CHAPTER 3

METHODOLOGY

3.1 SOURCE OF DATA

The samples contain the pool cross-sectional data for non-financial companies listed on the Stock Exchange of Thailand (SET). The samples exclude those firms residing in the Finance and Banking sector, along with the Insurance sector. The yearly accounting data use total liabilities, total asset, book value of equity, earning before interest and tax, and fixed asset. The study also employs yearly and monthly market data, which are stock market return or SET index and the market value of the firm's stock. The Data Stream database yields all yearly and monthly data, covering the periods from 1992 to 2002.

3.2 METHODOLOGY

Welch's model (2002) empirical test studies the firm's capital structure readjustment. The firm's capital structure readjustment consists the firm's capital structure readjustment toward the target capital structure, the relationship between firm's attributions versus firm's inert behavior in returning toward the target capital structure, the longevity the firm spends in rebounding toward the target capital structure, and the study in the role of stock market returns relative to the influence of other corporate variables on capital structure. The empirical study uses the regression model (OLS).

3.2.1 Testing the firm's capital structure readjustment toward the target capital structure

The research studies the firm's behavior on capital structure readjustment toward the target capital structure in reaction to the change in its market value of a firm's equity. When the market value of a firm's equity increases, firm's enterprise value goes up. As firm's enterprise value increases, the firm's debt to equity ratio decrease. To maintain the target capital structure,

firm will need to adjust its capital ratio. But, under stock price recession periods, firm's enterprise value decreases as capital ratio increases. To avoid increasing capital ratio, adjusting firm's capital structure level expects to keep the firm's the target capital structure on track. If firm refuses to adjust its capital structure levels to its predetermined capital structure, the firm's current capital ratio will move away from its optimal capital structure.

$$ADR_t = \beta_0 + \beta_1 . ADR_{t-1} + \beta_2 . IDR_{t-1,t} + \partial_t \quad (1)$$

Given;

$$ADR_t = D_t / (D_t + E_t) \quad (2)$$

$$IDR_{t-1,t} = D_{t-1} / (D_{t-1} + E_{t-1}\langle 1 + R_{t-1,t}\rangle) \quad (3)$$

Where,

ADR_t: denotes actual debt ratio reported at period (t), defined as total book value of debt reported at period (t) divided by the sum of total book value of debt and total market value of equity reported at period (t)

ADR_{t-1}: denotes actual debt ratio reported at period (t-1), defined as total book value of debt reported at period (t-1) divided by the sum of total debt and total market value of equity reported at period (t-1), implying the firm's the target capital structure which is presumably optimal capital structure[1]

$IDR_{t-1,t}$: denotes inert debt ratio from period of (t-1) to (t), defined as total book value of debt reported at period (t-1) divided by the sum of total debt reported at period (t-1) and total market value of equity reported at period (t-1) times (one plus stock market return from (t-1) to (t)), implying firm's inert behavior in returning toward the target capital structure

D_t: is the book value of debt, defined as sum of long-term debt and debt in current liabilities reported at period (t)

E_t: is the market value of equity defined as a multiple of number of outstanding share of firm and equity price reported at period (t)

---

[1] It is important to note that the assumption of the target capital structure of firm is as follows: if there is no fundamental change, the previous year's capital structure is considered its firm target capital structure. The validity of the assumption is discussed in the final section of this chapter. (section 3.2.4)

$R_{t-1,t}$: is the stock market return from (t-1) to (t), defined as the change in stock market return from period (t-1) to (t)

Hypotheses

H_0:	Readjustment Hypothesis	$\beta_1 = 1, \beta_2 = 0$
H_1:	Non-Readjustment Hypothesis	$\beta_1 = 0, \beta_2 = 1$

H_0: If a firm rebalances toward the target capital structure by taking action on its debt or equity, the coefficient (β_1) of ADR_{t-1} which represents firm's the target capital structure should be significantly close to 1. Whereas, the coefficient (β_2) of $IDR_{t-1,t}$ which represents firm's inert behavior in returning toward the target capital structure should be significantly close to 0.

