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# DETERMINANTS OF CAPITAL STRUCTURE: A CASE STUDY IN THAI STEEL INDUSTRY

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## ABSTRACT

This study examines the determinants of capital structure for Thai steel industry. The research selects growth opportunity, distance to bankruptcy, non-debt tax shield, and liquidity as research determinants and explores the relationship among determinants of leverage ratio. It also investigates which capital structure theory best explains the capital structure in the steel industry in Thailand. This study finds that growth opportunity and non-debt tax shield have positive relationships to leverage; whereas the distance to bankruptcy and liquidity of the firm have negative relationships to debt. The research's results suggest that steel firms should use internal financing as priority before going for external financing which is relevant to Pecking Order Theory. Furthermore, when going for external financing, the optimal leverage ratio of 48% for Thai steel industry is appropriate and can be applied as a guideline for steel firms' managers in determining the capital structure for a firm. Therefore, the benefit of this study could assist managers in the steel industry in selecting the right mix of debt and equity for their firms.

**Keywords:** Capital structure; growth opportunity; distance to bankruptcy; non-debt tax shield, liquidity

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## Introduction

A major financial decision for all firms deals with raising capital or funding. Firms have two ways to raise capital-through debt or equity. While equity financing is often thought in terms of issuing common stocks, it could actually take a variety of forms depending partly on the type of the firm, and partly on the firm's growth and risk characteristics. Equity financing could take form of internal equity financing (such as retained earnings) and external equity financing (such as owner's equity, common stocks, venture capital and warrants-Damodaran, 1999).

Debt financing consists of short-term debt and long-term debt; it can vary from a simple bank debt to issuing bond to borrow from public. Debt is a fixed obligation to make cash flow payments (both interest and principal payments), provides tax-deductible advantage, has fixed life, and has priority claims on cash flows in both operating periods and in times of financial trouble. There is little management cover after meeting all other fixed obligations, and it provides management control to the owners. However, equity provides no tax advantage from its dividends payments, and equity holders do not have priority in times of financial trouble (Damodaran, 1999).

Theory suggests that managers must choose a right financing mix of debt and equity that maximizes firm value (known as optimal capital structure.) The most common approach is to set leverage close to that of the industry to which the firm belongs. If the firms in the industry are similar to fundamental and healthy characteristics, it can be argued that this approach provides a short-cut in arriving at optimal capital structure. However, if the firms differ from these characteristics, this approach is likely to fail.

Characteristics of capital structure have been subject of many research studies. Many researchers have attempted to find out the determinants of the right mix between debt and equity. Most empirical studies in determinants of capital structure have focused on developed countries. Rajan and Zingales (1995) studied capital structure in G-7 countries; Burgman (1996) studies determinants of capital structure in the US; Hall *et al.* (2004) did a case study of capital structure of SMEs in European zone. Some studies focused on emerging and developing countries. Booth *et al.* (2001) studied capital structure of ten developing countries; Deesomsak *et al.* (2004) study capital structure of selected countries in Asia-Pacific region and they selected Thailand, Malaysia, Singapore, and Australia. Narrowing down the geographic to only one country, Buferna *et al.* (2005) researched the capital structure of some industries in Libya. Huang and Song (2006) researched capital structure in China across various industry sectors. Rafiq *et al.* (2008) conducted their research in Pakistan in chemical industry sector. Banchuenvijit (2011) researched 81 listed firms in Thailand.

Since most researches in this area have been done on regional basis, which includes many countries, or many industries in a specific country, the conclusions do not provide in-depth understanding for a specific industry or country. To avoid this problem, this research specifically examines determinants of capital structure of steel industry in in Thailand. More specifically, this research attempts to find the relationship among determinants of leverage ratio. It also investigates which capital-structure theory can best explain the mix of debt and equity proportion in the steel industry in Thailand.

This research attempted to address the following research questions:

1. What are the possible determinants of capital structure for the Steel Industry in Thailand?
2. What are relationships among these determinants and the leverage ratio? And,
3. Which capital structure theory, among the three, best explains the capital structure of the Steel Industry in Thailand?

The objectives of this research; therefore, are:

1. To identify and to gain a better understanding of the determinants of the capital structure for the Steel Industry in Thailand.
2. To suggest an optimal level of debt and equity financing in the Steel Industry, which could be used as a model for firms when making financing decision. And,
3. To identify the capital structure theory that best explains the characters of the Steel Industry in Thailand.

Thailand is the largest steel exporter in ASEAN countries. The need for steel products for domestic consumption has also been rising due to the growth in construction, infrastructures, and automotive industries. This study could assist managers in the steel industry in selecting the optimal financing mix for their firms.

## Literature Review

### Overview of Steel Industry in Thailand

Thailand is the largest steel consuming country in ASEAN group. It consumed approximately 16.4 million tons in 2012, which made it a major importer of iron and steel products in ASEAN group (Tan, 2013). Since 2010, within the country, the need of steel products has grown approximately 7.3 percent annually, and the import of steel to the country has risen approximately to 4.3 percent (Iron & Steel Institute of Thailand, 2012). Steel industry is an essential sector to Thailand's development. Steel products are vital as raw materials in many important industries and also are used in daily lives. Fifty four percent of the steel products in Thailand are mainly used in construction, in infrastructure projects, and 16 percent are used in automotive industry, 13 percent in machinery and industrial sectors, 12 percent in appliance, and the rest are used in canned packaging (Iron and Steel Institute of Thailand, 2012). In the construction industry, which has the most impacts for steel consumptions, the consumption of steel has grown continuously each year at the approximate rate of 5 percent per year (Office of the Permanent Secretary, 2012). The needs of steel in the automotive industry have also been expanding by 11 percent per year (Iron & Steel Institute of Thailand, 2012). In January 2011, there were 27 firms listed in the Stock Exchange of Thailand, valued in equivalent of 103 billion Thai baht, or approximately 1.32 percent of Stock Exchange of Thailand market capitalization (SET News, 2010).

