CHAPTER 3: RESEARCH METHODOLOGY

3.1 RESEARCH HYPOTHESES

Companies from different industries have different characteristics such as different profit margin stability and different sales volumes. Companies which have lower volatility in profit margins and higher sales should have higher debt levels than those with more volatile profit margins and lower sales. The debt-servicing ability of companies may also change over time as the business cycle fluctuates between economic booms and downturns. Company profits and sales will be higher during economic booms when consumers have more purchasing power than during recessions.

As the debt-servicing ability of companies is expected to differ across industry and time, the following null hypotheses have been formulated:

H1 : There is no significant difference in the capital structure of companies from different industry sectors

H2 : There is no significant difference in the capital structure of companies over the period of study

In addition to Hypotheses H1 and H2 which examine capital structure practice by looking at total debt to total asset ratios, the extent of long-term debt usage can be analysed by using the total capitalization ratio and the long-term debt to total debt ratio which will be discussed in further detail in sub-section 3.22. Long-term debt usage depends on the asset structure of companies which may differ across industry and time. Companies with long-lived fixed assets use long-term debt extensively while companies that have their assets mostly in receivables and inventories rely less on long-term debt financing and more on short-term financing (Weston and Copeland 1992).

The extent of long-term debt usage is expected to differ across industry and time. Therefore, the following null hypotheses have been formulated to test the two long-term debt ratios:

H3 : There is no significant difference in long-term debt ratios of companies from different industry sectors

H4 : There is no significant difference in long-term debt ratios of companies over the period of study

A firm should ideally practise a maturity matching principle or hedging approach to financing. In this approach, fixed assets and permanent current assets are financed with long-term debt, equity and the permanent component of current liabilities whereas temporary current assets are financed with short-term debt (Brigham et al.1999, Van Horne 1992). Permanent current assets are current assets on hand at low points of a business cycle while temporary current assets are additional current assets held during an upswing in business.

In order to examine whether Malaysian companies finance their fixed assets with long-term debt, Hypothesis H5 is formulated. This study also examines whether the long-term capital (long-term debt and equity) of Malaysian companies adequately cover their fixed assets and this is tested by Hypothesis H6. Hypotheses H5 and H6 are listed as follows:

H5 : Companies match the financing of fixed assets with long-term debt

H6 : The long-term capital of companies is less than their fixed assets

Borrowings have a leverage effect. The use of debt increases a firm's expected return on equity but it also increases the risk borne by stockholders (Brigham et al.1999). In order to test the effect of financial leverage on the financial performance of Malaysian companies, the following null hypothesis has been formulated:

H7 : There is no significant difference in the financial performances of companies with different debt levels within an industry sector

3.2 SELECTION OF MEASURES

This section discusses about measures selected to test the seven hypotheses.

3.21 Measurement of Leverage

A popular measure of leverage is the common stock equity to total assets ratio which was used by Schwartz and Aronson (1967), Naidu (1984), Naidu (1986) and Tho (1993). Another common measure of leverage used is the debt to equity ratio which was used by Pomerleano (1998) and Claessens et al (2000).

Rajan and Zingales (1995) used four different ratios to measure the extent of leverage across the G-7 countries. The ratios used are total liabilities to total asset ratio, debt (both short-term and long-term) to total asset ratio, total debt to net asset ratio and total debt to capital (defined as total debt plus equity) ratio. The first ratio, the total liabilities to total assets ratio, can be viewed as a proxy for what is left for shareholders in case of liquidation. Even though it can be viewed as a proxy for what is left for shareholders in case of liquidation, Rajan and Zingales (1995) say that the total liabilities to total assets ratio does not indicate whether a firm is at risk of default in the near future. Moreover, total liabilities in this ratio includes trade creditors which may be used for transaction purposes rather than for financing.

The total debt to total asset ratio was used by Ferri and Jones (1979), Ang (1994) and was one of the ratios used by Annuar and Shamsher (1993), Rajan and Zingales (1995) as well as Muhammad (1998). This ratio is used in this study because it is simple to comprehend.

A value which is close to zero shows a low level of leverage whereas a high level of leverage will give a value which is close to 1. Under normal circumstances, the total debt to total asset ratio should not be more than 1. However, if a company has a negative shareholders' equity but has not gone into liquidation yet, it will have a ratio which is more than 1 if the total of its liabilities and shareholders' equity (which equals total assets) is less than its total debt. The total debt to total asset ratio is preferred to the common stock equity to total asset ratio in this study because one of the main objectives of this study is to examine the effects of debt usage on financial performance. In this study, debt refers to short-term and long-term borrowings including related loans but excluding trade creditors and accruals.

