CHAPTER 4

CAPITAL STRUCTURE DETERMINANTS

This chapter will describe the methodology used to investigate the capital structure determinants among Thai firms. We will study the capital structure determinants by investigating both the static and dynamic model. The dependent variable will be the leverage ratio. The explanatory variables will be the capital structure determinants as suggested by the literature reviews as followings: - tax advantages, bankruptcy costs, agency costs of equity, agency costs of debt and asymmetric information. The lagged dependent variable will also be used as the explanatory variables for the dynamic model. The definitions of all variables are shown in Table A.5 in the appendix.

The measures of leverage will be discussed in the first section. The second section will dedicate to the proxy for capital structure determinants. The third and fourth section will elaborate the methodology to investigate capital structure determinants by using the static and dynamic model respectively. The last section in this chapter will present empirical results from both the static and dynamic approach.

4.1 Measures of Leverage

Several proxies were proposed to measure capital structure such as total liabilities to total assets ratio, total debt to total assets ratio, total debt to net assets ratio and total debt to capital ratio. Rajan and Zingales (1995) and Drobetz and Fix (2003) concluded that the ratio of total debt to total capital, defined as total debt plus equity, should be the best representative of the effects of past financing decisions. Although the ratio of total liabilities to total assets may proxy for the residual assets for

shareholders after liquidation, the use of total liabilities as the nominator may overstate firm's leverage from the inclusion of transaction sources of fund such as accounts payable. Total debt to total assets ratio excludes liabilities from transaction sources of fund but still incorporate specific assets offset by these non-debt liabilities. The use of the ratio between total debt and net assets, calculated as total assets minus accounts payable and other liabilities, is unaffected by the gross level of trade credit but may be affected by factors that may have nothing to do with financing. Therefore, in this study, we will investigate capital structure (LEV) from total debt to capital ratio which total debt defines as the sum of long-term debt and short-term debt.

4.2 Proxies for Capital Structure Determinants

Tax theory suggests that firms will be induced to borrow debt because they can deduct interest expenses before calculating tax expenses. Due to the constant corporate tax rate of 30%, we think that the proxy for marginal tax rate such as the trichotomous variable or the taxable income variable will instead reflect the corporate tax base or firm's profitability[46]. Therefore, the proxy of corporate marginal tax rate will not be taken into account in this study.

Since the corporate debt tax shields will be less significant if firm has the other non-debt tax shield (NDTS), proxy for non-debt tax shield will be investigated. Non-debt tax shield was used to be proxied by the ratio between depreciation and

---

[46] Graham (1996) defined trichotomous variable as "... i) the top statutory tax rate if the firm has neither a net operating loss carryforward nor negative taxable income, ii) one-half the top statutory rate if the firm has either a net operating loss carryforward or negative taxable income but not both, and iii) zero if the firm has negative taxable income and a net operating loss carryforward...". Graham (1996) defined the taxable income variable as a dummy variable that "...is assigned the value of the statutory rate for the top tax bracket if taxable income is positive and a value of zero otherwise".

Total assets. However, we think that the proxy used for non-debt tax shields may not be accurate. The use of depreciations to proxy the non-debt tax shield may not be enough, there still exist other deductions that firms can use for tax-substitutions such as bad debts, wear and tear, donations, provident fund contributions, entertainment expenses and net losses carried forward. Furthermore, there may exist a high correlation between depreciation and total fixed assets. Since fixed assets can be used as the collateral, firms with more fixed assets will have higher borrowing capacity and less moral hazard problems or less agency costs of debt. Therefore, the insignificant relationship between non-debt tax shields and leverage may be the mixed result of the non-debt tax shield and the agency cost of debt explanations.

In this paper, we measure non-debt tax shields following DeMiguel and Pindado (2001). The proxy for non-debt tax shields (NDTS) is calculated as the earnings before taxes minus the ratio between the taxes paid and the tax rate. Consequently, the variable includes those quantities of earnings that were not taxes because the firms had non-debt tax shields. Therefore, they are presented as a substitute for debt in order to reduce the tax burden. As a result, we hypothesize that a negative relationship exists between NDTS and leverage.