### The Capital Structure Theories

Three theories explain capital structure; MM theory, Static Trade-off theory, and Pecking order theory. These three theories are briefly summarized as follows:

### Modigliani-Miller Theory

The first capital structure theory was proposed in 1958 by Franco Modigliani and Merton H. Miller and was later referred to as the MM Theory. This MM theory contained certain unrealistic assumptions, such as, perfect and frictionless markets, no taxes, no bankruptcy costs, and no brokerage costs. Due to these assumptions, this theory concluded that capital structure did not affect the companies' value (Modigliani & Miller, 1958). Later in 1963, Modigliani and Miller revised their MM Model by including the effect of the corporate taxes. Their revised theory concluded that when the corporate taxes were considered, increase in leverage raised the value of company due to the fact that the interest is a tax-deductible expense. This meant that companies would have more cash available. On the other hand, if companies financed by equity, they did not get tax-shield benefits when the dividends were paid to the shareholders. Thus, the revised MM Model suggested that the optimal structure occurred when companies financed by 100 percent debts (Modigliani & Miller, 1963). An empirical study on the Modigliani and Miller tax model (1963) done by Fama and French (1998) argued that the major determinant of leverages had positive correlation with profitability. This conclusion suggested that profitable companies tended to hold high level of debt.

Miller also presented a paper that integrated both corporate tax and personal tax into the model. He found that as personal tax decreased, but not fully eliminated, the tax-shield was beneficial. Thus, the Miller Model also supported the use of 100 percent leverage (Miller, 1977). Various countries have different tax systems which cause various levels of debt tax benefits. Countries that permit companies to take advantages of both carry-forward and carry-back losses, like in the US, may encourage the companies to take more debts. This is because the companies can get cash refund from previous taxes paid or future tax deductions (Ashton, 1989). In Thailand, the companies are permitted tax benefits for carry-forward losses for only five accounting periods (PwC Thailand, 2013). This makes Thai companies unwilling to hold very high debt levels in their capital structure because

they do not want to increase the bankruptcy risk. There are many criticisms on both the MM and the revised Miller Model about their assumptions. For example, both models do not consider bankruptcy costs, agency costs, and brokerage costs, which is unrealistic.

The MM and revised Miller theories also influenced the development of other theories such as the Static Trade-off Theory and the Pecking Order Theory.

**Static Trade-off Theory**

The Static Trade-off theory was based on works of Baxter (1967), Stiglitz (1969), Kraus and Litzenberger (1973), and Kim (1978). The Static Trade-off Theory claimed that companies could reach the optimal capital structure as a trade-off between tax benefits and financial distress. The Static Trade-off Theory attempted to correct several imperfections of the MM and revised M theories by including bankruptcy costs, corporate taxes, and personal taxes. It kept the assumptions about market efficiency and symmetric information. Later, this theory also added the agency cost. Agency costs refer to costs associated with resolving conflicts among manager, bondholders as well as shareholders. More debt could lead to conflict between managers and bondholders, while more equity could lead to conflict between shareholders and management (because of the high level of free cash flow- Jensen and Meckling, 1976). Jensen and Meckling (1976) claimed that the conflicts between management control and owners' interest could give a negative impression to stockholders. For instance risk taking managers may invest in risky projects which shareholders may consider too risky for value of their investment.

The inclusion of bankruptcy and agency costs may reduce the benefits from tax-shield which limits use of debt. This is called the target or optimal level of capital structure. When a company issues more debts, the value of the company will raise to a certain point. Continued borrowing will lead to a fall in the firm's value. This is because when a company finances with high level of debt, the bankruptcy and agency costs tend to increase, which lowers the company's value (Jensen & Meckling, 1976).

According to the Static Trade-off Theory, a company has a target debt ratio which it tries to reach. The target is composed of the trade-off between the tax benefits and bankruptcy related costs (Jong *et al.*, 2008). Historically, some determinants that affect the target debt ratio are as follows.

Growth opportunity is one element. If there is little growth opportunity, the firm may not need to use much debt. This is due to the fact that the firm may already have sufficient free cash flow reserves. The purpose of this strategy is to limit the potential of investing in unprofitable projects. In a company facing high growth opportunities, which usually has a small free cash flow, raising more capital by debt financing may prove beneficial. However, the intensive use of debts may cause the agency conflicts among managers and bondholders which could end up to high financial distress and increased cost of debt. A strong growth company that wants to decrease these conflicts can offset the benefit of debt by equity funding (Jensen & Meckling, 1976). Healthy companies with high distance from bankruptcy are likely to have low level of debt (Kayo & Kimura, 2011). This is because the intensive use of debts leads to the increasing in bankruptcy risks that may reduce the value of the companies (Jensen & Meckling, 1976). Therefore, companies can stay away from bankruptcy if the companies maintain low level of debts.

Tax-shield benefits from holding debts can be substituted by other tax deduction called Non-debt tax shield which consist of investment tax credit and depreciation (DeAngelo & Masulis, 1980). Companies with a large section of non-debt tax shield do not need to pay much attention to the benefits from interest expenses. Thus, these companies tend to keep small portions of debts.

Companies that have high liquidity ratio have more potential to use debt financing. This is because the companies feel confident that they have enough cash on hand which they can use to support for the short-term obligation (Akinlo, 2011). Thereby, companies have higher chances to employ short-term debt financing.

**Pecking Order Theory**

In 1961 Donaldson introduced the Pecking Order

Theory from a survey among American companies. Later, Myers did further studies in this theory and concluded that according to this theory the optimal capital structure does not exist (Myers, 1984). Pecking order theory is based on the assumption of information asymmetry while MM theory assumes a perfect market. Information asymmetry assumes that since manager has more accurate information than outside investors, he/she notices earlier that the company is overvalued. Therefore, he/she may raise capital by issuing stocks. However, when the company issues more equity, especially before reaching the maximum limit of its debt, investors may perceive it as a signal that the company is stepping into a bad financial position. In such a case, investors' actions could lower the company's stock price. In order to prevent the decline in stock price, the managers may be forced to avoid issuing needed equity (Myers & Majluf,1984).