3.22 Financing Pattern Indicators

In addition to the total debt to total asset ratio which is used in this study, the following ratios are used to measure the extent of long-term debt usage:

3.22a Total Capitalization Ratio

The formula of the total capitalization ratio as given by Brealey and Myers (2000) is as follows:

$$\text{Total capitalization ratio} = \frac{\text{Long-term liabilities}}{\text{Long-term liabilities + Shareholders' equity}}$$

This ratio helps us to analyse the proportion of debt in total capitalization which makes up long-term financing. Total capitalization is the sum of long-term liabilities and shareholders' equity. This study uses the book value of shareholders' equity for this ratio.

3.22b Long-Term Debt to Total Debt Ratio

This ratio is used to measure long-term debt's share of total debt. It was used in Claessens et al.(2000).

3.22c Long-Term Debt to Fixed Asset Ratio

This ratio examines the extent to which long-term debts are used to finance fixed assets. If this ratio is less than 1, either equity or some short-term debts are also used to finance the purchase of fixed assets. A ratio value of more than 1 would mean that the company concerned is borrowing more long-term debts than needed to finance its fixed assets.

3.22d Long-Term Debt and Equity to Fixed Asset Ratio

This ratio examines whether long-term capital (long-term debt and shareholders' equity) adequately covers the fixed assets of companies. This study uses the book value of shareholders' equity for this ratio. A ratio value of more than 1 means that long-term capital is enough to finance the fixed assets of the company concerned while a ratio value of less than 1 means that short-term debt is also used to finance fixed assets.

3.23 Measurement of Financial Performance

Financial performance is measured by looking at profitability, net tangible assets per share (NTA/share), Altman's Z-score and the market-to-book ratio. Profitability is measured by using Economic Value Added (EVA), return on assets (ROA) and return on equity (ROE).

3.23a Economic Value Added (EVA)

EVA was developed by Stern Stewart & Co to measure a business's "true profit". The basic formula for EVA (Brigham et al.1999) is as follows:

EVA = Net operating profit after taxes (NOPAT)
– After-tax ringgit cost of capital

= EBIT(1 – Corporate tax rate)
– (Operating Capital)(After-tax percentage cost of capital)

Using earnings after tax but before interest would be more accurate than EBIT(1 – Corporate tax rate) because the tax expense included in earnings after tax is the actual tax expense incurred. Multiplying net income before tax with the corporate tax rate is not accurate because there may be some earnings which are tax-exempted and some expenses which are not tax deductible.

The after tax cost of capital can be computed by using the weighted average cost of capital (debt and equity). However, company annual reports usually give a range of interest rates for the companies' various types of borrowings and estimating the interest rates for each type of borrowing is often arbitrary.

Earnings after interest and tax which makes use of the actual interest expense incurred is used in this study. This is because in a sample of five companies[2], the author found that for financial year ending in 1999, the value of actual interest incurred (in ringgit) differed by only about 1 to 5 per cent when compared with the value of interest (in ringgit) that is computed by multiplying outstanding debt with the weighted average of interest rates given in annual reports.

[2] The five companies are Gold Coin (Malaysia) Berhad, Malayan Cement Berhad, Nanyang Press Holdings Berhad, Lien Hoe Corporation Berhad and Kretam Holdings Berhad.

The most important reason EVA differs from accounting profit is that the cost of capital is deducted when EVA is calculated. In order to account for cost of equity and because earnings after interest and tax is used, the EVA formula is simplified in this study to become as follows:

EVA = Earnings after interest and tax – (cost of preferred stock)(preferred stock) - (cost of common equity)(common equity)

The cost of equity is calculated by using the Capital Asset Pricing Model (CAPM) which is expressed by the following formula:

Cost of equity = $R_f + \beta_i [(R_m) - R_f]$

where R_f = risk-free rate of return

R_m = required rate of return on the market portfolio

β_i = beta coefficient of the *i*th stock

R_f is the average discount rate for 3-month Treasury Bills which can be found in the Bank Negara Malaysia Monthly Statistical Bulletins.

One way of estimating R_m is by using the return on stock market index over previous years. This was done by Yau (1996) who used the compounded growth rate of a stock market index over 10 years to estimate R_m for companies in Singapore from 1991 to 1993. However, the 5-year return on the KLSE Composite Index (KLSECI) was negative in 1998 as well as in 1999 and therefore cannot be used as R_m for these two years.