Size will be controlled because larger firms had smaller bankruptcy costs and tend to be more diversified and less prone to collapse as suggested by Warner (1977) and Titman and Vessels (1988) respectively. In this study, the natural logarithm of total assets (LnTA) will be used as the proxy for size. Therefore, the positive relation between LnTA and leverage is expected.

However, size may proxy for the other capital structure determinants as explained before, the additional proxy for bankruptcy costs is proposed by Titman and Wessels (1988) as the selling and administrative expenses to sales (SG&A/Sale) ratio.

Selling and administrative expenses include advertising expenses, research and development expenses, wages and sales commission. These expenses involve the investment in the intangibility of firms that may be totally loss if firms bankrupt. Therefore, firms with higher selling and administrative expenses to sales ratio should have lower leverage.

Bankruptcy costs will not be investigated through standard deviation of sales, stock return or return on asset. We think that the use of only 3 to 5 observations (firm-years) in calculating standard deviation may not be adequate. However, using longer time series may include the effect from the other macroeconomic factors that also may not be the accurate proxy for bankruptcy costs.

The effect of bankruptcy costs toward capital structure decisions will be more severe if firm is likely to bankrupt in the near future. Therefore, the additional proxy is proposed to take into account the business risk. Due to the high collinearity between the leverage ratio and the Z-score (including the ratio of equity to debt as one component) MacKie-Mason (1990) modified the Altman's (1968) Z-score, in order to indicate the likelihood of distress, by excluding the ratio of market equity to book debt[47]. In this paper, we will adjusted the new Altman et al. (1995) Z-score (Z'') by excluding the ratio of equity to debt followed MacKie-Mason (1990). This alternative measurement of bankruptcy probability (Z"PROB) will be used as

$$Z''PROB = 6.56X_1 + 3.26X_2 + 6.72X_3 \quad (1)$$

---

[47] Altman (1968) proposed the Z-score model developed with the public firms as $Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$ where X_1 = working capital/total assets, X_2 = retained earnings/total assets, X_3 = earnings before interest and taxes/total assets, X_4 = market value equity/book value of total liabilities, X_5 = sales/total assets. The original model of Z-score was then adapted for private firms by substituting the book value of equity for the market value of equity. The revised Z-score is calculated as $Z' = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5$ Altman et al. (1995) have further improved the revised Z-score model toward emerging markets corporates. This new Z''-score model was $Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$.

where X_1 = working capital/total assets, X_2 = retained earnings/total assets and X_3 = earnings before interest and taxes/total assets. Firms with lower probability of bankruptcy have less significant leverage-related costs, leading to higher borrowings. We, thus, hypothesize the negative relation between leverage and probability of bankruptcy or the positive relation between Z''PROB and leverage.

Due to the limitation of data that we have only the latest managerial ownership in 2001, we cannot investigate the agency costs of equity from the managerial ownership. Furthermore, we question whether managerial ownership can be used as an accurate proxy for agency costs of equity among Thai firms. It is generally realized that there is widespread use of other related persons (sometimes with different surname) as nominees among Thai firms. The agency costs of equity may be reflected by the efficiency ratio or the asset utilization ratio calculated as the ratio of annual sales to total assets. Ang et al. (2000) argued that the asset utilization ratio may proxy for the agency costs of equity because this proxy was related to the management investment decisions and the management's shirking. The inefficient asset utilization would reflect the higher level of perquisite consumption or the higher agency costs of equity. Shareholders among firms having lower efficiency ratios may have higher concern about this agency problem and need more monitoring from debtholders. Therefore, there should be a negative relationship between the efficiency ratio (Sale/TA) and leverage.

The agency costs between shareholders and debtholders because of the asset substitution problem and the underinvestment problem will be controlled as well. The asset substitution problem will be less severe among firms with higher assets tangibility since the tangible assets can be used as the collateral as proposed by Titman and Wessels (1988), MacKie-Mason (1990), Jensen et al. (1992), Graham (1996),

Graham et al. (1998), Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). Furthermore, growth will be controlled due to the underinvestment problem as suggested by Graham et al. (1998). Firms with larger growth opportunities should be less levered to avoid the underinvestment problem. The tangibility of assets (TAN) will be calculated as the net plant, property and equipment divided by total assets while the percentage change in total assets (GTA) will proxy for growth. We hypothesize the positive relation between TAN and leverage as well as the negative relation between GTA and leverage.

