



## Determinants of Capital Structure of Listed Companies in Thailand ปัจจัยที่กำหนดโครงสร้างเงินทุนของบริษัทจดทะเบียนในตลาด หลักทรัพย์แห่งประเทศไทย

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### Abstract

The determinants of capital structure of 81 listed companies from 6 industries on the Stock Exchange of Thailand from 2004 to 2008 are investigated. After controlling for industry, profitability, size, and tangibility affect leverage significantly. Firms with low profitability, large size, and low tangibility have high leverage. Additionally, firms in retail business sector of service industry acquire more funds from short-term debt in order to align with their short-term assets from daily operations. However, growth and volatility do not determine leverage.

**Keywords:** 1) Capital Structure 2) Leverage 3) Listed Companies 4) Stock Exchange of Thailand

### บทคัดย่อ

งานวิจัยเรื่องปัจจัยที่กำหนดโครงสร้างเงินทุนของบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย ทำการศึกษาทั้งหมด 81 บริษัท จาก 6 กลุ่มอุตสาหกรรม ในช่วงปี พ.ศ. 2547 ถึง พ.ศ. 2551 ภายหลังจาก การควบคุมตัวแปรกลุ่มอุตสาหกรรม พบร่วม ความสามารถในการทำกำไร ขนาดบริษัท และสินทรัพย์ที่จับต้องได้ มีผลต่อการจัดหาเงินทุนจากการกู้ยืมอย่างมีนัยสำคัญทางสถิติ กล่าวคือ บริษัทที่มีความสามารถในการทำกำไรต่ำ มีขนาดใหญ่ และมีสินทรัพย์ที่จับต้องได้น้อย จะมีการจัดหาเงินทุนจากการกู้ยืมมาก อีกทั้ง บริษัทที่อยู่ในหมวด ธุรกิจค้าปลีก กลุ่มอุตสาหกรรมบริการ จะมีการจัดหาเงินทุนจากการกู้ยืมรายสั้นมาก ทั้งนี้ เพื่อใช้เป็นสินทรัพย์ ระยะสั้นสำหรับการดำเนินงานประจำวัน อย่างไรก็ตาม การเติบโตของบริษัท และความผันผวนของกำไร ไม่มีผล ต่อการจัดหาเงินทุนจากการกู้ยืม

**คำสำคัญ :** 1) โครงสร้างเงินทุน 2) การจัดหาเงินทุนจากการกู้ยืม 3) บริษัทจดทะเบียน 4) ตลาดหลักทรัพย์ แห่งประเทศไทย

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## Introduction

In modern corporate finance, the issue of corporate capital structure is still contentious. Since the study of Modigliani and Miller (1958), a superfluity of research has been executed to identify the determinants of capital structure. Nonetheless, the concerns of most capital structure studies are in developed countries such as Rajan and Zingales (1995) (the G-7 countries), Burgman (1996) (the US), Bevan and Danbolt (2002) (the UK), Antonious, Guney, and Paudyal (2002) (the UK, Germany, and France), Hall, Hutchinson, and Michaelas (2004) (European SMEs), Akhtar (2005) (Australia), and Akhtar and Oliver (2009) (Japan).

There are few studies that offer evidence from developing countries such as Wiwattanakantang (1999) (Thailand), Booth et al. (2001) (Brazil, Mexico, India, South Korea, Jordan, Malaysia, Pakistan, Thailand, Turkey, and Zimbabwe), Pandey (2001) (Malaysia), Chen (2004) (China), Omet and Nobanee (2001) (Jordan), Al-Sakran (2001) (Saudi Arabia), and Buferna, Bangassa, and Hodgkinson (2005) (Libya). In addition, some capital structure studies have used cross-country comparisons between developed and developing countries such as Deesomsak, Paudyal, and Pescetto (2004) (Thailand, Malaysia, Singapore, and Australia), Supanvanij (2006) (Japan, Hong Kong, Singapore, Korea, Thailand, Malaysia, Taiwan, and Philippines), and Kim and Berger (2008) (the US and Korea).

This study focuses on companies listed on the Stock Exchange of Thailand during 2004-2008, the period after the vanishing of the effect of 1997 financial crisis and before the occurrence of the impact of hamburger crisis, in order to examine the determinants of capital structure for both

short-term and long-term financing. This study differs from other studies that use the data from Thailand because it is an in-depth study in only one country and utilizes only corporate internal independent variables with the control for industry. Therefore, this study provides further evidence of the capital structure theories pertaining to a developing country.

The objective of this study is to examine the determinants of capital structure of listed companies in Thailand with the following hypothesis.

$H_0$ : None of the variables examined, namely profitability, size, tangibility, growth, and volatility, is statistically significant in determining capital structure of listed companies in Thailand.