In this study, R_m is estimated by using either the return on the KLSECI over the preceding 5 years or the 12-month average fixed deposit interest rate of finance companies, whichever is higher. This is based on the assumption that investors expect to earn at least the 12-month fixed deposit interest rate from their share investments, otherwise they will place their funds in fixed deposits instead of investing in shares. The fixed deposit interest rates for finance companies are used because they are higher than

the fixed deposit interest rates for commercial banks. Appendix 1 shows that the rates that are used as R_m from 1990 to 1999.

The beta values for β_i are extracted from Bloomberg and are shown in Appendix 2. They are adjusted beta values from 1992 to 1999 based on weekly KLSECI values. This period is chosen because the Bloomberg terminal at the KLSE library cannot compute betas for periods commencing earlier than 1992. The adjusted beta values are equal to 0.67 (historical beta) + 0.33 and this adjustment is made because betas tend to move towards 1.0 over time (Blume 1975). The same beta value for each company is used for the 10-year period of study because it is assumed that the beta values for the companies remain constant over time. This assumption is based on Kok (1992) who found in his study that there was substantial stability of betas for 77 component stocks of the KLSECI from 1983 to 1989.

In order to compare EVA on a percentage basis between industry sectors and between years, the computed EVA is divided by operating capital which is made up of debt and equity. EVA/capital in this paper is similar to the EVA calculated by Pomerleano (1998) which was equal to the difference between return on capital employed (ROCE) and lending rates which he used as the opportunity cost of equity.

3.23b Return on Assets (ROA)

The ROA formula used in this study follows the formula used in Brealey and Myers (2000) which is as follows:

$$\text{ROA} = \frac{\text{Earnings before interest and tax (EBIT)} - \text{Tax}}{\text{Average total assets}}$$

This ratio measures the rate of return earned through operating total assets provided by both creditors and owners (Hoggett and Edwards 1987).

The ROA formula used in this study is the average between total assets at the beginning and at the end of the financial period instead of just the total assets at the end of the financial period. This gives a better ROA ratio because total assets change throughout the financial period.

3.23c Return on Equity (ROE)

The ROE formula used in this study also follows Brealey and Myers (2000). The formula is as follows:

$$\text{ROE} = \frac{\text{Earnings available to common shareholders}}{\text{Average common equity (book values)}}$$

This ratio measures the rate of return earned on assets provided by shareholders who are owners of the company only and excludes the assets provided by creditors. It indicates how well the common stockholders' equity investment is performing (Pomerleano 1998) after interest payments have been deducted.

3.23d Net Tangible Assets per Share (NTA/Share)

The formula used to compute this ratio is as follows:

$$\text{NTA/share} = \frac{\text{Total ordinary shareholders' fund}}{\text{Number of ordinary shares issued}}$$

where Total ordinary shareholders' fund = issued share capital + reserves + retained profits - accumulated losses – intangible assets – preference issued capital

NTA/share was used by Tay (1993) as a proxy for the degree of establishment of a company whereby a large NTA would imply a well established firm while a small NTA would imply otherwise. This ratio can also be used as a performance measurement because profits increase shareholders' fund whilst losses have the opposite effect.

3.23e Altman's Z-Score

Altman's Z-score is a discriminant function that has seen wide use in actual practice to predict bankruptcy (Brigham et al.1999). The function of this model is as follows:

$$Z = .012X_1 + .014X_2 + .033X_3 + .006X_4 + .999X_5$$

where X_1 = net working capital/total assets

X_2 = retained earnings/total assets

X_3 = earnings before interest and taxes/total assets

X_4 = market value of equity/book value of total liabilities

X_5 = sales/total assets

Z = overall index

Altman (1968) found that all firms having a Z score of greater than 2.99 fell into the "non-bankrupt" sector while those firms having a Z score below 1.81 were all bankrupt. The area between 1.81 and 2.99 was defined as the "zone of ignorance" or "grey area" and firms in this area are vulnerable to bankruptcy.

3.23f Market-to-Book Ratio

Brealey and Myers (2000) and Brigham et al.(1999) use the market-to-book ratio but Ang (1998) used the book-to-market equity ratio in his study. Both ratios have the same purpose and the market-to-book ratio is preferred in this paper.