H_1: If a firm does nothing to its debt or equity so as to rebalance toward the target capital structure, the coefficient (β_1) of ADR_{t-1} which represents firm's the target capital structure should be significantly close to 0. Whereas, the coefficient (β_2) of $IDR_{t-1,t}$ which represents firm's inert behavior in returning toward the target capital structure should be significantly close to 1.

From equation (1), the variables regress from the samples of the chosen firms to explore the firm's behavior in readjusting capital structure to their target capital structure. This will prove whether firms follow the readjustment hypothesis or the non-readjustment hypothesis mentioned. If both the observed coefficients β_1 and β_2 lie between 0 and 1, firms are assumed to take action on debt or equity, but continue to fail in pulling back toward the optimal capital structure.

The previous chosen study, covering the periods from 1992 to 2002, finds that financial calamity took place in 1997 and 1998 is a crucial factor impacting firm's capital structure readjustment.

Because financial crisis causes liquidity squeezes to the entire economy, to explore what the capital structure rebounding behavior of the firm is like during the periods before the crisis and to prove whether there are any changes after-crisis period. So, this research purposely divides the duration of study into two sub periods. The two periods are from the years 1992 to 1996 (pre-crisis period) and 1999-2002 (post-crisis period).

The study's criteria in categorizing the studied intervals are based upon the economic crisis in July 1997. The time Thai government declared the transformation of the exchange rate

system from the fixed exchange rate system into the floating exchange rate system, this led to financial calamity. Firms carrying a heavy amount of debt, particularly in the sectors of Finance and Banking, act as major sources of firm's capital or the key mechanic in providing the entire economic system with liquidity fund.

3.2.2 Testing the relation between firm attributions and firm's inert behavior in returning toward the target capital structure

This section investigates the relationship between the firm's attributions and the firm's inert behavior in returning toward the target capital structure. The proxies use for the firm's size, the bankruptcy risk, the growth opportunity and profitability defines as the firm's total asset, the firm's equity-return volatility, the firm's book value to the market value of equity, and the firm's return on asset. The sorters are as follows:

Total Asset$_{t-1}$

: is book value of total asset reported at period (t-1)

Equity-Return Volatility$_{(t-2,t-1)}$

: is computed as the simple standard deviation of returns over 12 months preceding the measurement period (t-1)

Book Value$_{t-1}$ to Market Value$_{t-1}$ of Stock

: is the ratio of the book value of equity reported at period (t-1) divided by the market value of equity reported at period (t-1)

Return on Asset$_{t-1}$

: is the ratio of earning before interest and tax reported at period (t-1) divided by total assets reported at period (t-1)

From equation (1), the samples are ranked into 5 intervals where each interval of the data is divided into the percentiles of 20, 40, 60, and 80. These percentiles rank from the highest level to lowest level by using the total asset of firm, the return on asset of the firm, the book value to market value of equity of firm, and the equity-return volatility of firm as the criteria. The variables regress at each sorted interval attempts to investigate the firm's capital structure readjustment in terms of size, profitability, growth opportunity and volatility. This expects to

determine whether readjustment of the firm's capital structure is consistent with the readjustment hypothesis or the non-readjustment hypothesis through considering the degree of magnitudes on coefficients (β_1) of ADR_{t-1} and (β_2) of $IDR_{t-1,t}$ at each interval.

Hypotheses: the relation between firm attributions and firm's inert behavior in returning toward the target capital structure

- Total Asset: The total asset of a firm is used as a proxy for a firm's size. Firms, which have relatively higher asset or larger firms, expect a high correlation with the tendency of rebalancing toward their target capital structure. At the same time, firms, which have relatively lower asset or smaller firms, expect a much less correlation with the rebalancing behavior. Because larger firms tend to be more diversifiable than smaller firms, larger firms less volatile on income factor yield lower risk of bankruptcy. Therefore, higher asset firms are expected to have more accessibility to sources of capital than lower asset firms hence, the capital structure rebounding of larger firms is achieved easier than that of smaller ones. Under the assumption that the following is true, the coefficient (β_1) of ADR_{t-1} representing large firms is greater than the coefficient (β_1) of ADR_{t-1} representing smaller firms. Simultaneously, the coefficient (β_2) of $IDR_{t-1,t}$ representing large firms is less than the coefficient (β_2) of $IDR_{t-1,t}$ representing small firms.