Due to the asymmetric information, the explanatory variables will also include the proxy for profitability as the basic earnings power (BEP), the ratio between the earnings before interest and tax to total assets, as suggested by Titman and Wessels (1988) and Jensen et al. (1992). The negative relation between BEP and leverage is expected because firms with higher profitability will have more internal funds to invest and less necessity to issue equity due to the pecking order theory.

4.3 Capital Structure Determinants: Static Model

The firm-specific variables are proxied by the industry dummy variables to conserve degrees of freedom and control the product/input market interaction. Then, the time-specific variables will also be examined through time dummy variables. Therefore, we reach the following ordinary least square regression as the static model.

$$\begin{aligned} LEV_{it} = \alpha_0 &+ \alpha_1(NDTS)_{i,t} + \alpha_2(LnTA)_{i,t} + \alpha_3(SG\&A/SALE)_{i,t} + \alpha_4(Z''PROB)_{i,t} \\ &+ \alpha_5(Sale/TA)_{i,t} + \alpha_6(TAN)_{i,t} + \alpha_7(GTA)_{i,t} + \alpha_8(BEP)_{i,t} \\ &+ \beta Industry\ dummy + \delta Time\ dummy + \varepsilon_{it} \end{aligned} \quad (2)$$

4.4 Capital Structure Determinants: Dynamic Model

In general, the static approach in examining the capital structure determinants is to regress the observed leverage on a set of explanatory variables. This approach has to assume that the observed leverage is optimal since the capital structure theory explains capital structure determinants of the optimal leverage. The dynamic model is used in addition to the static model in order to relax the assumption that the observed leverage is the optimal leverage. Banerjee, et. al. (2000), Heshmati (2001), Loof (2003) and Bartholdy and Mateus (2003) used the alternative methodology to study the capital structure determinants as explained below. By using the dynamic model, the empirical results showed the adjusted R-square approximately 60% to 80%[48].

Several variables determine the optimal capital structure as the firm and time variant variables (Y_{it}), the firm-specific factors (X_i) and the time-specific factors (X_t). This relationship is presented in equation (3). Under the idealized condition, the observed capital structure will be the optimal capital structure. By applying the dynamic setting, the change in actual leverage (L_{it}) from the previous to the current period should be exactly equal to the change from the previous actual leverage (L_{it-1}) to the current optimal leverage (L^*_{it}). However, the observed capital structure may not be the optimal capital structure due to the adjustment costs (δ_{it}). Therefore, the change of actual leverage through time should be a portion of the required leverage change to be optimal as shown in equation (4). Substitute equation (3) into equation (4) will yield equation (5) as followings:

---

[48] The adjusted-R^2 of the static empirical evidences were about 5% to 27% as shown by MacKie-Mason (1990), Mehran (1992), Jensen et al. (1992), Graham (1996), Graham et al. (1998) and Frank and Goyal (2003). On the other hand, the dynamic capital structure investigation reached the explanatory power about 60% to 80%. However, some contradictory relation between leverage and firm-specific variables still pointed out the importance of institutional influences underlying firms' financial environments.

$$L_{it}^{*} = f(Y_{it}, X_{i}, X_{t}) \quad (3)$$

$$L_{it} - L_{it-1} = \delta_{it}(L_{it}^{*} - L_{it-1}) \quad (4)$$

$$L_{it} = (1 - \delta_{it})L_{it-1} + \delta_{it}L_{it}^{*} + e_{it} \quad (5)$$

