CHAPTER 3   RESEARCH METHODOLOGY

3.1   Hypotheses

A total of eleven hypotheses are constructed in this study to answer the research questions. The dependent variable is debt ratio. Five independent variables are identified based on the firm characteristics of firm size, interest coverage ratio, tangibility, profitability, and growth opportunities. In addition, one dummy variable is included in this study. The relationships between dependent variable and independent variables plus dummy variable for manufacturing firms in Malaysia are studied through the forming of a few hypotheses.

3.1.1 Firm Size Hypothesis

Firm size plays an important role in determining the capital structure of a firm. While some researchers report negative relationship between debt ratio and firm size (Marsh, 1982 and Titman and Wessels, 1988), majority of the studies results show a positive relationship between debt ratio and firm size.

Following the trade-off models of capital structure, large firms usually are more diversified with relatively lower default risk. These firms also have more assets which could be used as collateral to borrow more money. Therefore, large firms should employ more debt than smaller firms. This is supported by Huang and Song (2006). They argue that larger firms are often more diversified and have more stable cash flow with a relatively lower tendency of bankruptcy in comparison to smaller firms. According to Berryman (1982),

lending to small businesses is riskier because of the strong negative correlation between firm size and the probability of insolvency. Hall (1995) argues that this could partly be due to the limited portfolio management skills and partly due to the attitude of lenders. Therefore, firm size is positively correlated to debt ratio. The positive relation is also supported by the results of recent studies (Al-Najjar, 2008; Dalbor and Upneja, 2002; D'Mello and Farhat, 2008; Drobetz and Fix, 2005; Eriotis et al., 2007; Huang and Song, 2006; Psillaki and Daskalakis, 2009).

Marsh (1982) and Titman and Wessels (1988) report a contrary negative relationship between debt ratio and firm size. Marsh (1982) argues that small firms, due to their limited access to equity capital market tend to rely heavily on loans for their funding requirements. Titman and Wessels (1988) indicate that the inverse relationship is probably due to small firms rely less on equity issue. These small firms face a higher unit transaction cost when issuing the equity. The same negative relationship is also reported in the study by Fischer et al. (2004).

Anyway, firm size is found to have no significant impact to capital structure by Viviani (2008) in the study of capital structure of firms in wine industry. The same finding of insignificant relationship is also found by Karadeniz et al. (2009) and Tang and Jang (2007).

While it is found to have a mixture of results for the relationship between firm size and debt ratio in numerous studies of capital structure, the studies being

conducted for Malaysian firms also show an inconsistent result. Deesomsak et al. (2004), Fraser et al. (2006), Pandey (2004), and Tan (2005) find that firm size is significantly positive related to debt ratio for Malaysian firms. However, Mat Kila and Wan Mahmood (2008) find a negative relationship between firm size and capital structure.

Based on the majority of results from earlier studies and trade-off theory, the alternative hypothesis is formed by suggesting that there is a significant relationship between firm size and debt ratio. Therefore, the first hypothesis is proposed as below:

$H1_0$:   There is no relationship between firm size and debt ratio.

$H1_A$:   There is a significant relationship between firm size and debt ratio.

3.1.2 Interest Coverage Ratio Hypothesis

Another independent variable that is considered in this study is interest coverage ratio. It is expressed as earning before interest, taxes, depreciation, and amortization (EBITDA) divided by interest expense. Interest coverage ratio has already been theoretically investigated as a determinant of capital structure. Harris and Raviv (1990) propose that leverage is negatively correlated with the interest coverage ratio. They argue that an increase in debt directly causes a higher default rate in servicing the debt obligation. Assuming that interest coverage ratio is a measurement of default probability, this implies that a higher interest coverage ratio indicates a lower debt ratio which is consistent with trade-off theory. This proposal from Harris and Raviv

(1990) is also consistent with the findings of Eriotis et al. (2007) and Mat Kila and Wan Mahmood (2008) that the relationship of interest coverage ratio and debt ratio is negatively significant. Therefore, this study suggests that interest coverage ratio has significant relationship with debt ratio.

