A USE OF FINANCIAL RATIOS TO PREDICT THE
PROBABILITY OF BANKRUPTCY: A CASE OF
SMALL AND MEDIUM ENTERPRISES IN THAILAND

By
YOSSAVADEE PUGPAICHIT

An Independent Study
Submitted in partial fulfillment of the requirements
for the Degree of

MASTER OF SCIENCE IN FINANCIAL ECONOMICS

MARTIN DE TOURS SCHOOL OF MANAGEMENT AND ECONOMICS
Assumption University
Bangkok, Thailand

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This Study by: Ms. Yossavadee Pugpaichit

Entitled: "A Use of Financial Ratios to Predict the Probability of Bankruptcy: A Case of Small and Medium Enterprises in Thailand"

has been approved as meeting the independent study requirement for the:

DEGREE OF MASTER OF SCIENCE IN FINANCIAL ECONOMICS

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Date of Defense   December 3, 2012

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Dr. Phassawan Suntraruk, Advisor

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YOSSAVADEE PUGPAICHIT

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ABSTRACT

Recently, the economy of Thailand rather fluctuates. Because of this reason, a chance of bankruptcy of Small and Medium Enterprises (SMEs) increases unavoidably. Therefore, a tool for bankruptcy prediction is an importance to decrease risks of stakeholders. Then, the objective of this research is to identify whether financial ratios can be used to predict the company bankruptcy in case of SMEs in the form of company limited in Thailand. For the methodology, the logistic regression is employed to create an estimated model by using financial ratios of 110 companies during 2005 to 2008. Later, this estimated model is used to test the ability of prediction in 2009 for 50 companies.

This study evidences that total asset turnover and a ratio of earnings after taxes to total assets are significant factors and can be used to predict the probability of bankruptcy. It is found that total asset turnover and a ratio of earnings after taxes to total assets are negatively related to the probability of bankruptcy. It means that if total asset turnover and a ratio of earnings after taxes to total assets increase, the probability of bankruptcy is likely to decrease.

By using out-of-sample data to test the predictive ability of the estimated model, the results show that the estimated model provides favorable results in which the percentage of accuracy of predicting bankruptcy and non- bankruptcy firms are 68% and 60%, respectively. In addition, a total of 64% of all samples are predicted correctly.

The result of this research provides the benefits to many groups of people such as management and employees, creditors, investors, and credit agencies, etc. They may use information helping them on their decision in order to avoid the wrong decision and get the maximum benefit. Importantly, academicians can gain an idea about studying on topic of bankruptcy prediction for SMEs in the future because there is a few existing research which used SMEs in form of companies limited as sample.

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CHAPTER I

GENERALITIES OF THE STUDY

1.1 Background of the Study

The well-known financial crises; Great Depression in 1929, Tomyam Kung crisis in 1997, and Hamburger crisis in 2007, are examples of the great financial problems which cause many firms in the world to go bankrupt and make many groups of people realize the importance of bankruptcy prediction by financial ratios. In 1929, the Great Depression started and expanded to many countries rapidly. This crisis was the longest, most pervasive, and deepest depreciation of 20th century. For the Great Depression, United States of America was the primary country. It started from the fall in stock price on September 4, 1929 and became big news with the stock market crash on October 29, 1929. Due to this depression, the American Bank was bankrupt on December 11, 1930. Moreover, a total of 352 banks were bankrupt in December 1930. In September 1931, the United Kingdom abandoned the gold standard so it pursued an even more harmful policy. Finally, the banking panic happened in 1933 (Romasco, 1960).

In case of Thailand, Thai Baht was attacked by foreign speculators in May 1997. So, the government of Thailand decided to spend 90% of foreign reserves to defend the Baht against speculative attack. Furthermore, the exchange rate system of Thailand was changed from fixed exchange rate to managed-floated regime on June 2, 1997. Because of these reasons, Thai economy turned into recession which further negatively affected financial sector. Firstly, the index of Thailand's stock market declined from 787 points in January 1997 to a low of 337 points in December. Secondly, fifty-six financial institutions were bankrupt in 1997 and the remaining financial institutions suffered from financial panic (Luanphaisarnnont, Mahakitsiri, Siriariyaporn, & Utoktham, 2004).