The static models have to assume the observed capital structure to be the optimal capital structure. In order to avoid this assumption, the dynamic model is proposed as shown in equation (5). Due to the high correlation between leverage and lagged leverage, the ordinary least square cannot be used to investigate equation (5). The generalized method of moments will be used to investigate equation (5) by applying all the lagged twice values of the right-hand side variables as the instruments set as suggested by Arellano and Bond (1991). To check for potential misspecification of the models, the second-order serial correlation in the first-difference residuals will be tested. Another test of specification used is Sargan's statistic of over-identifying restrictions, which tests for the absence of correlation between instruments and error term. The dynamic capital structure model will be investigated as follow:

$$LEV_{it} = \alpha_1 LEV_{i,t-1} + \alpha_2(NDTS)_{i,t} + \alpha_3(LnTA)_{i,t} + \alpha_4(SG\&A/SALE)_{i,t} + \alpha_5(Z''PROB)_{i,t} + \alpha_6(Sale/TA)_{i,t} + \alpha_7(TAN)_{i,t} + \alpha_8(GTA)_{i,t} + \alpha_9(BEP)_{i,t} + \beta Industry\ dummy + \delta Time\ dummy + \varepsilon_{it} \quad (6)$$

In conclusion, the first objective of this study is to test for the hypothesis that

Hypothesis I : The leverage ratios among Thai firms can be explained by determinants from the capital structure theories. Specifically, capital structure is positively related to size, modified Z-score (Z"PROB) and asset tangibility as well as is negatively related to non-debt tax shields, asset uniqueness, asset utilization, growth and profitability.

Table 8: The hypothesized relationship between leverage ratio and capital structure determinants

Explanatory Variables	Hypothesized coefficients
Non-debt tax shields (NDTS)	-
Size (LnTA)	+
Product uniqueness (SG&A/Sale)	-
Z"PROB	+
Asset utilization (Sale/TA)	-
Asset tangibility (TAN)	+
Growth (GTA)	-
Profitability (BEP)	-

Table 9 Regression Results of the Capital Structure Determinants Investigation

The dependent variable is leverage ratio that is measured as total debt to total capital ratio. Panel A and C show the results with the static model before and after the matching criteria respectively. The static model follows equation (8) as following:

$$LEV_{it} = \alpha_0 + \alpha_1(NDTS)_{i,t} + \alpha_2(LnTA)_{i,t} + \alpha_3(SG\&A/SALE)_{i,t} + \alpha_4(Z''PROB)_{i,t} + \alpha_5(Sale/TA)_{i,t} + \alpha_6(TAN)_{i,t} + \alpha_7(GTA)_{i,t} + \alpha_8(BEP)_{i,t} + \beta Industry\ dummy + \delta Time\ dummy + \varepsilon_{it} \quad (2)$$

Panel B and D show the results with the dynamic model before and after the matching criteria respectively from equation (9) as following:

$$LEV_{it} = \alpha_1 LEV_{i,t-1} + \alpha_2(NDTS)_{i,t} + \alpha_3(LnTA)_{i,t} + \alpha_4(SG\&A/SALE)_{i,t} + \alpha_5(Z''PROB)_{i,t} + \alpha_6(Sale/TA)_{i,t} + \alpha_7(TAN)_{i,t} + \alpha_8(GTA)_{i,t} + \alpha_9(BEP)_{i,t} + \beta Industry\ dummy + \delta Time\ dummy + \varepsilon_{it} \quad (6)$$

t-statistics are in parentheses. *, ** and *** significant at the 10, 5 and 1 percent level, respectively. The second column shows the regression result among the whole sample. The third and fourth columns show the regression result among non-listed and listed firms respectively. The fifth, sixth and seventh columns show the regression result from the static model in 1999, 2000 and 2001 respectively.