$H_1$ : At least one of the variables examined, namely profitability, size, tangibility, growth, and volatility, is statistically significant in determining capital structure of listed companies in Thailand.

Moreover, the scope of this study is the five-year period from 2004 to 2008. This study examines companies listed on SET100 as reported on December 31, 2008 by the Stock Exchange of Thailand. However, 19 companies in financial industry are excluded from this study because of the use of the special rules regarding financing. Therefore, this study includes 81 firms from 6 industries, comprising of Agro and Food industry, Industrials industry, Property and Construction industry, Resources industry, Services industry, and Technology industry. Additionally, the year-end related data is gathered from SETSMART, Business Online (BOL), and firms' websites.

There are several benefits from the study of determinants of capital structure of



listed companies in Thailand. First, this study will show the determinants of capital structure of listed companies in general (by using the ratio of total debt to total assets as a proxy for leverage), in long-term (by using the ratio of long-term debt to total assets as a proxy for leverage), and in short-term (by using the ratio of short-term debt to total assets as a proxy for leverage). Second, this study will illustrate similarity and dissimilarity among the determinants of general, short-term, and long-term financing decisions. Next, this study will supply evidence whether factors identified by previous studies are the same as the ones found to be determinants of capital structure of listed companies in Thailand. Lastly, this study will provide further evidence of the capital structure theories pertaining to a developing country.

## Literature Review

### Profitability

According to the pecking order theory, a profitable firm is more likely to finance from internal sources rather than external sources. More profitable firms are expected to hold less debt because it is easier and more cost effective to finance internally. A negative relation between profitability and leverage is found in Rajan and Zingales (1995), Allen (1991), Cassar and Holmes (2003), Deesomsak, Paudyal, and Pescetto (2004), Akhtar (2005), Supanvanij (2006), Kim and Berger (2008), and Akhtar and Oliver (2009). However, the trade-off theory supports a positive relation because firms try to borrow as much as possible (up to the optimal capital structure level) in order to obtain the low financing cost of debt, hence rising firms' profitability. Following Titman and Wessels (1988), Rajan and Zingales (1995), and

Supanvanij (2006), the ratio of operating income to total assets is used as a proxy for profitability.

### Size

Since larger firms have higher creditworthiness and higher ability to borrow, they tend to finance with more debt than smaller firms. The positive relation between firm size and debt level is indicated in Agrawal and Nagarajan (1990), Rajan and Zingales (1995), Chkir and Cosset (2001), Deesomsak, Paudyal, and Pescetto (2004), Akhtar (2005), Buferna, Bangassa, and Hodgkinson (2005), Supanvanij (2006), and Akhtar and Oliver (2009). Nevertheless, larger firms are expected to have lower information asymmetries making equity issue more attractive. This implies a negative relation between size and leverage. Following Titman and Wessels (1988), Rajan and Zingales (1995), and Supanvanij (2006), the natural logarithm of net sales is used as a proxy for size.

### Tangibility

Firms with tangible assets that can be used as collateral are expected to issue high level of debt because they can borrow on favorable terms, suggesting a positive relation between tangibility and leverage. The positive relation between tangibility and leverage is found in Harris and Raviv (1991), Deesomsak, Paudyal, and Pescetto (2004), Akhtar (2005), Supanvanij (2006), and Akhtar and Oliver (2009). However, if tangible assets lower information asymmetries, equity issue will be relatively less costly, lowering leverage ratios. Hence, there is a negative relation between tangibility and leverage. Following Friend and Lang (1988), Chittenden, Hall, and Hutchinson (1996), and Akhtar (2005), the ratio of fixed



assets to total assets is used as a proxy for tangibility.

### Growth

Firms with high intangible growth opportunities do not want to commit themselves to debt servicing as their revenue may not be available when needed. This postulates an inverse relation between firm growth and leverage as indicated in Smith and Watts (1992), Lang, Ofex, and Stulz (1996), Barclay and Smith (2005), Buferna, Bangassa, and Hodgkinson (2005), Supanvanij (2006), and Akhtar and Oliver (2009). Nonetheless, firms with more growth options are expected to have higher information asymmetries, resulting in higher cost of raising funds from equity. Hence, these firms are expected to have higher leverage. Following Al-Sakran (2001), Um (2001), and Buferna, Bangassa, and Hodgkinson (2005), the percentage change in book value of total assets is used as a proxy for firm growth.