Later in 2007, the subprime or hamburger crisis happened in February. The effects of subprime crisis were seen by high unemployment rate and bankruptcy in many financial institutions and companies. Causes of subprime crisis are the broken bubble of information

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technology industry in 2000 and attack of terrorists on September 11, 2001. The effects of these two significant events are decreasing economics growth of United States of America and other countries continuously. The Government of United States of America had to announce a decrease in interest rate in order to stimulate their economic growth and increase in investment within their country. After these policies were used, economic growth of United States of America was higher, real estate industry grew over than fact, and loan of financial institutions were careless. Finally, United States of America had to face subprime crisis (Nilbai, 2008).

According to the past financial crisis, many researchers realized the importance of prediction of bankruptcy such as Altman (1968; 1971), Altman, Haldeman, and Narayanan (1977), Altman, Margaine, Schloseet, and Vernimmen (1974), Beaver (1966), Blum (1969, 1974), Deakin (1972), Grammatikos and Gloubos (1983), and Wilcox (1971).

Moreover, many researchers realized the importance of prediction of bankruptcy by using financial ratios because financial ratios work as the mirror to reflect financial situation and performance of the company. Ingram (2009) asserted that financial ratios are used by many companies' stakeholders. First is the company's management. Financial ratios are used to assess the strengths and weaknesses of companies and also used as a guideline in order to improve the operation's weaknesses within company. Second is a group of creditors. Financial ratios are used to consider the ability to repay debt of debtors in order to avoid default risk. Third is a group of investors. Financial ratios are used to evaluate stability of companies in order to reduce chance of losing their money from investment. Finally is a group of credit agencies such as Standard and Poor's Rating Service, Fitch Ratings, Moody's, etc. They can use financial ratios of companies to be a factor of consideration of credit ranking (Finn, 2012). Besides, financial ratios can be used to compare the company's financials to those of other companies, to analyze trends and the past performance of financial situations, and to predict the future financial events, to decrease chance of future financial bankruptcy (Ingram, 2009).

In conclusion, financial ratios have various benefits for management of company, creditors, investors, credit agencies, and etc. Therefore, financial ratios are important variables for bankruptcy prediction in Thailand.

1.2 Statement of the Problem

Financial ratios can be used to measure financial status widely. Many researchers studied the topic of ability of financial ratios to predict bankruptcy, but all of them used sample data of public companies which are large firms. Therefore, there are currently limited evidences about the ability of financial ratios for bankruptcy prediction in Small and Medium Enterprise (SMEs). Furthermore, there is also a limited number of previous works which used sample data of SMEs in the form of companies limited. Therefore, it will be more interesting to examine the prediction of bankruptcy of SMEs in the form of companies limited.

1.3 Research Objectives

The objective of this research is to identify whether financial ratios can be used to predict the bankruptcy of the companies in case of SMEs in the form of companies limited in Thailand.

1.4 Research Question

Question of this research is "Can probability of bankruptcy of SMEs in the form of companies limited be predicted by using financial ratios as primary predictors?"

1.5 Scope of the Research

The sample in this study is SMEs in the form of companies limited, particular in manufacturing industry in Thailand. This study uses the data from 2005 to 2010. The data in 2005 to 2008 are used for model creation and the data in 2009 are used to test for predictive ability of model in order to compare with actual event in 2010. In part of dependent variable, the study uses a binary variable in which "1" and "0" are set as bankruptcy firm and non-bankruptcy firm, respectively. For independent variables, there are four independent variables examined in this study: a ratio of net working capital to total assets, a ratio of total liabilities to total assets, total asset turnover, and a ratio of earnings after taxes to total assets.

1.6 Limitations of the Research

In Thailand, most owners of SMEs would like to show high liability in financial statement in order to pay less amount of tax (Tipsumonta, 2010). Because of this reason, some significant financial ratios of previous research may not be significant financial ratios in this research.

In addition, the financial information of SMEs in form of companies limited is less complete and limited, comparing to those of public firms. Many significant financial ratios found in previous research such as Altman (1968), Beaver (1966), Ohlson (1980), etc. cannot be tested in this current study because of lack of available data.