The Pecking Order Theory states that a company follows a hierarchy of financing choices ranging from internal to external sources and from those with cheaper to more expensive transaction costs. When a company needs more capital, usually at the beginning, it normally uses internal funds. If the internal financing is insufficient, it moves to acquire the external funding. The company will select the cheapest sources of financing to minimize the total cost of capital. This usually makes the debt financing preferable. Issuing preferred stocks is the next step, and is then followed by issuance of common stock (Myers & Majluf, 1984; Pinegar & Wilbricht, 1989).

Adedeji (1998) criticized that Pecking Order Theory did not clearly explain some concepts, such as the effects of government intervention and level of interest. When the economy is down, the government intervenes by lowering the level of interest in order to stimulate the economy. In such a case, the cost of debt will be lower than the cost of internal funds (Cull & Xu, 2005). Pecking Order Theory suggests that companies follow suggested financing hierarchy and does not allow for any exceptions.

According to the Pecking Order Theory, the market-to-book ratio is regularly used to measure company's growth opportunities. Studies have revealed that during period of high growth opportunity, companies usually hold high debt level (Myers, 1984; Fama & French, 1998); therefore suggest a positive relationship between growth opportunity and leverage.

Pecking Order Theory claims that companies prefer to use internally generated funds, in form of profits and retained earnings, to finance the company activities before consider other sources of financing (Myers, 1984). This theory suggests that the greater the distance from bankruptcy, the lower level of debt a company should use. A company with positive income, stable sales revenue, and good operating performance is normally considered to be far from bankruptcy.

Empirical evidence has found that the Non-Debt Tax Shield had high positive correlation with asset tangibility (Bradley *et al.* 1984; Huang & Song, 2006). Pecking Order Theory proposes that tangible assets are used as an assurance for borrowing money from banks and issuing debts because of the asymmetric information since creditors prefer some collateral assets to guarantee for the defaults (Myers & Majluf, 1984). This leads to a positive relationship between the Non-Debt Tax Shield and leverage.

Moreover, Pecking Order Theory states that companies with high liquidity have fewer debts because the companies already have sufficient internally generated funds and free cash flow to use for their operation (Niu, 2008; Akinlo, 2011).

**Previous Studies on Capital Structure and its Determinants**

The following section briefly discusses previous research on capital structure as well as its determinants. Four determinants of the capital structure (leverage ratio) are growth opportunity, distance from bankruptcy, non-debt tax shield, and liquidity.

**Leverage Ratio (Dependent variable)**

Studies by Titman and Wessels (1998); Buferna *et al.* (2005); used three main ratios to measure the firms' ability to meet financial obligation and to identify methods of financing. These three leverage ratios were total debt to total assets (TD/TA), short-term debt to total assets (STD/TA), and long-term debt to

total assets (LTD/TA). Buferna, *et al.* (2005) analyzed each of these leverage ratios with similar set of data in explanatory variables. From their research, they found that total debt to total assets (TD/TA) gained the highest adjusted $R^2$ of 0.95. Myers and Majluf (1984) found the composition of the duration of debt ratios: short-term debt to total assets, and long-term debt to total assets, -would be a better method to measure leverage. They also stated that the book value of assets should be used since assets-in-place are used to as collateral to support debt, while market value of assets relies on growth opportunity of the firms and is not closely related to the level of debt used. Research in Thailand by Udomsirikul *et al.* (2011), and Banchuenvijit (2011), found that it was more precise to use total debt to total assets (TD/ TA) as a proxy for leverage ratio. In this research, we chose book value of total debt to book value of total assets (TD/ TA), as the proxy for leverage ratio.

**Growth Opportunity (Independent variable)**

Steel industry is highly capital intensive and to seek growth potentials a firm needs a large capital investment which often involves a large amount of debt financing. Researchers use variety of methods to measure growth opportunity. Titman and Wessels (1988) used three ratios to measure growth opportunity: capital expenditures to total assets; research and development to sales, and percentage of change in total assets. Huang and Song, (2006) used growth rate in sales to represent growth opportunity. Many researches study growth rate using percentage increases in total assets (Buferna *et al.*, 2005); Saeed, 2007; Rafiq *et al.*, 2008; Banchuenvijit, 2011). Other researchers argue that a more reliable growth opportunity measure is Tobin's Q ratio, the market value-to-book value ratio of common equity, since it incorporates the future expectation and confidence of investors (Rajan & Zingales, 1995; Booth *et al.*, 2001; Udomsirikul *et al.*, 2011). In our research, we used market value-to-book value ratio of common equity as a proxy for growth opportunity. This was due to the fact that our study did not include research and development expenses or capital expenditures (seldom used in steel industry.)

**Distance from Bankruptcy (Independent variable)**

Altman (1968) developed a model called Altman's Z-score to test companies' distance to bankruptcy. Altman's Z-score indicates the potential of the firm to go bankrupt; the higher the z-score, the less likely is the firm would go bankrupt. In the original work, the Altman's Z-score model was composed of five ratios; 1) earnings before interest and taxes to total assets, 2) retained earnings to total assets, 3) sales to total assets, 4) working capital over total assets, and 5) market value of equity to book value of total debts. MacKie-Mason (1990) modified Altman's Z-score by excluding market value of equity to book value of total debts, because such factor contains a close relationship with other equity measurements such as growth opportunity or Tobin's Q ratio. Graham *et al.* (1998) applied the modified Altman's model in their research and modified Altman's Z scores, are as the following:

$$Z = 3.3\left(\frac{EBIT}{Total\ Assets}\right) + 1.0\left(\frac{Sale}{Total\ Assets}\right) + 1.4\left(\frac{Retained\ Earnings}{Total\ Assets}\right) + 1.2\left(\frac{Working\ Capital}{Total\ Assets}\right)$$

Static Trade-off Theory and Pecking order Theory claimed that distance from bankruptcy had a significance negative relationship with leverage; i.e., a firm with low leverage has a high distance from bankruptcy. Some empirical evidence supported this claim (Byoun, 2008; Lee *et al.*, 2010; Lewis & Jais, 2013; Fathi *et al.*, 2014). However, Kayo and Kimura (2011) found that the distance from bankruptcy was not a significant influence on leverage ratio.