H2$_0$:   There is no relationship between interest coverage ratio and debt ratio.

H2$_A$:   There is a significant relationship between interest coverage ratio and debt ratio.

3.1.3 Tangibility Hypothesis

Trade-off theory suggests a positive relationship between the share of fixed assets and debt ratio, since fixed assets serve as collateral for debt financing. In other words, firm will obtain debt more easily when its collateral value of fixed assets is higher (Harris and Raviv, 1991; Myers, 1977; Myers and Majluf, 1984; Thornhill et al., 2004; Williamson, 1988).

According to pecking order theory, however, firms that own more fixed assets have less asymmetrical information. Therefore, they tend to depend on equity financing. When we consider maturity, the pecking order theory suggests that share of fixed assets is positively related to long-term debt financing and negatively related to short-term debt financing (Feikadis and Rovolis, 2007; Qian et al., 2007).

Most of the studies find a positive relationship between the share of fixed assets and leverage ratio (Booth et al., 2001; Chen and Zhou, 2004; Dalbor

and Upneja, 2002; D'Mello and Farhat, 2008; Fattouh et al., 2003; Fraser et al., 2006; Tang and Jang, 2007; Zou and Xiao, 2006). Some studies report a negative relationship between debt ratio and tangibility which is relatively less common (Akintoye, 2008; Karadeniz et al., 2009, Sayılgan et al., 2006; Psillaki and Daskalakis, 2009; Sen and Oruc, 2008). However, in the study of capital structure by Deesomsak et al. (2004) reveals that there is no statistically significant relationship between tangibility and debt ratio for Thailand, Malaysia, and Singapore markets. The findings of Bokpin (2009) are ambiguous. While tangibility is found to be statistically significant inverse relationship with financial leverage (long-term debt to equity ratio), external financing, and short-term debt to equity, it is also suggested to have no significant relationship with total liabilities to total assets.

The studies conduct for Malaysian firms show a mixture of results. While Fraser et al. (2006), Pandey (2004), Prasad et al. (2007), Tan (2005) and Suto (2003) find a positive relationship between tangibility and leverage, the study conducts by Deesomsak et al. (2004) show that there is no statistically significant relationship between tangibility and debt ratio.

In this study, a significant relationship is postulated for manufacturing firms in Malaysia by either following the trade-off theory or the pecking order theory. This is consistent with the findings by most of the researchers in the study of capital structure for Malaysian firms. The hypothesis for tangibility is summarized as below:

H3$_0$:   There is no relationship between tangibility and debt ratio.

H3$_A$:   There is a significant relationship between tangibility and debt ratio.

3.1.4 Profitability Hypothesis

Pecking order theory, developed by Myers and Majluf (1984) and Myers (1984) is a consequence of information asymmetries existing between insiders of the firm and outsiders (i.e. the capital market). Managers adapt their financing policy to minimize the associated costs. More precisely, they prefer internal financing more than external financing. If external financing is required, debt rather than external equity is preferable. In such context information asymmetries are relevant only for external financing. According to that theory, more profitable firms have more internal financing available. In fact according to the pecking order theory where internal cash flows (retained earnings) are the preferred form of financing new investments, one should expect a negative relationship between leverage and profitability (Booth et al., 2001; Harris and Raviv, 1991; Rajan and Zingales, 1995).

In a trade-off theory framework, an opposite conclusion is expected. Tax shield benefits of debt will induce profitable firms to use more debt (Jensen and Meckling, 1976; Myers, 1977; Harris and Raviv, 1991). Therefore, more profitable firms tend to use debt capital heavier than less profitable firms and thus a positive relationship is postulated.

The results of the past studies for the relationship of debt ratio and profitability are inconclusive. In the study conducted by Amidu (2007), a positive

relationship is observed between long-term debt ratio and profitability for banking industry in Ghana. This is consistent with the finding of Teker et al. (2009) for Turkish firms.