### Volatility

Higher volatility of earnings increases the probability of financial distress since firms may not have enough revenue to fulfill their debt servicing commitments. This suggests a negative relation between volatility and leverage as indicated in Bradley, Jerrell, and Kim (1984), Harris and Raviv (1991), Jensen, Solberg, and Zorn (1992), and Akhtar and Oliver (2009). However, risky firms are more likely to suffer from information asymmetries, causing them high cost of raising funds from equity. Therefore, they are expected to have higher levels of leverage. This supports a positive relation between volatility and leverage as shown in Booth et al. (2001) and Deesomsak, Paudyal, and Pescetto (2004). Following Titman and Wessels (1988) and Kim and Berger (2008), the standard deviation

of the percentage change in operating income is used as a proxy for earnings volatility.

### Methods

Since the data is cross-sectional time series, pool cross-sectional time series analysis is employed to avoid the problems of using cross-sectional proxies for time-sequenced variables (Gul 1999). In addition, White Heteroscedasticity Test is conducted to correct for possible heteroscedasticity. In this study, three pool cross-sectional time series regression models with industry control are used to analyze capital structure determinants as follows.

**Model 1:** Total debt to total assets is a proxy for leverage.

$$TD_{i,t} = \alpha + \beta_1 \text{Profitability}_{i,t} + \beta_2 \text{Size}_{i,t} + \beta_3 \text{Tangibility}_{i,t} + \beta_4 \text{Growth}_{i,t} + \beta_5 \text{Volatility}_{i,t} + \beta_6 \text{INDDUM1}_{i,t} + \beta_7 \text{INDDUM2}_{i,t} + \beta_8 \text{INDDUM3}_{i,t} + \beta_9 \text{INDDUM4}_{i,t} + \beta_{10} \text{INDDUM5}_{i,t} + \varepsilon_{i,t} \quad (1)$$

**Model 2:** Long-term debt to total assets is a proxy for leverage.

$$LTD_{i,t} = \alpha + \beta_1 \text{Profitability}_{i,t} + \beta_2 \text{Size}_{i,t} + \beta_3 \text{Tangibility}_{i,t} + \beta_4 \text{Growth}_{i,t} + \beta_5 \text{Volatility}_{i,t} + \beta_6 \text{INDDUM1}_{i,t} + \beta_7 \text{INDDUM2}_{i,t} + \beta_8 \text{INDDUM3}_{i,t} + \beta_9 \text{INDDUM4}_{i,t} + \beta_{10} \text{INDDUM5}_{i,t} + \varepsilon_{i,t} \quad (2)$$

**Model 3:** Short-term debt to total assets is a proxy for leverage.

$$STD_{i,t} = \alpha + \beta_1 \text{Profitability}_{i,t} + \beta_2 \text{Size}_{i,t} + \beta_3 \text{Tangibility}_{i,t} + \beta_4 \text{Growth}_{i,t} + \beta_5 \text{Volatility}_{i,t} + \beta_6 \text{INDDUM1}_{i,t} + \beta_7 \text{INDDUM2}_{i,t} + \beta_8 \text{INDDUM3}_{i,t} + \beta_9 \text{INDDUM4}_{i,t} + \beta_{10} \text{INDDUM5}_{i,t} + \varepsilon_{i,t} \quad (3)$$

Where:

TD = the ratio of total debt to total assets

LTD = the ratio of long-term debt to total assets



STD = the ratio of short-term debt to total assets

Profitability = the ratio of operating income to total assets

Size = the natural logarithm of total assets

Tangibility = the ratio of fixed assets to total assets

Growth = the percentage change in book value of total assets

Volatility = the standard deviation of the percentage change in operating income

For the following industry dummy variables, *Technology industry* is chosen as the control group.

INDDUM1 = "1" if a firm is in *Agro & Food industry* and "0" otherwise

INDDUM2 = "1" if a firm is in *Industrials industry* and "0" otherwise

INDDUM3 = "1" if a firm is in *Property & Construction industry* and "0" otherwise

INDDUM4 = "1" if a firm is in *Resources industry* and "0" otherwise

INDDUM5 = "1" if a firm is in *Services industry* and "0" otherwise

## Results

Table 1 shows regression results of all three types of leverage. For TD as a proxy for leverage, after controlling for industry, profitability, size, and tangibility statistically significantly affect leverage at the 0.01 level with adjusted  $R^2$  of 0.4855. Profitability negatively affects leverage, meaning that a one-percent increase in the ratio of operating income to total assets reduces the ratio of total debt to total assets by 0.96%. Size positively affects leverage, meaning that the larger the firm's size, the higher is the level

of leverage. Tangibility negatively affects leverage, meaning that a one-percent increase in the ratio of fixed assets to total assets decreases the ratio of total debt to total assets by 0.32%. There is no effect of growth and volatility on leverage.

For LTD as a proxy for leverage, after controlling for industry, only profitability statistically significantly affects leverage at the 0.01 level with adjusted  $R^2$  of 0.4434. Profitability negatively affects leverage, meaning that a one-percent increase in the ratio of operating income to total assets reduces the ratio of long-term debt to total assets by 0.28%. There is no effect of size, tangibility, growth and volatility on leverage.