According to the Static Trade-off Theory, the firm's financial decisions are influenced by costs and benefits of using debts. Therefore the measure of how far the firm is from bankruptcy helps measure the risk of debt financing. There are a limited numbers of studies in relationship between distance from bankruptcy and leverage; therefore,

it is studied in our research. In this research, we use the modified Altman's Z-score as a proxy for distance of bankruptcy.

**Non-debt Tax Shield (Independent variable)**

Non-debt tax shield consists of investment tax credits and depreciation that can be used for tax deduction at the year-end. Firms with many non-debt tax shield items could hold fewer or lower debts, due to the fact that these non-debt tax shield items could be used as substitutes for interest expenses (DeAngelo & Masulis, 1980). In their study, Deesomsak *et al.* (2004) found a negative relationship between non-debt tax shield and leverage. On the contrary, Bradley, Jarrell, and Kim (1984), Saeed (2007), and Rafiq *et al.* (2008) found a positive relationship between non-debt tax shield and leverage. A research by Titman and Wessels (1988) found no significant relation between the two variables. Due to conflicting findings of previous researches, in our study of the Thai steel industry, we decided to further study the relationship between non-debt tax shield and leverage. A common ratio used in previous studies to measure non-debt tax shield is the ratio of depreciation expenses to total assets. In our research, we used the ratio of annual depreciation expense to total assets as proxy for non-debt tax shield in Steel industry in Thailand.

**Liquidity (Independent variable)**

The purpose of liquidity in a firm is to provide sufficient current assets to cover daily operations and to meet short-term liabilities. Researchers have used cash conversion cycle model (composed of three ratios) or a simpler current ratio (current assets divided by current liabilities) to represent liquidity of a firm (Akinlo, 2011; Jong *et al.*, 2008). Cash conversion cycle model focuses on the length of time between when the company makes payments and when it receives cash inflows (Richards & Laughlin, 1980). The firm's goal should be to shorten the cash conversion cycle as much as possible without hurting its operations. The reduction in the cash conversion cycle, the lower the required net operating working capital, and the higher the free cash flow.

Current ratio shows the firm's ability to cover its current liabilities with its current assets; usually should be more than one with a larger the number representing higher ability of the firm to pay off its short-term obligations. However, a very high current ratio could imply that the firm sacrifices profitability for liquidity. In this research, we use current ratio to represent liquidity of the company. The relationship of liquidity and leverage in capital structure theories are still questionable. According to Static trade-off theory, there is a significantly positive relationship between liquidity and the level of debt used. The higher liquidity a firm has, the more it can use debt (Akinlo, 2011). On the other hand, Pecking Order Theory states that a firm prefers to use internal source of financing due to its lower cost compared to the cost of external financing. As a consequence, a firm that maintains adequate liquidity accumulates more internal financial resources and usually seeks lower external financing. Niu's study (2008) showed a negative relationship between liquidity and debt financing supporting the prediction of the Pecking Order Theory.

## Research Model

From the stated research questions and research objectives proposed in Section 1, we suggested the following regression equation to test the model:

$$LEV_t = b_0 + b_1 (GT_{t-1}) + b_2 (DBR_{t-1}) + b_3 (NDTS_{t-1}) + b_4 (LIQ_{t-1}) + e_i$$

*Where;*

| | | |
|---|---|---|
| LEV | = | Leverage |
| GT | = | Growth opportunity |
| DBR | = | Distance from bankruptcy |
| NDTS | = | Non-debt tax shield |
| LIQ | = | Liquidity |
| $e_i$ | = | error term |

## Research Method

This study used a cross-sectional data, which was tested with a multiple regressions method. First, this study tested the correlation between independent variables to check for multicollinearity. Second, the regression was applied and results were obtained. Third, a t-test was used to check for significance of each variable in order to explain the importance and its relationship with the leverage. Fourth an ANOVA was applied to get an F-statistic for supporting the significance of the model. Finally, a robustness test was performed a reliability test.

## Hypotheses

Four hypotheses were used to test the relationships. Null hypotheses were rejected when the result showed statistically significance of 1%, and 5%.

$Ha_1$: There is a relationship between Growth opportunity and Leverage.

$Hb_1$: There is a relationship between Distance from Bankruptcy and Leverage.

$Hc_1$: There is a relationship between Non-Debt Tax Shield and Leverage.

$Hd_1$: There is a relationship between Liquidity and Leverage.

## Scope of the research

As mentioned earlier, most research studied on capital structure has covered many industries or were done in many countries. Although the existing empirical results from these studies have broadened the knowledge in the area, they have provided few results with high applicability in determining the right mixture of debt and equity which could be used by managers of a specific industry in a specific country. This research attempted to cover this gap by investigating the optimal capital structure in the steel industry in Thailand.

The purpose of this research was to study the determinants of capital structure, and the relationships among these determinants and the leverage ratio in the specified industry. Furthermore, this research study examined existing capital structure theories to find out which theory best explained debt and equity mixture in the selected industry. We select steel industry in Thailand to study due to the fact that this industry has grown continuously since year 2010. We believe that the results of our research should benefit Thai managers in the chosen industry in determining the optimal level of capital financing.

**Research Sample**

In 2009 there were approximately 3,815 steel companies registered in Thailand with only 27 listed in the Stock Exchange of Thailand (The Thailand Company Directory, 2009 ). Early in year 2011, Stock Exchange of Thailand added "Steel Sector" into the "Industrials" Industry group. This indicates the growing importance of the steel sector in Thailand. In 2011, firms listed under Steel sectors were composed of the producers, processors, and sellers of steel and its related products (The Stock Exchange of Thailand, 2011).

In this study we used the companies listed in the Stock Exchange of Thailand under the Steel Sector (27 companies.) The reason for this selection was the availability of information for public companies.

**Sources of Data**

The research collected published information from various places. Financial statements of 27 listed companies under Steel Industry sector were collected mainly from Securities and Exchange Commission of Thailand, the firms' annual reports and, the firms' websites (Securities & Exchange Commission Thailand, 2014.) The study obtained data during 2007 to 2012, six years in total. However, one listed company had less than six years of financial information (financial statements for the year 2012 were not available.) There were 160 cases from 27 companies used as data for this research.