On the other hand, Ooi (1999) finds that there is no statistically significant relationship between profitability and debt ratio for property firms in United Kingdom. This is supported by the study of Deesomsak et al. (2004). They also conclude that there is no statistically significant relationship between profitability and debt ratio for Thailand, Singapore and Australia markets. However, an exception for Malaysian firms with a statistically significant inverse relationship.

A larger number of studies reveal that the results are more consistent with the pecking order theory which suggests a negative relationship between profitability and debt ratio (Akintoye, 2008; Al-Najjar, 2008; Chen et al., 2009; D'Mello and Farhat, 2008; Friend and Lang, 1988; Gaud et al., 2005; Rajan and Zingales, 1995; Viviani, 2008).

Several studies of capital structure for Malaysian firms reveal that profitability has significant influence to these firms. The studies conduct by Deesomsak et al. (2004), Pandey (2004), and Tan (2005) indicate a statistically significant inverse relationship between profitability and debt ratio of firms. In another study by Fraser et al. (2006), profitability is found to be statistically significant positive relationship with capital structure for Malaysian firms.

In this study, it is expected either to follow the pecking order theory by having a negative relationship or the trade-off theory by having a positive relationship between profitability and capital structure. This is also consistent with majority of previous studies for Malaysian firms. Therefore, null and alternative hypotheses for profitability are given as below:

H4$_0$: There is no relationship between profitability and debt ratio.

H4$_A$: There is a significant relationship between profitability and debt ratio.

3.1.5 Growth Opportunities Hypothesis

According to pecking order theory, growth opportunities should be positively related to debt ratio of a firm (Myers, 1984). This is because there is an asymmetrical information problem across outside investors and firm managers in the firms that have more growth opportunities than the assets they have (particularly small firms). Firms with higher growth opportunities tend to be easier to finance the growth by debt capital since creditors are more incline to loan out the money.

According to market timing theory by Baker and Wurgler (2002), firms with high market-to-book value more favour to use equity financing and thus have a lower debt ratio. These firms often repurchase equity when market-to-book value is low. This is interpreted as evidence that capital structure is the cumulative outcome of past attempts to time the equity market. Therefore, an inverse relationship is expected between growth opportunities and debt ratio. Baker and Wurgler (2002) also argue that the significance of historical market-

to-book ratio in explaining capital structure is contradicting with trade-off theory. However, if firms' growth opportunities are measured with error by the current market-to-book ratio, then historical market-to-book ratio may be a firm characteristic that also captures growth opportunities. Anyway, this study uses Tobin's Q rather than market-to-book ratio of equity as the proxy for growth opportunities which measures the future growth opportunities of firms. Therefore, the validity of market timing in explaining capital structure for this study is in doubt.

On the other hand, trade-off theory requires a negative relationship between growth opportunities and debt ratio of a firm (Jensen and Meckling, 1976; Myers, 1977; Stulz, 1990). Since firms with more growth opportunities bear more risk, they have higher financial distress costs. Nevertheless, high-growth firms finance growth by equity in order to mitigate idle capacity problem arising from risky debt (Benito, 2003; DeAngelo and Masulis, 1980; Hall et al., 2000; Jensen, 1986; Myers, 1984; Myers and Majluf, 1984; Zou and Xiao, 2006). Auerbach (1985) also argues that leverage is inversely related to growth rate because the tax deductibility of interest payments is less valuable to fast growing firms since they usually have non-debt tax shields.

A number of studies on capital structure report a positive relationship between market-to-book ratio and leverage ratio (Al-Najjar, 2008; Benito, 2003; Dalbor and Upneja, 2002; Hall et al., 2000; Jensen, 1986; Myers and Majluf, 1984; Tang and Jang, 2007; Zou and Xiao, 2006). Michaelas et al. (1999) also find that future growth opportunities are positively related to leverage and long-

term debt. Contrary to the positive findings, D'Mello and Farhat (2008), Gaud et al. (2005), Huang and Song (2006), Mahajan and Tartaroglu (2008), and Rajan and Zingales (1995) find a statistically significant negative relationship between growth opportunities and leverage ratio, while Deesomsak et al. (1996) find a mixed evidence for capital structure in different countries from Asia Pacific region. Nevertheless, some researchers (Eriotis et al., 2007; Serrasqueiro and Ragao, 2009; Sen and Oruc, 2008) find no significant relationship between capital structure and growth opportunities.