	1999-2001	Non-listed	Listed	1999	2000	2001
Panel A: Static model among all firms before the matching criteria						
NDTS[a]	-0.303***	-0.290***	-0.193	-0.423***	-0.398***	-0.137
	(-4.36)	(-3.84)	(-0.92)	(-3.05)	(-3.43)	(-1.17)
LnTA[b]	0.046***	0.052***	0.067***	0.047***	0.049***	0.045***
	(11.57)	(10.36)	(8.17)	(6.29)	(6.98)	(6.71)
SG&A/Sale[c]	-0.000	-0.000	0.019*	0.000	-0.001	0.007***
	(-0.07)	(-0.20)	(1.68)	(0.31)	(-1.40)	(2.70)
Z"PROB[d]	-0.020***	-0.019***	0.002	-0.028***	-0.014***	-0.017***
	(-11.72)	(-10.61)	(0.38)	(-5.33)	(-2.84)	(-6.89)
Sale/TA[e]	-0.023***	-0.035***	0.008	-0.027**	-0.023**	-0.016
	(-3.32)	(-4.59)	(0.40)	(-1.96)	(-1.94)	(-1.53)
TAN[f]	0.102***	0.070***	0.184***	0.009	0.162***	0.134***
	(4.77)	(2.85)	(3.85)	(0.22)	(4.26)	(3.76)
GTA[g]	-0.009	-0.011*	-0.044	-0.029***	-0.010	0.016
	(-1.50)	(-1.80)	(-0.84)	(-2.74)	(-1.14)	(1.47)
BEP[h]	-0.151***	-0.113*	-0.812***	-0.074	-0.174*	-0.230**
	(-2.51)	(-1.76)	(-4.08)	(-0.63)	(-1.67)	(-2.28)
F-statistics	28.78***	21.95***	14.47***	12.07***	12.33***	10.36***
Adjusted R^2	0.152	0.150	0.276	0.173	0.162	0.131
Panel B: Dynamic model among all firms before the matching criteria						
Lagged LEV	0.433***	0.416***	0.485***			
	(11.91)	(10.51)	(5.44)			
NDTS[a]	-0.155**	-0.139*	-0.296			
	(-2.18)	(-1.76)	(-1.56)			
LnTA[b]	0.114***	0.115***	0.154***			
	(7.68)	(7.15)	(3.70)			
SG&A/Sale[c]	0.000	0.000	-0.028***			
	(0.51)	(0.26)	(-2.88)			
Z"PROB[d]	-0.005***	-0.007***	0.034***			
	(-3.42)	(-4.03)	(5.78)			
Sale/TA[e]	-0.016**	-0.015*	0.002			
	(-1.91)	(-1.71)	(0.05)			
TAN[f]	0.106***	0.039	0.395***			
	(2.60)	(0.85)	(4.61)			
GTA[g]	-0.007**	-0.007**	0.011			
	(-2.00)	(-2.09)	(0.31)			
BEP[h]	-0.168***	-0.187***	-0.399**			
	(-2.55)	(-2.63)	(-1.95)			
Sargan test	12.40**	13.47**	20.38***			
m_1	-12.53***	-10.46***	-7.16***			
m_2	-0.55	-1.22	1.58			

Panel C: Static model among listed and non-listed matched firms

NDTS[a]	-0.489***	-0.366***	-0.179	-0.499***	-0.454***	-0.516***
	(-4.86)	(-2.62)	(-0.85)	(-2.76)	(-2.91)	(-2.47)
LnTA[b]	0.043***	0.023**	0.067***	0.035***	0.044***	0.045***
	(6.56)	(2.17)	(8.15)	(2.99)	(3.96)	(4.04)
SG&A/Sale[c]	0.001	0.001	0.019*	0.001	0.012	0.023
	(0.69)	(0.52)	(1.67)	(0.64)	(0.43)	(1.27)
Z"PROB[d]	-0.011**	-0.029***	0.002	-0.021***	-0.008	-0.012
	(-2.41)	(-4.02)	(0.31)	(-2.47)	(-0.98)	(-1.40)
Sale/TA[e]	-0.006	-0.026**	0.007	0.014	-0.002	-0.017
	(-0.65)	(-2.01)	(0.34)	(0.73)	(-0.14)	(-1.07)
TAN[f]	0.083***	-0.042	0.179***	-0.022	0.126**	0.152***
	(2.56)	(-0.92)	(3.73)	(-0.38)	(2.28)	(2.66)
GTA[g]	-0.018*	-0.027***	-0.049	-0.022**	-0.061	0.083
	(-1.71)	(-2.44)	(-0.91)	(-1.99)	(-1.03)	(1.57)
BEP[h]	-0.340***	-0.184*	-0.818***	-0.282*	-0.361***	-0.396**
	(-4.04)	(-1.72)	(-4.09)	(-1.84)	(-2.75)	(-2.36)
F-statistics	15.85***	6.42***	14.35***	5.85***	6.49***	6.28***
Adjusted R^2	0.175	0.134	0.276	0.157	0.171	0.168