## The Results of Hypotheses Testing

**Descriptive Statistics**

Shown in Table 1 below, most companies in Thai Steel industry had the average debt ratio of 46.36 percent. More specifically, about 40 percent of the aggregate debt was short-term, while about 6 percent was long-term. One explanation of this mixture could be that managers believe that shot-term debt provided more flexibility in term of repayment period than long-term debt. This might be due to

the fact that the firms in the industry face unstable earnings due to the changes of world steel price and demand. Furthermore, this may be due to the financial policy of some companies that prefer equity financing and avoid long-term debt. Low short term rate in recent years may also have contributed to this strategy. Further research is needed to determine the reason behind this short term borrowing preference. The maximum rate of growth opportunity (39.21 times) could indicate a bright future for Thai Steel Companies. However, some companies have negative total equity values which could lead to their negative growth opportunity. The average of distance from bankruptcy for Thai Steel Companies was a positive value. Lastly, the maximum number of liquidity, 31.87 times, illustrated that some companies had very liquidity and internal funding.

Table 1 Descriptive Statistics of Research Variables

| | Mean | Median | Minimum | Maximum | SD |
|---|---|---|---|---|---|
| Leverage | 0.4636 | 0.4570 | 0.0181 | 1.7068 | 0.2288 |
| Growth Opportunity | 1.6119 | 0.7101 | -0.6852 | 39.2120 | 4.0289 |
| Distance from Bankruptcy | 1.6805 | 1.7436 | -3.8365 | 6.0380 | 1.1794 |
| Non-debt tax shield | 0.0252 | 0.0237 | 0.0012 | 0.0787 | 0.0140 |
| Liquidity | 2.6390 | 1.4760 | 0.1263 | 31.8668 | 3.6782 |

Correlation analysis among independent variables found the lowest correlation between independent variables was -0.4259 and the highest was 0.2190 (Table 2). Therefore, the multicollinearity was not a problem. The distance from bankruptcy was positively related to growth opportunity and liquidity, whereas it was negatively related to non-debt tax shield.

Table 2 Correlation Matrix of Independent Variables

| | Growth Opportunity | Distance from Bankruptcy | Non-debt tax shield | Liquidity |
|---|---|---|---|---|
| Growth Opportunity | 1 | | | |
| Distance from Bankruptcy | 0.0630 | 1 | | |
| Non-debt tax shield | -0.0462 | -0.4259 | 1 | |
| Liquidity | -0.0954 | 0.2190 | -0.0890 | 1 |

## Regression Results and Analysis

Table 3 illustrates the ANOVA which tests the goodness of fit between the data and the model. The total number of observation is 160 sets. The F-test shows that there are relationships among independent variables (growth opportunity, distance to bankruptcy, non-debt tax shield, and liquidity) and the dependent variable (leverage ratio). The last column in Table 3 indicates a significance level of 1%, suggesting good predictability of the model.

Table 3 ANOVA Table of Multiple Regressions

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 4 | 4.36371 | 1.09093 | 42.70573 | 0.00000 |
| Residual | 155 | 3.95951 | 0.02555 | | |
| Total | 159 | 8.32323 | | | |

R-square ($R^2$) was equal to 0.52428 and Adjusted $R^2$ was equal to 0.512 (Table 4). This meant that the variation of all four independent variables could explain the variation in the dependent variable. Approximately 52.4 percentile of the proportion of the variance in dependent variable can be explained by the variations in the independent variables by 51.2 percent. The standard error of estimation was15.98 percent, which was relatively low, so there was less dispersion of dependent variable around its mean. The regression results that study the determinants of leverage are also presented in Table 4 below. This comprises of the expected sign of coefficients and the statistical significance of each independent variable. The results infer that all independent variables have statistically significant relationship to the leverage ratio at 1% and 5%.

Table 4 Regression Coefficients and Significance Results

| | Coefficients | Standard Error | *t-stat* | *p-value* |
|---|---|---|---|---|
| Intercept | 0.479854 | 0.040920 | 11.726517 | 0.000000 |
| Growth Opportunity | 0.025428 | 0.003165 | 8.033711 | 0.000000 |
| Distance from Bankruptcy | -0.025715 | 0.012156 | -2.115460 | 0.035989 |
| Non-debt tax shield | 2.386679 | 0.999294 | 2.388366 | 0.018127 |
| Liquidity | -0.028108 | 0.003554 | -7.908445 | 0.000000 |

Multiple R = 0.72407 ; $R^2$ = 0.52428 ; Adjusted $R^2$ = 0.51200

The regression equation for this research can be rewritten based on the coefficients in Table 4 as follows:

$$LEV_t = 0.47985 + 0.02543(GT_{t-1}) - 0.02572(DBR_{t-1}) + 2.38668(NDTS_{t-1}) - 0.02811(LIQ_{t-1}) + e_i$$

Based on this analysis, growth opportunity has a positive relationship with leverage. The coefficient is 0.02543 with a significant level of 1% (Table 4). This means that firms with growth opportunity maintain a high level of debt financing instead of issuing new equity. This is in line with the Pecking Order Theory, whereas the results contradict the Static Trade-Off Theory. The finding revealed that firms with high growth opportunity in Thai Steel Industry tended to have high debt due to the fact that the low interest rate policy of the Thai government aimed at stimulating the economy and supporting industries with high growth potentials. This finding was consistent with findings of the study by Saeed (2007) and Rafiq *et al.* (2008) which also observed a positive relationship of growth opportunity and leverage. However, it was worthy of noting that some prior researchers found a negative correlation between growth opportunities and leverage while other studies found no significant relationship (Deesomsak *et al.*, 2004; Buferna *et al.*, 2005; Supanvanji, 2006; Banchuenvijit, 2011). Distance from bankruptcy had a negative relationship with the leverage ratio in studied companies, with coefficient of -0.2572, at significant level of 5% (Table 4). This means that the steel companies in Thailand generally have sufficient internal funding, such as retained earnings for investments; therefore, they used lower level of debt financing to reduce the chance of bankruptcy. This finding was in line with suggestions made by both the Static Trade-off and Pecking Order Theories that the companies try to avoid using intensive debt desire to select the cheapest source of capital, usually from internal capital sources such as retained earnings. Byoun, 2008; Fathi *et al.*, 2014 also found similar evidence in their research. Companies in Thai steel industry consider themselves to be far from bankruptcy (or to have low bankruptcy risk) and usually have low leverage ratio.

