correlated with the error. Welch (2004) states that lagged interest is highly correlated with contemporaneous interest, indicating that it is a good instrument.

In the first stage, contemporaneous interest (*INT*) is regress on lagged interest (*L_INT*) and the other exogeneous variables and estimate the residual (*ERROR*). The Hausman (1978) test incorporates *ERROR* as an additional variable. As a result, the specification to ascertain endogeneity of contemporaneous interest is as follows:

$$VALUE = \alpha_0 + \alpha_1 INT + \alpha_2 ERROR + \alpha_3 EARN + \alpha_4 R\&D + \alpha_5 DIV + \varepsilon$$

The null of no endogeneity is rejected if $\alpha_2 \neq 0$.

3.2.3 Two-Stage Least Square (2SLS) specification

In two-stage least square estimation, the predicted value (*INT_2SLS*) from the first stage is used to replace the endogeneous variable (*INT*). Fama and French (1998)

argue that inadequate controls for future profitability could affect the relation between firm value and debt. In order to address this concern, Jayaraman (2006) include capital expenditures (*CAPEX*) to better control for the firm's future profitability. He also uses firm size (*SIZE*), defined as log sales, to control for other firms level factors. Following Petersen (2005), Jayaraman (2006) include year indicators to control for possible cross-sectional correlation in the errors due to existence of macroeconomic factors that affect all firms. He concludes the regression specification as:

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 EARN + \alpha_3 R\&D + \alpha_4 DIV + \alpha_5 CAPEX + \alpha_6 SIZE + \varepsilon$$

3.2.4 Free Cash Flow Theory

Jensen (1986) argues that debt reduces the agency costs of free cash flows by reducing cash flow that is available for spending at the discretion of managers. In order to discriminate between the tax theory and agency cost theory, the relation between firm value and debt are analyze with additional controls for the firm's cash flow from operations (*CFO*). Jayaraman (2006) states that if the positive relation between firm value and debt is due to the presence of free cash flows, there should be no relation between value of the firm and debt once the level of free cash flows is controlled for. He concludes the specification as follows:

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 CFO + \alpha_3 EARN + \alpha_4 R\&D + \alpha_5 DIV + \alpha_6 CAPEX + \alpha_7 SIZE + \varepsilon$$

To ensure that the results are not confounded by the possible endogeneity of contemporaneous cash flows, the second set of specification is developed based on lagged free cash flows (*L_CFO*). The specification is as follows:

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 L\_CFO + \alpha_3 EARN + \alpha_4 R\&D + \alpha_5 DIV + \alpha_6 CAPEX + \alpha_7 SIZE + \varepsilon$$

3.2.5 Debt signaling hypotheses

Leland and Pyle (1977) and Ross (1977) have stated the uses of financial structure to signal insider's assessment of firm type. Jayaraman (2006) argue that if high quality firms take on more debt to signal their high quality, then the positive relation between firm value and debt might be driven by underlying firm quality.

Role of short term debt is use to distinguish between the signaling and the tax hypotheses. Flannery (1986) in Jayaraman (2006) models firm's choice of debt maturity in the presence of information asymmetry. He concludes that high quality firms willing to issue short term debt to signal their high type to the market. Low quality firms on the other hand would be happy to be treated as the 'average' type and issue long term debt.

If the positive relation between firm value and debt is driven by the signaling role of short term debt, then controlling for the ratio of short term debt to total debt, there would be no relation between firm value and debt. Ratio of short term debt to total

debt (*STD*) is included as an additional control in the primary regression to test the alternate interpretation. The specification model to test is as follows:

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 STD + \alpha_3 EARN + \alpha_4 R\&D + \alpha_5 DIV + \alpha_6 CAPEX + \alpha_7 SIZE + \varepsilon$$

To ensure that the results are not confounded by the possible endogeneity of contemporaneous debt, the second set of specification is developed based on lagged free cash flows (*L_CFO*). The specification is as follows:

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 L\_STD + \alpha_3 EARN + \alpha_4 R\&D + \alpha_5 DIV + \alpha_6 CAPEX + \alpha_7 SIZE + \varepsilon$$

3.2.6 Role of managerial alignment in the relation between firm value and debt

Following Berger et al (1997), level of stock and option based compensation (*ALIGN*) is use as proxy for managerial alignment. Jayaraman (2006) stated that to assess the impact of managerial alignment on the relation between firm value and debt, *INT_2SLS* is interact with *ALIGN* (*INT_2SLS*ALIGN*). The specification model is as follows:

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 INT\_2SLS*ALIGN + \alpha_3 ALIGN + \alpha_4 EARN + \alpha_5 R\&D + \alpha_6 DIV + \alpha_7 CAPEX + \alpha_8 SIZE + \varepsilon$$

The specification model use for lagged manager alignment is as follows.

$$VALUE = \alpha_0 + \alpha_1 INT\_2SLS + \alpha_2 INT\_2SLS*L\_ALIGN + \alpha_3 L\_ALIGN + \alpha_4 EARN + \alpha_5 R\&D + \alpha_6 DIV + \alpha_7 CAPEX + \alpha_8 SIZE + \varepsilon$$

3.2.7 Robustness tests

This section intent to examine whether the results are robust to various sensitivity tests. First test is to employ alternate empirical specification such as (i) robust regressions which control for the influence of outliers and (ii) cross-sectional (between-firm) regression which control for the serial correlation in the errors. Secondly, additional proxies are included for firm level factors such as firm age and profitability (using analyst's long term forecasts). Thirdly, introducing control for industry level factors by including proxies for industry growth opportunities and finally employing a specification that uses all lagged control to address the concern of possible endogeneity of the other control variables.

3.3 Sampling Design

The sample consists of Public Listed Company (PLC) listed on the Kuala Lumpur Stock Exchange (KLSE) for the period of 1999 to 2008. A number of 100 companies are selected excluded the financial sector firms. To be included in the sample, the PLC had to be quoted on the KLSE at least a year before the date of their accounting year-end for 1999. This condition was imposed to ensure that the performance of firms, capital structure and ownership were not affected as a result of new listing.

3.4 Data Collection Procedures

This study uses secondary data on firm's financial statement. The sources of data are extracted from Datastream and Bloomberg. Data has been extracted from Balanced

Sheet, Cash Flow Statement and Profit and Loss Account. All the data then transfer into excel format.

3.5 Data Analysis Techniques

Data analysis is to be simulating with Eviews 6. Raw data in terms of firms financial data gather from Data Stream shall be transfer to Excel for estimating the independent and dependent variables. The definition and development of variables is as shown in Table 4.10.

All related data that was formed in Excel file shall then be transferred to Eviews 6 to be simulated. The simulation is conducted according to the model implied with Descriptive Analysis, Ordinary Least Square (OLS) and Two-Stage Least Square (2SLS) specification. The simulation output is summarized in tables and discuss in Chapter 4.