Panel D: Dynamic model among listed and non-listed matched firms

Lagged LEV	0.434***	0.342***	0.485***
	(6.76)	(3.98)	(5.43)
NDTS[a]	-0.229**	-0.132	-0.298
	(-2.30)	(-1.01)	(-1.57)
LnTA[b]	0.089***	0.057*	0.154***
	(3.49)	(1.70)	(3.69)
SG&A/Sale[c]	0.000	0.000	-0.028***
	(1.01)	(0.25)	(-2.88)
Z"PROB[d]	0.032***	0.029***	0.034***
	(6.78)	(4.03)	(5.77)
Sale/TA[e]	-0.019	-0.021	0.002
	(-1.05)	(-1.00)	(0.05)
TAN[f]	0.146***	-0.000	0.395***
	(2.49)	(-0.01)	(4.60)
GTA[g]	0.001	0.001	0.011
	(0.15)	(0.08)	(0.30)
BEP[h]	-0.418***	-0.414***	-0.398**
	(-4.12)	(-3.37)	(-1.94)
Sargan test	6.91	13.70**	20.39***
m_1	-7.39***	-3.52***	-7.17***
m_2	1.06	-0.25	1.59

[a] LEV is the ratio of total debt to capital which is calculated as (Short term debt + Long term debt)/(Short term debt + Long term debt + Equity).

[b] NDTS is the proxy for non-debt tax shields which is calculated as EBIT – Interest expenses – (Taxes paid/Tax rate) standardized by total assets.

[c] LnTA is the natural logarithm of total assets. SG&A/Sale is the ratio between selling and administrative expenses and total sales.

[d] Z"PROB is the modified Z-score adjusted from *Altman (1995)* which equals to $6.56X_1 + 3.26X_2 + 6.72X_3$ where X_1 = working capital/total assets, X_2 = retained earnings/total assets, X_3 = earnings before interest and taxes/total assets.

[e] Sale/TA is the proxy for the agency costs of equity that is calculated as total sales over total assets.

[f] TAN is the proxy for the agency costs of debt that is measured as the ratio of the plant, property and equipment to total assets.

[g] GTA of total assets [is] the percentage changes in total assets from the previous year.

[h] BEP is calculated as the ratio of earnings before interest and tax to total assets.

4.5 Empirical Results

4.5.1 Static Model

Panel A in the Table 9 shows the regression results of the capital structure determinants investigation of the before-matched sample from the traditional approach in equation (2) that assumes the observed capital structure to be the optimal capital structure. The leverage ratios under consideration are total debt to total capital ratio. The second column presents the results when all observations are used for the investigation while the third and fourth columns show the results of the non-listed firms and listed firms separately. The fifth, sixth and seventh columns present the results of the subsample during the year of 1999, 2000 and 2001 respectively.

The coefficient of the proxy for non-debt tax shields is consistent with the tax theory. Firms with lower non-debt tax shields use leverage more aggressively. The additional percentage of non-debt tax shields to total assets increase the use of total debt 0.30% of total capital employed. Results seem to be similar when we consider the subsample of 1999, 2000 or 2001.

Size is shown to be positively related to the ratio of total debt to total capital as expected. This is consistent with the view that larger firms face lower direct costs of bankruptcy. The higher diversification of larger firms may also enhance their debt capacity. Furthermore, larger firms may have an advantage over smaller firms in accessing credit markets. Results seem to be similar either we consider the subsample of 1999, 2000 or 2001.

Asset uniqueness as proxied by the selling and administrative expenses to sales ratio is found to be insignificantly related with total debt to total capital ratio, which is not consistent with the bankruptcy costs explanation. We cannot explain for

the insignificant or the positive relationship found but doubt these findings are caused by the use of static model.

The modified Altman's (1995) Z-score (Z"PROB) is found to be negatively related to total debt to total capital ratio which is not consistent with the bankruptcy costs explanation. However, Z"PROB is statistically significant and negatively related with leverage for the total sample but not statistically significant among listed firms. The separation of Thai firms into non-listed and listed firms has pointed out that the negative relation between Z"PROB and leverage may be resulted from the non-listed firms. One explanation is that non-listed firms with weak financial status may be highly induced to borrow external debt due to the lack of access to stock market. The weaker financial status may induce the greater needs for additional funds that can be raised only via borrowing.