In this research, we found that the non-debt tax shield was positively related to the level of leverage used by firms with a coefficient equal to 2.38668, at significance level of 5%. This positive relationship is in line with the Pecking Order Theory. We found that when firms had more tangible assets and normally used these assets as collaterals to get more debt. The depreciation expenses increases with the increasing of tangible assets due to their closely positive relationship (Bradley *et al.*, 1984). Our findings were in agreement with other previous research which found a positive relationship between non-debt tax shield and leverage used (Bradley *et al.*, 1984; Saeed, 2007; Rafiq *et al.*, 2008; Lewis & Jais, 2013). It is noteworthy to mention that in contrast, Titman and Wessels (1988) had found that non-debt tax shield was not a significant determinant of debt proportion.

In our study, liquidity was negatively related to the leverage ratio. The coefficient for liquidity in our model was -0.02811 with significance at 1%. This makes our findings consistent with the Pecking Order Theory stating that the firms with higher liquidity usually use lower debt proportion. Firms with sufficient internal funds usually need lower level of debt financing. Previous empirical evidences had also suggested a negative relationship between leverage and liquidity (Jong *et al.*, 2008; Lewis & Jais, 2013).

In conclusion, our research indicated that the Peking Order Theory may provide a good explanation of the financing decision made by the managers of the Thai steel companies. Results from our research suggested a positive relationship between leverage and two independent variables (growth opportunity and non-debt tax shield.) The study also found a negative relationship between leverage and two independent variables (distance from bankruptcy and liquidity (see Table 4 and regression equation).

## Hypotheses Testing

About four hypotheses stated in Section 4.1, along with results shown in Table 4, we conclude the following:

*$Ha_1$: There is a relationship between Growth opportunity and Leverage.*

Our findings supported this hypothesis. The null hypothesis ($Ha_0$) was rejected. We concluded that there was a positive relationship between growth opportunity and leverage. This relationship was significant at 1%.

*$Hb_1$: There is a relationship between Distance from Bankruptcy and Leverage.*

The study supported this hypothesis. The null hypothesis ($Hb_0$) was rejected. We concluded that there was a negative relationship between distance from bankruptcy and leverage and this relationship was significant level at 5%.

*$Hc_1$: There is a relationship between Non-Debt Tax Shield and Leverage.*

The study supported this hypothesis and the null hypothesis ($Hc_0$) was rejected. We conclude that there was a positive relationship between non-debt tax shield and leverage and this relationship was significant level at5%.

*$Hd_1$: There is a relationship between Liquidity and Leverage.*

The study supported this hypothesis and the null hypothesis ($Hd_0$) was rejected. We concluded that there was a negative relationship between liquidity of the firm and leverage and this relationship was significant level at 1%.

## Summary and Concluding Remarks

### Summary of the Findings

The choice of the capital structure is a major financial decision for manager of firms. The right mix of debt and equity used affects a firm's cost of the capital, the risk and return to shareholders, and the value of the firm. Several capital structure theories have attempted to explain the behavior of companies in regards to making this financial decision. Research in capital structure has been burdened by mixing industries, countries, etc. which has limited its applicability for specific managerial decisions.

The main objective of our research was to identify key determinants of the capital structure for the steel industry in Thailand. The findings could provide not only a better understanding of the

industry but also a guideline for future financial decisions. Two well-known capital structure theories were used to explain the optimal level of capital structure. The Static Trade-off Theory claims that there is an optimal level of capital structure. The Pecking Order Theory proposes that firms tend to use internal resources before external resources for financing in order to lower the cost and to avoid asymmetric information.

In Thailand, the steel industry has become more important due to its growth opportunities and its contribution to the overall economy. Our research used a sample of 27 listed firms in Steel Industry group in the Stock Exchange of Thailand. Data collection period was from 2007 to 2012. Multiple regressions of cross-sectional data were used as an analytical method. Four determinants of capital structure studied were growth opportunity, distance from bankruptcy, non-debt tax shield, and liquidity. The results indicated that all four determinants had significance relationships with the firm's leverage. Growth opportunity and non-debt tax shield had positive relationships to leverage; whereas the distance to bankruptcy and liquidity of the firm has negative relationship to debt. The research discovered that the Pecking Order Theory was an appropriate theory to explain the leverage characteristic of firms in Thai steel industry. The studied firms tended to use internal financing as their priority before they applied for external financing. We also concluded that growth firms tended to hold higher levels of debt financing since they may have more investment projects and insufficient internal funds. Firms that generate high level of operating earnings were more likely to use lower debt financing to reduce the risk of bankruptcy. Firms with more tangible assets can use their assets as collaterals when applying for debt can benefit from non-debt tax shield advantage. Finally, firms with high liquidity usually hold lower debt due to sufficient internal capital resources. From the conclusion of our findings, these four specific factors significantly influenced on the capital structure and their relationships are consistent with the application Pecking Order Theory. We believe that our research findings about these four determinants could be applied to other industrial sectors in Thailand, which may have similarity in the nature of these determinants or firm-specific factors. However, this would leave the gap for further research before making such conclusion.

**Managerial Implication**

The leverage model derived in this research can be used for managerial decisions on determining appropriate capital structure for steel companies in Thailand. A steel firm can use the debt level of the industry to determine its proper capital mixture. Table 5 illustrates the average numbers of all determinants calculated for the researched companies in the study in 2012. The recommended leverage ratio (debt ratio) for year 2012 is determined by the model.