- Equity-Return Volatility: Firms, which have relatively higher equity-return volatility, expect to be less correlated with the tendency of rebalancing toward the target capital structure. On the contrary, firms with relatively lower equity-return volatility expect to be highly correlated with the rebalancing behavior. Because creditor find that the higher volatility a firm possess , the higher uncertainty on that firm and so creditor favors to lend to lower equity-return volatility with lower risk. But in case where firms with higher risk do loan, they will have to face harsher lending terms and higher discount rate to compensate for the firm's uncertainty. Therefore, low equity-return volatility firms gain higher access to funding sources. With more capital, low equity-return volatility firms expect to succeed easier than those of high-equity volatility firm. The coefficient (β_1) of ADR_{t-1} , representing higher-risky firms, assumes to have a smaller value in the coefficient

(β_1) of ADR_{t-1} than lower-risky firms. At the same time, the coefficient (β_2) of $IDR_{t-1,t}$, representing higher-risky firms, expects a greater amount on the coefficient (β_2) of $IDR_{t-1,t}$ than those lower-risky firms.

- Book to Market Value of Stock: Firms, which have relatively higher growth opportunity, expect a high correlation with the tendency of rebalancing toward the target capital structure. While, firms, which have relatively lower growth opportunity, expect a less correlation with the tendency of rebalancing toward the target capital structure. Creditors find firms with relatively higher growth opportunity to possess better potential to expand and develop their business line and market. Creditors expect that large firm will generate a constant stream of cash flow, thus lowering the tendency to default on loans providing consistent returns to creditors. Hence, the higher growth firm will be able to acquire new borrowings than the lower growth firm. Therefore, readjusting a firm's capital structure to the predetermined capital structure of higher-growth firm is implemented more effectively and easily than those of lower-growth firm. The coefficient (β_1) of ADR_{t-1}, representing higher-growth firm, is greater than lower-growth firms. The coefficient (β_2) of $IDR_{t-1,t}$ representing higher-growth firm, is less than the coefficient (β_2) of $IDR_{t-1,t}$ of the lower-growth firms.

- Return on asset: Firms, which have relatively higher return on asset, expect a high correlation with the tendency of rebalancing toward the target capital structure. While, firms, which have relatively lower return on asset, expect a less correlation with the tendency of rebalancing toward the target capital structure. Because firms that have relatively higher return on asset are assumed to have less probability of risk default than lower-profit firms, higher-profit firms access to the source of capital and the capital structure readjustment of them becomes achieved easier than lower-profit firms. Thus, the coefficient (β_1) of ADR_{t-1}, representing higher-profit firm, is greater than coefficient (β_1) of ADR_{t-1}, representing lower-profit firm. The coefficient (β_2) of $IDR_{t-1,t}$, representing higher-profit firm, is less than the coefficient (β_2) of $IDR_{t-1,t}$, representing lower-profit firm.

3.2.3 Testing the longevity of firm in readjusting capital structure to the target capital structure

If firms do not readjust their capital structure to the target capital structure within a short term, approximately within one year, the question is how long firms will take in rebalancing their capital structure to the target capital structure or how long the inertia period will last. Therefore, the section establishes to answer how persistent the influence of market return is, or whether firms will eventually readjust to their former capital structure.

$$ADR_{t+a} = \alpha_0 + \alpha_1 . ADR_t + \alpha_2 . IDR_{t,t+a} + \partial_t \quad (4)$$

Given;

$$ADR_{t+a} = D_{t+a} / [D_{t+a} + E_{t+a}] \quad (5)$$

$$IDR_{t,t+a} = D_t / [D_t + E_t * (1 + R_{t,t+a}] \quad (6)$$

Where;

ADR_{t+a}: denotes actual debt ratio reported at period (t+a), defined as total book value of debt reported at period (t+a) divided by the sum of total book value of debt and total market value of equity reported at period (t+a)

ADR_t: denotes actual debt ratio reported at period (t), defined as total book value of debt reported at period (t) divided by the sum of total book value of debt and total market value of equity reported at period (t)

$IDR_{t,t+a}$: denotes inert debt ratio from period of (t) to (t+a), defined as total book value of debt reported at period (t) divided by the sum of total debt reported at period (t) and total market value of equity reported at period (t) times (one plus stock market return from (t) to (t+a))