In the studies of capital structure for Malaysian firms, Deesomsak et al. (2004), Fraser et al. (2006), and Mat Kila and Wan Mahmood (2008) find no significant relationship between leverage ratio and growth opportunities. However, Pandey (2004) observes a cubic relationship between debt ratio and growth opportunities measured by Tobin's Q ratio. It is attributed to the complex interaction of market conditions, agency problems, and bankruptcy cost.

Generally, it is expected to follow the pecking order theory that debt is preferable than external equity for capital sourcing. In addition, firms with high growth may not want to share with other new equity holders for the upcoming great profits of the firms. Therefore, firms with high growth opportunities tend to finance by debt rather than external equity and thus is predicted to have a positive relationship between growth opportunities (proxy by Tobin's Q ratio) and debt ratio. This study predicts that there is a significant relationship either

positive or negative between growth opportunities and debt ratio. Therefore, the fifth hypothesis is then constructed as below:

H5$_0$: There is no relationship between growth opportunities and debt ratio.

H5$_A$: There is a significant relationship between growth opportunities and debt ratio.

3.1.6 Capital Structure Differentiation Hypothesis

Based on the best knowledge of the author, so far only two papers (Eriotis et al., 2007; Mat Kila and Wan Mahmood, 2008) have conducted the study to capture and isolate the difference between firms with more and less than a pre-determined percentage of debt ratios This provides a better estimation for the regression model of capital structure of firms with different levels of debt ratio. Eriotis et al. (2007) find a significant difference in capital structure between Greek firms with greater and lesser than fifty (50) percent of debt ratio. Consistently, Mat Kila and Wan Mahmood (2008) also obtain a similar result for Malaysian firms by applying a cut off point of thirty (30) percent in debt ratio.

This study applies a cut off point of fifty (50) percent in debt ratio. Consistent with the two previous studies, this study also expects a statistically significant difference in capital structure between firms with more and less than fifty (50) percent of debt ratio. Therefore the sixth hypothesis is constructed as follows:

$H6_0$: There is no difference in capital structure between firms with more and less than 50% of debt ratio.

$H6_A$: There is a significant difference in capital structure between firms with more and less than 50% of debt ratio.

3.1.7 Firm Characteristics Differentiation Hypotheses between Firms with More and Less than Fifty Percent of Debt Ratio

In addition to the effect of capital structure, this study also investigates the differences in firm characteristics (i.e. firm size, interest coverage ratio, tangibility, profitability, and growth opportunities) between firms with more and less than fifty (50) percent of debt ratio. It is postulated that differences do exist amongst these five firm characteristics between firms with more and less than fifty (50) percent of debt ratio. Therefore, five additional hypotheses are formed as follows:

$H7_0$: There is no difference in firm size between firms with more and less than 50% of debt ratio.

$H7_A$: There is a significant difference in firm size between firms with more and less than 50% of debt ratio.

$H8_0$: There is no difference in interest coverage ratio between firms with more and less than 50% of debt ratio.

$H8_A$: There is a significant difference in interest coverage ratio between firms with more and less than 50% of debt ratio.

$H9_0$: There is no difference in tangibility between firms with more and less than 50% of debt ratio.

$H9_A$: There is a significant difference in tangibility between firms with more and less than 50% of debt ratio.

$H10_0$: There is no difference in profitability between firms with more and less than 50% of debt ratio.

$H10_A$: There is a significant difference in profitability between firms with more and less than 50% of debt ratio.

$H11_0$: There is no difference in growth opportunities between firms with more and less than 50% of debt ratio.

$H11_A$: There is a significant difference in growth opportunities between firms with more and less than 50% of debt ratio.