The market-to-book ratio measures how much investors are willing to pay for the stocks of a company as compared to the accounting book values of what the company has received from shareholders or reinvested on their behalf. This ratio has a shortcoming because its numerator (market value of equity) is calculated by using the prevailing market price while its

denominator (book value of equity) uses historical accounting values which do not take into account the time value of money.

However, the market-to-book ratio is used in this paper because it gives an indication of how much value has been created or destroyed from the funds that were invested by shareholders. The formula of the market-to-book ratio is as follows:

$$\text{Market-to-book ratio} = \frac{\text{Market price per share}}{\text{Book value per share}}$$

$$\text{where Book value per share} = \frac{\text{Common equity}}{\text{Shares outstanding}}$$

and Common equity = Total assets – Total liabilities – Minority interests

3.3 SAMPLING DESIGN

The KLSE industry sectors from which the sample companies are taken and the number of companies taken from each sector are as follows:

1.	Consumer products	32
2.	Industrial products	50
3.	Construction	8
4.	Trading/Services	32
5.	Properties	20
6.	Plantation	26
7.	Mining	6
	Total	174

The sample consists of both KLSE Main Board and Second Board companies. If companies in the finance (27 counters), hotel (3 counters) and trust (3 counters) sectors are excluded, there were 252 counters listed in the KLSE on 31 December 1990. Therefore, the 174 sample companies make up about 69 per cent of the 252 counters in the sectors that are

examined in this study. The criteria used to select the sample companies are as follows:

1. The sample companies must be continuously listed in the KLSE between December 1990 and December 1999.

2. Sample companies selected from the consumer product, industrial product, construction and trading/services sectors of the Main Board must have remained in the same sector between September 1993 and December 1999. KLSE divided the old industrial companies sector into these four sectors in September 1993. Companies selected from these four sectors had to be in the old industrial companies sector between December 1990 and August 1993.

3. Sample companies selected from the property, plantation and mining sectors of the Main Board must have remained in the same sector between December 1990 and December 1999.

4. Sample companies selected from the Second Board must have remained in the same sector between March 1997 and December 1999. There was no breakdown in the Second Board into separate sectors prior to March 1997.

5. The financial data of the selected companies are in Ringgit Malaysia. Hence, companies listed in the KLSE but incorporated overseas, particularly in the United Kingdom, are excluded.

The sample firms are listed in Appendix 1. The 1999 financial data for Arus Murni Corporation Bhd from the trading/services sector is not available yet but it is included in the sample because it has data for the other nine years.

3.4 DATA COLLECTION PROCEDURE

This study uses secondary data. The sources of data are as follows:

1. Financial data were extracted from the KLSE – RIIAM (Research Institute of Investment Analysts Malaysia) Web-site, KLSE Annual Companies Handbooks and company annual reports.

2. Market prices of the companies' stocks were extracted from the KLSE Annual Companies Handbook and Investors Digest.

3. Beta values needed to calculate cost of equity for EVA computation were extracted from Bloomberg.

4. Treasury bill discount rates and fixed deposit interest rates were taken from Bank Negara Malaysia Monthly Statistical Bulletins.

3.5 DATA ANALYSIS TECHNIQUES

The One-way Analysis of Variance (ANOVA) with F-statistic is used to test Hypotheses H1, H2, H3 and H4 on whether observed differences between industry sectors and between years are attributable to chance or whether true differences occur. One-way ANOVA requires the assumption that data are from normal populations. In order to overcome this assumption, a non-parametric test, the Kruskal-Wallis test with H-statistic is also used in this paper in addition to One-way ANOVA.

The One-sample T Test is used to compare whether the long-term debt to fixed asset ratios are significantly different from 1 and test Hypothesis H5. If the observed t-value is less than the critical t-value at $p<.05$ level, then it is deduced that the ratios are significantly different from 1 and that the sample companies do not match long-term debt with fixed assets.

In order to test Hypothesis H7, the companies are divided according to their total debt to total asset ratios into four quartiles in ascending order. Quartile 1 consists of companies with the lowest total debt to total asset ratios while Quartile 4 is made up of companies with the highest total debt to total asset ratios. The total debt to total asset ratios of companies in Quartiles 2 and 3 are larger than the ratios of companies in Quartile 1 but smaller than the ratios of companies in Quartile 4. The financial performances of the quartiles are compared by using the One-way ANOVA and Kruskal-Wallis tests. Only industry sectors which have at least 20 companies in the selected sample are analysed. Therefore, companies in the construction and mining sectors that only have 8 and 6 companies respectively are not segregated into quartiles and compared.