Table 5 The Average Financial Information of Thai Steel Industry in 2012

| Growth Opportunity (Market value/book value of equity) | Distance from Bankruptcy (Modified Altman's Z Score) | Non-Debt Tax Shield (Annual depreciation expenses/ total assets) | Liquidity (Current assets/current liabilities) |
|---|---|---|---|
| 1.8318 | 1.4702 | 0.0270 | 2.5826 |

$$LEV_t = 0.47985 + 0.02543(GT_{t-1}) - 0.02572(DBR_{t-1}) + 2.38668(NDTS_{t-1}) - 0.02811(LIQ_{t-1})$$

$$LEV_t = 0.47985 + 0.02543(1.8318) - 0.02572(1.4702) + 2.38668(0.0270) - 0.02811(2.5826)$$

Therefore, $LEV_{2012} = 48.03\%$

The research model suggested a debt ratio of 48% for the Thai Steel Industry. Although this model can be used as a guideline for determining the capital structure for a firm, specifics of various companies would allow for deviations from this average.

The bar chart in Figure 1 shows the comparison between the actual leverage and the leverage suggested by the model for each of the 27 firms in our study in 2012. More than half of 27 listed firms had similar leverage levels as the model recommended. Only a few firms have major deviations due to their unique business preferences for equity financing.

The investors can also use the findings of this study to assist them in making investment decisions to determine a firm's riskiness when purchasing stocks. Risk-averse investors can apply the leverage model along with other valuation techniques in order to avoid investing in the risky companies.

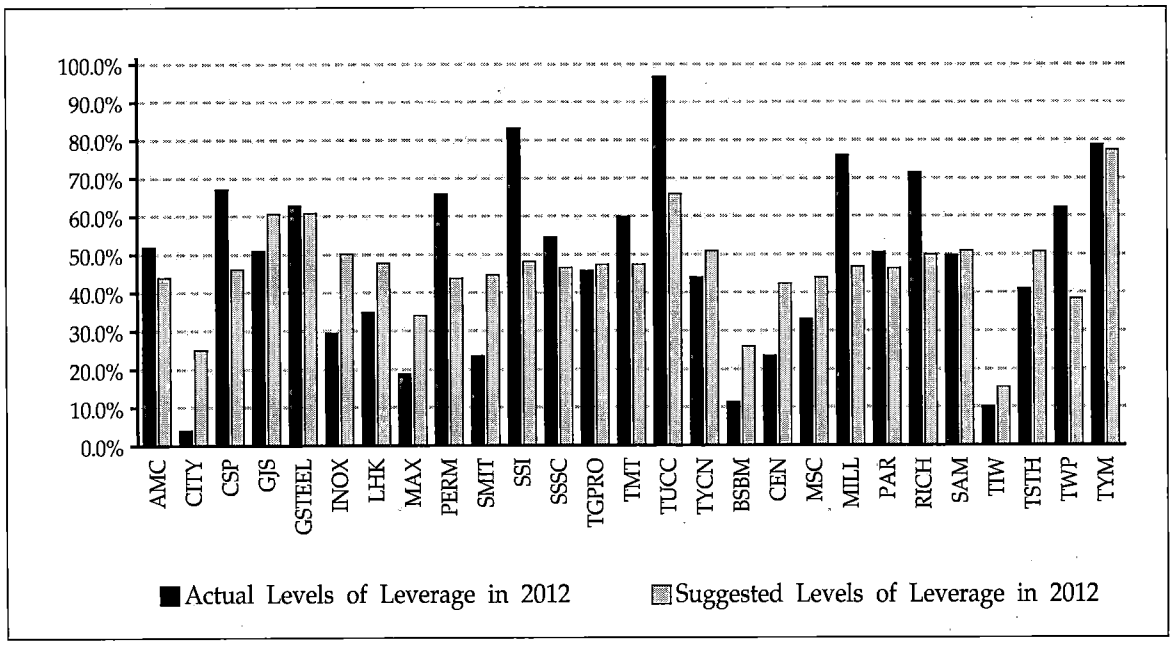


Figure 1 Comparison the Actual Leverage to the Suggested Leverage

## Limitations of the Study

Since the focus of this research was to examine the characteristics and the determinants of capital structure of the Thai steel industry, its conclusions may not be applied to other industries in Thailand without further research. Moreover, the characteristics of Steel Industry may be different across countries, so the research results may not represent such an industry in other countries.

## Recommendations for Further Research

This research focused on four determinants of the capital structure. Other determinants, such as volatility of income and structure of ownership and influencing leverage decision could be included or could be the subjects of future studies.

## References

Adedeji, A. (1998). Does the pecking order hypothesis explain the dividend payout ratios of firms in the UK. *Journal of Business Finance & Accounting, 25*(9-10), 1127-1155.

Akinlo, O. (2011). Determinants of capital structure: Evidence from Nigerian panel data. *African Economic and Business Review, 9*(1), 1-16.

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy.*The Journal of Finance, 23*(4), 589-609.

Ashton, D. J. (1989). The Cost of Capital and the Imputation Tax System. *Journal of Business Finance & Accounting, 16*(1) , 75-88.

Banchuenvijit, W. (2011). *Determinants of capital structure of listed companies in Thailand.* Retrieved from http://eprints.utcc.ac.th/1694/1/1694fulltext.pdf

Baxter, N. (1967). Leverage, risk of ruin and the cost of capital. *The Journal of Finance, 22*(3), 395-403.

Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V. (2001). Capital structure in developing countries. *The Journal of Finance, 56*(1), 87-130.

Bradley, M., Gregg, A. J., & Kim, E. H. (1984) On the existence of an optimal capital structure: theory and evidence. *The Journal of Finance, 39*(3), 857-878.

Buferna, F., Bangassa, K., & Hodgkinson, L. (2005). *Determinants of capital structure evidence from Libya, Liverpool:* The University of Liverpool.

Burgman, T. A. (1996). An empirical examination of multinational corporate capital structure. *Journal of International Business Studies, 27*(3), 553-570.

Byoun, S. (2008). How and when do firms adjust their capital structures toward targets?. *The Journal of Finance, 63*(6), 3069-3096.