In general, the bankruptcy costs explanation is mixed but with the robust positive relation between size and leverage as unanimously found in the other researches. The larger the firm is, the more aggressively the capital structure decisions are. Asset uniqueness, which may be totally lost if the firm goes bankrupt, does not seem to cause the managers to be more financially conservative or more financially aggressive. Firms with higher bankruptcy risk are not found to borrow less aggressively than firms with lower bankruptcy risk.

There is significantly negative relation between leverage and asset utilization ratio among Thai firms. The asset utilization ratio, as proxy for agency costs of equity, is found to be statistically significant and negatively related to total debt to total capital ratio only among non-listed firms. However, there should be not much conflict of interest between manager and shareholders among non-listed firms. The negative relationship between leverage and asset utilization ratio among non-listed firms may

be induced by the fact that firms with less sales will have less internal funds and have to borrow more external funds.

The coefficient of the asset tangibility is statistically significant and positively related to leverage. Firms with more fixed assets are found to use higher leverage. Results imply that firms with larger fixed assets or long-term assets that can be used as collateral have a larger borrowing capacity. However, the relationship between asset tangibility and leverage is not significant in 1999. The additional percentage of fixed assets to total assets will increase borrowing capacity 0.10% of total debt to total capital employed.

Thai firms with high growth are found to use less leverage as expected. The additional percentage of growth will decrease the use of total debt 0.01% of total capital employed. However, results show the negative relation between growth and leverage but not statistically significant.

The relationship between the proxy for profitability (BEP) and leverage is negative and strongly significant. High-profit firms use internal financing, while low-profit firms use more debt because their internal funds are not adequate. However, results are not statistically significant in 1999.

Panel C in the Table 9 shows the regression results of the capital structure determinants investigation of the sample that have been matched non-listed firms with listed firms one-by-one due to industry classification and size. The leverage ratios under consideration are total debt to total capital ratio. The second column presents the results when all observations are used for the investigation while the third and fourth columns show the results of the non-listed firms and listed firms separately. The fifth, sixth and seventh columns present the results of the subsample during the year of 1999, 2000 and 2001 respectively. Results seem to be similar no matter the sample are

firms before the matching criteria or after the matching criteria. There is contradictory sign on asset tangibility coefficient among non-listed firms before the matching criteria or after the matching criteria; however, both groups have no statistically significant relationship.

In conclusion, the static models show that the capital structure decisions are usually consistent with the theories. Firms with less non-debt tax shields, lower bankruptcy costs, lower agency costs of debt and lower profitability are borrowing more aggressively. However, the relation between agency costs proxy and leverage is not statistically significant. Results do not seem to be different for the subsample in different time.

4.5.2 Dynamic Model

Panel B of the Table 9 shows the regression results of the capital structure determinants investigation from the dynamic approach in equation (6) for the before-matched sample. This approach does not assume the observed capital structure to be the optimal capital structure. The leverage ratio under consideration is total debt to total capital ratio.

The coefficient of the proxy for non-debt tax shields is again consistent with the tax theory. Firms with lower non-debt tax shields use leverage more aggressively. By using the target adjustment model, the additional percentage of non-debt tax shields to total assets decrease the use of total debt 0.15% of total capital employed.

Size is shown to be highly significantly and positively related to leverage ratio. Larger size will enhance debt-borrowing capacity as expected. The use of dynamic model shows the higher impact from size toward capital structure than the use of static model. The coefficient of size is 0.11 for the dynamic model which is greater than 0.05 as found for the static model.

The asset uniqueness as proxied by the selling and administrative expenses to sales ratio is found to be statistically significant and negatively related with leverage among listed firms, which is consistent with the bankruptcy costs explanation. Listed firms with high bankruptcy costs as proxied by asset uniqueness are borrowing debt more conservatively. The use of dynamic model shows the result that consistent with bankruptcy costs explanation, which cannot be observed by using the static model.

The bankruptcy probability investigated via the modified Altman's (1995) Z-score (Z"PROB) is found to be statistically significant and positively related to total debt to total capital ratio among listed firms. This finding confirms the hypothesis that risky firms cannot raise external debt as high as firms with lower risk. Without using the dynamic model, we cannot observe the positive relation between Z"PROB and leverage.