D_{t+a}: is the book value of debt, defined as sum of long-term debt and debt in current liabilities reported at period (t+a)

E_{t+a}: is the market value of equity defined as a multiple of number of outstanding share of firm and equity price reported at period (t+a)

$R_{t,t+a}$: is the stock market return from (t) to (t+a), defined as the change in stock market return from period (t) to (t+a)

Variables ADR and IDR are redefined to be used on capital structure for the duration of the period of more than one year. IDR relies not on one-year raw return, but on multiple-year raw returns. From equation (4), to regress the variables ADR_t and $IDR_{t, t+a}$ from the samples of the chosen firms explores the behavior of firm in readjusting their capital structure. The duration of study is extended from one year to nine years. Thus, the coefficients of ADR_t and $IDR_{t, t+a}$ will be likely to mirror the direction and the duration of which a firm will take in readjusting the target capital structure over the intermediate term and long term. The coefficient of $IDR_{t, t+a}$ assumes to reduce to an extended period, and the coefficient of ADR_t assumes to increase. A consistent and constant reduction of the coefficient of $IDR_{t, t+a}$ or a gradual increase of the coefficient of ADR_t will yield a signal that the firm implement the adjustment of capital structure toward the target capital structure.

3.2.4 The study of role of stock market returns relative to influence of other corporate variables in explaining capital structure

The concern of this section arises two separate issues. Firstly, it examines the potential role of other corporate factors that may influence capital structure, beyond the mechanistic influences of the stock market return. These corporate variables represent the firm's growth and profitability, volatility, and size. If the role of the stock market return is important and significantly greater than the role of other corporate variables, the magnitude of inert debt ratio ($IDR_{t-1,t}$) should be greater than the other corporate variables.

In other words, the magnitudes of other corporate variables is likely to become less significant in explaining the capital structure. This implies that movement of the market value of the firm stock drives the firm's capital structure rather than other corporate reason mentioned above. This study uses the corporate factor of time (t-1) to capture the lag-effect on other corporate factor on capital of structure at time (t).

Secondly, this section also proves the validity of the assumption regarding the firm's the target capital structure mentioned earlier Section 3.2.1, which is that the previous year firm's capital structure is the target capital structure under the assumption that there is no fundamental change. If an addition of corporate variables has no significant impact on the statistical significance of the independent variables $ADR_{t-1}$and $IDR_{t-1, t}$ and also some or all of other corporate variables are simultaneously statistically significant, this will explicitly mean that the previous

year's firm capital structure, which is regarded as the target capital structure, is valid even though there is fundamental change because firm's capital structure can be explained by either corporate variables or stock market return adjusted historical capital structure ($IDR_{t-1,t}$). Thus, the validity of this assumption of the target capital structure rests crucially on the statistical significance of variables shown below.

$$ADR_t = \beta_0 + \beta_1 . ADR_{t-1} + \beta_2 . IDR_{t-1,t} + \beta_3 . EVOL_{t-1} + \beta_4 . ROA_{t-1} + \beta_5 . FXA_{t-1} + \beta_6 . BM_{t-1} + \partial_t \quad (7)$$

Where,

ADR_t: denotes actual debt ratio reported at period (t), defined as total book value of debt reported at period (t) divided by the sum of total book value of debt and total market value of equity reported at period (t)

ADR_{t-1}: denotes actual debt ratio reported at period (t-1), defined as total book value of debt reported at period (t-1) divided by the sum of total debt and total market value of equity reported at period (t-1), implying the firm's the target capital structure which is presumably optimal capital structure

$IDR_{t-1,t}$: denotes inert debt ratio from period of (t-1) to (t), defined as total book value of debt reported at period (t-1) divided by the sum of total debt reported at period (t-1) and total market value of equity reported at period (t-1) times (one plus stock market return from (t-1) to (t)), implying firm's inert behavior in returning toward the target capital structure

$EVOL_{t-1}$: is equity-return volatility computed as the simple standard deviation of returns over the 12 months preceding the measurement period.