Cull, R., & Xu, L.C. (2005). Institutions, ownership, and finance: the determinants of profit reinvestment among chinese firms. *Journal of Financial Economics, 77*(1), 117-146.

Damodaran, A. (1999). *Applied Corporate Finance; a User's Manual.* New York: John Wiley & Sons Inc.

DeAngelo, H., & Masulis, R.W. (1980). Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics, 8*(1), 3-29.

Deesomsak, R., Paudyal, K., & Pescetto, G. (2004). The determinants of capital structure: evidence from the Asia Pacific region. *Journal of Multinational Financial Management, 14*(4-5), 384-405.

Fama, E. F. (2002). Testing trade-off and pecking order predictions about dividends and debt. *Review of Financial Studies, 15*(1), 1-33.

Fama, E. F., & French, K. R. (1998). Taxes, financing decisions, and firm value. *The Journal of Finance, 53*(3), 819-843.

Fathi, S., Ghandehari, F., & Shirangi, S. Y. (2014). Comparative study of capital structure determinants in selected stock exchanges of developing countries and Tehran stock exchange. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 4*(1), 67–75.

Graham, J. R., Lemmon, M. L., & Schallheim, J. S. (1998). Debt, leases, taxes, and the endogeneity of corporate tax status. *The Journal of Finance, 53*(1), 131-162.

Hall, G. C., Hutchinson, P. J., & Michaelas, N. (2004). Determinants of the capital structure of European SMEs. *Journal of Business Finance & Accounting, 31*(5-6), 711-728.

Huang, G., & Song , F. M. (2006). The determinants of capital structure: Evidence from China. *China Economic Review, 17*(10, 14-36.

Iron and Steel Institute of Thailand. (2012). *Thailand Economic Development and Steel Industry.* Retrieved from http://www.oecd.org/sti/industryandglobalisation/50494696.pdf.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review, 76*(2), 323-329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.

Jong, A. D., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm- and country-specific determinants. *Journal of Banking & Finance, 32*(9), 1954-1969.

Kayo, E. K., & Kimura, H. (2011). Hierarchical determinants of capital structure. *Journal of Banking & Finance, 35*(2), 358-371.

Kim, E. H. (1978). A mean-variance theory of optimal capital structure and corporate debt capacity. *The Journal of Finance, 33*(1), 45-63.

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance, 28*(4), 911-922.

Lee, S., Koh, Y., & Huh, C. (2010). Financial Distress for U.S. Lodging Industry: Effects of Leverage, Capital Intensity, and Internationalization. In *Proceedings of International CHRIE Conference-Refereed Track. Papaer 3*, (pp. 1-8). Massachusetts: ScholarWorks@UMass Amherst.

Lewis, L., & Jais, M. (2014). The capital structure of malaysian firms in the aftermath of Asian financial crisis 1997. *Journal of Global Business and Economics, 8*(1), 1-20.

MacKie-Mason, J. K. (1990). Do taxes affect corporate financing decisions? *The Journal of Finance, 45*(5), 1471-1493.

Miller, M. H. (1977). Debt and taxes. *The Journal of Finance, 32*(2), 261-275.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporate finance and the theory of investment. *The American Economic Review, 48*(3), 261-297.

Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: A correction. *The American Economic Review, 53*(3), 433-443.

Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance, 39*(3), 574-592.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187-221.

Niu, X. (2008). Theoretical and practical review of capital structure and its determinants. *International Journal of Business and Management, 3*(3), 133-138.

Office of the Permanent Secretary. (2012). *Strategic roadmap by Ministry of Trasportation Year 2011-2015.* Retrieved from http://mot-cms.mot.go.th/ MOTCMS/AddCommentPage.jsp

Pinegar, J. M., & Wilbricht, L. (1989). What managers think of capital structure theory: a survey. *Financial Management, 18*(4), 82-91.

PwC Thailand. (2013). *Thai Tax 2013 Booklet.* Retrieved from http://www.pwc.com/en_TH/th/publications/ 2013/thai-tax-2013-booklet.pdf.

Rafiq, M., Iqbal, A., & Atiq, M. (2008). The determinants of capital structure of chemical industry in pakistan. *The Lahore Journal of Economics, 13*(1), 139-158.

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance, 50*(5), 1421-1460.

Richard, V. D., & Laughlin, E. L. (1980). A Cash Conversion Cycle Approach to Liquidity Analysis. *Financial Management. 9*(1), 32-38.

Saeed, A. (2007). *The determinants of Capital Structure in Energy Sector (A study of Pakistani listed firms).* Karlskrona: School of Management.

Securities and Exchange Commission Thailand. (2014). *Financial Report Search.* Retrieved from http://capital.sec.or.th/webapp/corp_fin2/cgi-bin/findFSe.php?lang=e&ref_id=291 &content_id=1

SET News. (2010). *Thai bourse creates Steel Sector listing under Industrials Group.* Retrieved from http://www.set.or.th/dat/news/201009/10034331.pdf.

Stiglitz, J. E. (1969). A Re-Examination of the Modigliani-Miller Theorem. *The American Economic Review, 59*(5), 784-793.

Stulz, R. (1990). Managerial discretion and optimal financing policies. *Journal of Financial Economics, 26*(1), 3-27.

Supanvanij, J. (2006). Capital structure: Asian firms vs. Multinational firms in Asia. *The Journal of American Academy of Business, Cambridge, 10*(1), 324-330

Tan, A. Y. (2013). Message from Secretary General. *South East Asia Iron and Steel Institute Newsletter.*

The Stock Exchange of Thailand. (2011). *The addition of Steel Sector to the industry group of Industrials commencing.* Retrieved from http://www.set.or.th/dat/news/201009/10034325.pdf

The Thailand Company Directory. (2009). *The Thailand Company Directory.* Retrieved from http://www.108company.com/thailand-industry.

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance, 43*(1), 1-19.

Udomsirikul, P., Jumreornvong, S., & Jiraporn, P. (2011). Liquidity and capital structure: The case of Thailand. Journal of Multcapital structure: The case of Thailand. *Journal of Multinational Financial Management, 21*(2), 106-117.