In sum, bankruptcy costs explanation is confirmed especially toward the use of dynamic model. Firms with larger total assets, less asset uniqueness and less probability of bankruptcy are borrowing debt more aggressively.

The asset utilization ratio, as proxy for agency costs of equity, is found to be negatively related with leverage. However, the results are statistically significant among non-listed firms but not statistically significant among listed firms. The negative relationship between leverage and asset utilization ratio among non-listed firms may be induced by the fact that firms with less sales will have less internal funds and have to borrow more external funds. On the other hand, the lack of statistically significant among listed firms may be due to concentrated ownership among Thai firms.

The coefficient of the asset tangibility is positive as expected with the 1% significant level. Firms with higher proportion of fixed assets are found to use higher

leverage. Tangible assets will be needed as collateral to alleviate the asset-substitution problems. The use of dynamic model shows the higher impact from tangible assets to enhance borrowing capacity compared to the results from the static model. The additional percentage increase in asset tangibility is found to enhance borrowing capacity 0.10% from the use of dynamic model which is similar to 0.10% increase in debt borrowing capacity found from the use of static model.

Growth is found to be negatively related with total debt to total capital ratio. Firms with investment opportunities tend not to borrow aggressively in order to maintain borrowing capacity for future investment. However, the relationship is not statistically significant among listed firms, which may be resulted from the lack of growth opportunities among listed firms.

The relationship between the proxy for profitability (BEP) and leverage is negative and strongly significant especially among listed firms. This result supports the pecking order theory. High-profit firms use internal financing, while low-profit firms use more debt because their internal funds are not adequate. The one percentage reduction in profitability increase the use of leverage 0.19% and 0.40% among non-listed firms and listed firms respectively.

The coefficients of the lagged dependent variables are statistically significant and positive. This implies that adjustment toward optimal capital structure is costly. The observed capital structure is not the optimal capital structure. Firms bear transaction costs when they decide to adjust the capital structure of the previous year to the target level in the current period. The coefficient of the lagged leverage ratio is inversely proportional to transaction costs as shown in equations (4) and (5). The comparisons of the coefficients of lagged leverage ratios between our study and the studies in other countries show the higher adjustment costs among Thai firms. The

coefficient of lagged leverage ratio among Thai firms is 0.433 while those among Spanish firms and U.S. firms are approximately 0.201 to 0.214 and 0.304 to 0.410 respectively as suggested by DeMiguel and Pindado (2001).

To check for the potential misspecification of the models, the Arellano-Bond test for lack of second-order serial correlation is always rejected. Although, the Arellano-Bond test for lack of first-order serial correlation always cannot be rejected, the transformation with the lagged right-hand side variables as valid instruments will mitigate this problem. These results validate the target adjustment model or the dynamic model for the capital structure decisions.

Panel D in the Table 9 shows the regression results of the capital structure determinants investigation of the sample that have been matched non-listed firms with listed firms one-by-one due to industry classification and size by using the dynamic model. Results seem to be similar no matter the sample are firms before the matching criteria or after the matching criteria. There is one significant different result from the use of before-matched and after-matched sample. Non-listed matched firms are found to have positive relationship between the modified Z-score and leverage contradictory to the finding in Panel B.

In conclusion, listed Thai firms have the transaction costs in adjusting the leverage to the target ratio. The observed leverage ratios are not the optimal ratios. Capital structure decisions, therefore, have to be investigated from the target adjustment model. Results seem to be consistent with the capital structure theories especially among listed firms. The availability of non-debt tax shields decreases the firm's incentive to borrowings. Firms with larger size and less probability of bankruptcy have higher borrowing capacity. Profitability is very significant in setting the optimal capital structure among Thai firms. Asset tangibility can be used to

enhance debt-borrowing capacity among listed firms. Asset uniqueness will induce listed firms to have conservative capital structure. Agency cost of equity is not a significant factor in setting target capital structure. The study in this chapter still cannot explain why listed firms borrow more conservatively relative to non-listed firms. This investigation answer why particular firms no matter listed or non-listed follow aggressive or conservative capital structure. Therefore, the next chapter will be dedicated to the investigation of why listed firms have lower leverage compared to non-listed firms.