3.2   Research Design

This research has been designed to collect the secondary data from firms that are listed in the Main Market of Bursa Malaysia. In this study, the focus is on the sector of Industry Products. A period of five years data is chosen for this study from year 2004 to 2008. The cross-sectional and time series analyses are performed to compare the firm characteristics and debt ratio.

The dependent variable being chosen for this study is debt ratio. Five independent variables are selected for this study, which are firm size, interest coverage ratio, tangibility, profitability, and growth opportunities. A dummy

variable of debt ratio is also applied to capture and isolate the difference in capital structure between firms with more and less than fifty (50) percent of debt ratio. Mann-Whitney U Test technique is used to confirm if there is any statistically significant difference for capital structure of these two categories of firms. Further analyses are extended to investigate if there is any statistically significant difference in each of the five firm characteristics between the two categories of firms using T-Test technique.

Correlation analysis is first used to describe the strength and direction of the linear relationship between dependent variable and each independent variable. Multiple regression method is used to study the interrelationship between dependent variable and five independent variables plus a dummy variable. The final model is then estimated after a reasonable consideration for the assumptions of normality, linearity, independence of residuals, multicollinearity, heterocedasticity, and autocorrelation.

3.3   Data Collection

Samples of this study are taken from the secondary data for firms listed in the Main Market of Bursa Malaysia under the sector of Industry Products. The source of secondary data is taken from subscribed Bloomberg service. The period of samples being chosen for this study is from year 2004 to 2008.

A search for the public listed firms in the Main Market of Bursa Malaysia under the category of Industrial Products consists of 270 firms as of December 2009. In order to avoid any missing data which could introduce bias to the sample,

only those firms with complete data for all five years from year 2004 to 2008 are considered. Firms with incomplete financial data are discarded since the identified variables are unable to be computed. Those firms listed after year 2004 also being taken out from this study since the year-end sharing closing price is not available. In order to provide a standardized and comparable result, the daily share closing price at the end of each year is taken for the computation of market equity value for that year. In case there is no trading for any particular stock on the last day of the year, the daily closing price of the most recently traded day is used instead.

After the elimination of newly listed stocks (listed after year 2004), there are 249 firms meeting the initial requirements. These firms are randomly ranked in order by the aid of computer program. The first 60 ranked firms with complete financial data (from Bloomberg) which are required to compute all the identified variables are selected for this study.

3.4   Regression Model

A linear regression is used to study the relationship of these variables since there is no priori reason to believe the relationship is non-linear. In addition, the use of linear model is supported by the previous studies (Amidu, 2007; Eldomiaty, 2007; Eriotis et al., 2007; Karadeniz, 2009; Ng, 1996, Psillaki and Daskalakis, 2009). A regression model is formed to test hypotheses raise for this study. This regression model consists of one dependent variable, five independent variables, and one dummy variable and is given as below:

$$DR_{i,t} = \alpha + \beta_1 SIZ_{i,t} + \beta_2 ICR_{i,t} + \beta_3 TAN_{i,t} + \beta_4 PRO_{i,t} + \beta_5 GRO_{i,t} + \beta_6 DUM_{i,t} + \varepsilon_{i,t}$$

where *i* stands for the *i*th firm, *t* stands for year *t*, and the variables are defined as follows:

$DR_{i,t}$ = Debt ratio of firm *i* at time *t*,

$SIZ_{i,t}$ = Firm size of firm *i* at time *t*,

$ICR_{i,t}$ = Interest coverage ratio of firm *i* at time *t*,

$TAN_{i,t}$ = Tangibility of firm *i* at time *t*,

$PRO_{i,t}$ = Profitability of firm *i* at time *t*,

$GRO_{i,t}$ = Growth opportunities of firm *i* at time *t*,

$DUM_{i,t}$ = Dummy variable for debt ratio of firm *i* at time *t*, (1 for debt

ratio > 50%, otherwise is 0)

α = Intercept coefficient

$\varepsilon_{i,t}$ = Random error term for firm *i* at time *t*.