ROA_{t-1}: is return on asset computed as the ratio of earning before interest and tax reported at period (t-1) divided by total assets reported at period (t-1

FXA_{t-1}: is fixed asset divided by total asset reported at period of (t-1)

BM_{t-1}: is firm growth computed as the ratio of the book value of equity reported at period t-1 divided by the market value of equity reported at period (t-1)

The following part presents a brief discussion on the different attributes suggested by different theories on capital structure, which may have effects on the firm's capital structure. These attributes are the firm's equity-return volatility, the firm's profitability, the firm's collateral, and the firm's growth.

Equity-Return Volatility ($EVOL_{t-1}$): Firms, which have relatively higher equity-return volatility, are expected to be less correlated with their capital ratio, as opposed to firms which have relatively lower equity-return volatility are assumed to be more correlated with their capital ratio on account of the idea that a source of capital is made easier access to the lower equity-return volatility firms than the higher risky firms. The debtor with higher risk normally will be required to confront a much stricter lending term and higher discount rate charged to compensate for the firm uncertainty. Thus, there should be a negative tendency on the relationship between firm's capital structure and the firm's equity-return volatility. The coefficient sign of this variable expects to be a negative (-).

Profitability (ROA_{t-1}): According to Trade Off Theory, higher profitability leads to a higher degree of cash flow problem because firm's manager tends to bring the capital to invest in inappropriate project. Thus, the benefit from leveraging increases due to obligation attached on debt in terms of reimbursing the principal and the interest. This indirectly forces firm manager to invest in optimal project. Consequently, this variable assumes to be positively correlated with debt ratio in this regard. Hence, the coefficient sign of this variable expects to be positive (+).

On the other hand, according to asymmetric information or Pecking Order Theory, firms prefer raising capital through a series of steps. They would first start from retained earning, second from debt, and third from issuing new equity. When firm's profitability increases, it is likely to impact the firm's retained earning. Sufficient retained earning means less spending on the amount of debt required for raising firm's capital. Hence, there should be a negative tendency on relationship between the firm's capital structure and the firm's profitability in accord with this theory. The expected coefficient sign of this variable is a negative (-).

Collateral Value (FXA_{t-1}): This study uses this variable to determine the value on tangible asset of the firms. The model used to predict the positive relationship between an enterprise's liquidation value and the level of liability is an Agency Model. When firms have more tangible

asset, the creditor is willing to lend more. This is due to having more collateral value, decreasing risk. Firm with inadequate collateral will have to turn to the use of equity financing as an alternative. The higher the value on tangible assets, the likelier a firm will have higher leverage ratio. Hence, a positive tendency on relationship between firm's capital structure and the firm's collateral is presented. The expected sign of the estimated coefficient of collateral value is positive (+).

Growth Opportunity (BM_{t-1}): According to the Trade Off Theory, when firm's investment opportunities increase, fewer chances will manager take under inappropriate project. This will lead to the idea that there will be less usage of debt to take control over manager. Therefore, there should be a positive tendency on the relationship between the firm's capital structure and the firm's book to market value of equity. The expected sign of this estimated coefficient of this variable should be a positive (+).

According to the Market Timing Theory, firms are more likely to issue equity when their market values are high, relative to the book and the past market values. They will have urges to repurchase their equity when their market values are low. Therefore, the usage of debt will reduce when the market value of stock increase, relative to the book value of stock or the market price of stock in the past. Consequently, there should be a positive tendency on the relationship between the firm's capital structure and the firm's book to market value of equity. In addition, the expected sign of the estimated coefficient of this variable should be a positive (+).

According to the Pecking Order Theory, when the firm's investment opportunities are substantially higher, firms are most likely to put their effort to reducing the proportion of current liabilities and collecting more retain earning. This will eventually raise funds for future use without having to issue any stock. The positive tendency on relationship between the firm's capital structure and the firm's book to market value of equity will be true. The expected coefficient sign of this variable should be a positive (+).

On the contrary, the Pecking Order Theory supports another stance where firms still prefer to raise capitals in a series of steps. They start would start first from retain earning, second from debt, and third from issuing new equity. When firms' investment opportunities are extremely high that the internal cash flow for financing become inadequate, firms will demand additional debt for fund raising. Therefore, there should be a negative tendency on relationship

between the firm's capital structure and the firm's book to market value of equity. The sign of this variable should be negatively correlates with the debt ratio (-).