For STD as a proxy for leverage, after controlling for industry, profitability, size, tangibility, and INDDUM5 statistically significantly affect leverage with adjusted  $R^2$  of 0.3537. Profitability negatively affects leverage at the 0.01 significant level, meaning that a one-percent increase in the ratio of operating income to total assets reduces the ratio of short-term debt to total assets by 0.59%. Size positively affects leverage at the 0.01 significant level, meaning that the larger the firm's size, the higher is the level of leverage. Tangibility negatively affects leverage at the 0.05 significant level, meaning that a one-percent increase in the ratio of fixed assets to total assets decreases the ratio of short-term debt to total assets by 0.23%. There is no effect of growth and volatility on leverage. Moreover, INDDUM5 positively affects leverage at the 0.10 significant level, meaning that firms in services industry have higher ratio of short-term debt to total assets than firms in other industries by 0.13%.



**Table 1:** Regression results of three types of leverage: the ratio of total debt to total assets (TD), the ratio of long-term debt to total assets (LTD), and the ratio of short-term debt to total assets (STD)

Leverage	TD	LTD	STD
$\alpha$	-0.3782	0.1532	-0.6279
Profitability	-0.9571***	-0.2752***	-0.5948***
Size	0.1453***	0.0145	0.1420***
Tangibility	-0.3186***	-0.0714	-0.2332**
Growth	-0.0109	0.0016	-0.0278
Volatility	0.0003	0.0004	-0.0001
INDDUM1	-0.0653	-0.0064	-0.0355
INDDUM2	-0.0234	-0.0478	0.0193
INDDUM3	0.0505	-0.0307	0.0805
INDDUM4	-0.0638	-0.0111	-0.0985
INDDUM5	0.1231	-0.0222	0.1322*
F-Statistic	30.3337***	25.7707***	18.0154***
Adjusted R-Squared	0.4855	0.4434	0.3537

\*\*\* = 0.01 significant level; \*\* = 0.05 significant level; \* = 0.10 significant level

### Conclusion and Discussion

For all three proxies of leverage, the negative association between profitability and leverage shows that firms with high profits borrow less than firms with low profits. This statistically significant finding is in line with pecking order theory, Rajan and Zingales (1995), Allen (1991) and Cassar and Holmes (2003), Deesomsak, Paudyal, and Pescetto (2004), Akhtar (2005), Supanvanij (2006), Kim and Berger (2008), and Akhtar and Oliver (2009).

For TD and STD, the positive association between size and leverage indicates that big firms borrow more than small firms. This statistically significant finding is in line with Agrawal and Nagarajan (1990), Rajan and Zingales (1995), Chkir and Cosset (2001), Deesomsak, Paudyal, and Pescetto (2004), Akhtar (2005), Buferna, Bangassa, and Hodgkinson (2005), Supanvanij (2006), and

Akhtar and Oliver (2009). In addition for TD and STD, the negative association between tangibility and leverage demonstrates that firms with high proportion of fixed assets to total assets borrows less than firms with low proportion of fixed assets to total assets. This statistically significant finding is in line with information asymmetries theory. According to this theory, tangible assets lower information asymmetries so that equity issue will be relatively less costly. As a result, debt financing decreases in firms with high tangibility.

After controlling for industry, only INDDUM5 statistically significantly affects leverage, which is proxied by the ratio of short-term debt to total debt. The possible explanation might be because the majority of firms in services industry in this sample are from retail business sector such as CP All Public Company Limited, Home Product



Center Public Company Limited, Siam Makro Public Company Limited, and Robinson Department Store Public Company Limited. The nature of retail business operates mostly with short-term assets, comprising of cash, account receivables, and inventories; therefore, it needs to match its operation with the short-term financing. Thus, firms in services industry finance with short-term debt more than firms in other industries. However, growth and volatility have no effects on all three proxies of leverage.

In conclusion, this paper examines the determinants of capital structure of listed companies in Thailand during the period from 2004 to 2008 by using the pool cross-sectional time series regression. The sample includes 81 firms from 6 industries. After controlling for industry, profitability negatively and significantly affects all three types of leverage. The results present that firms with high profit use less debt. Size positively and

significantly affects both TD and STD, meaning that large firms use more total debt and short-term debt. Tangibility also negatively and significantly affects both TD and STD, showing that firms with high tangibility issue less total debt and short-term debt. However, growth and volatility do not affect leverage. Moreover, only the service industry dummy variable shows positively and marginally significant effect on STD. This means that firms in service industry, particularly in retail business sector, borrow more short-term debt in order to match their short-term assets from regular operations.

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