1.7 Significance of the Research

Result of this research can be beneficial to groups of people as the following:-

Firstly, management and employees of companies can use this research as a tool to assess financial situation of companies. Moreover, this research can be used to stimulate the strategic change within an organization in order to avoid financial problem of company. Moreover, creditors can use this research to consider the reliability of companies and ability to repay debt in order to set the volume of loan, interest rate, and reduce chance of default risk. Next, investors can use this research to consider investment volume of shareholders on Small and Medium Enterprise. Furthermore, this study helps shareholders predict event of bankruptcy in the future in order to reduce chance of loss of their money from investment on enterprises. In addition, credit agency can use this research as a tool to help setting rank and reliability of companies. Lastly, academicians can use this research to be a reference for the topic of bankruptcy prediction on SMEs in form of companies limited in the future because there are few existing research which used SMEs in form of companies limited as a sample.

1.8 Definition of Terms

SMEs (Small and Medium Enterprise) are businesses that are too big to be just small businesses but which are too small to be regarded as big businesses. Conditions of Small and Medium Enterprise in manufacturing industry are as follows. For medium

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enterprise, amount of fixed asset or number of employees is not more than 200,000,000 baht and 200, respectively. For small enterprises, amount of fixed assets or number of employees is not more than 50,000,000 baht and 50, respectively (Nutchanat , 2010).

Bankruptcy is legal procedure which cites both natural person and juristic person. These two groups of person will become status of bankruptcy if they are fraudulent or their debt is not paid fully or all of two conditions. Bankruptcy can be brought upon itself by insolvent debtor or it can be forced on court orders issued on creditors' petition. Two major objectives of a bankruptcy are fair settlement of the legal claims of the creditors through an equitable distribution of debtor's assets, and to provide the debtor and opportunity for fresh start (Bankruptcy Act, 1940)

Logistic regression is nonlinear equation that is suitable for analyzing the binary data and describes outcomes that are more complex than multiple regressions. Moreover, the predictive value of logistic regression must fall within the range of zero and one (Rodriguez, 2007)

Ratio Analysis is a tool that is used by managers, creditors, regulators, and investors in order to conduct a quantitative analysis of financial statement of companies. These ratios are calculated from current year and are used to compare to the previous years, other companies, the industry, or even the economy to judge the performance of company (Higgins, 2009).

CHAPTER II

REVIEW OF RELATED LITERATURE

This section of research starts from the theory of symptoms and concept of cash flow. Next, the section explains about definition of bankruptcy. The last section is empirical studies.

2.1. Theory/Concept Related to the Study

2.1.1 Theory of Symptoms of Bankruptcy

There are several studies mentioned about the symptoms of bankruptcy variously. Blum (1974) indicated that bankruptcy event might be symptomized by data of accounting. He proposed a theory of symptoms of bankruptcy that focuses on the behavior of fundamental economic variables that would be expected to be shown in financial statement. He asserted that the products of accounting system are very useful because they represent principals and the economic event of an entity. In addition, Dellutri and Florida (2012) indicated signal of bankruptcy starts from full of their credit limit and using all available credit without making any meaningful payment. Moreover, the Law Offices of Neil Crane (2012) cited that the first symptom of bankruptcy is the increase in borrowings of consumer credit cards, business credit cards, credit lines and other forms of business and personal borrowing. Ultimately, these practices lead to unmanageable monthly payments.

2.1.2 A Concept of Cash Flow

Beaver (1966) explained that ratio analysis can explain cash flow of the firms. He indicated that liquid assets are as a reservoir which is supplied by inflows and drained by outflows. In addition, he defined bankruptcy firm as the firm exhausting their reservoir and is unable to pay their obligations. According to Beaver (1966), four important concepts of relationship between the liquid assets flow model and the ratios can be concluded as the following.

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The first is the size of the reservoir. If the reservoir is larger, the probability of bankruptcy will be smaller. Second is the net liquid asset flown from operations which measures amount of liquid assets supplied to their reservoir. If the net liquid asset flown from operation is larger, the probability of bankruptcy will be smaller. Third is the debt held by the firm and measure of potential of reservoir's draining. If the amount of debt is larger, the probability of bankruptcy will be larger. The fourth is the fund expenditures for operations and measure of amount of reservoir's draining from reservoir. If the amount of fund expenditures for operations is larger, the probability of bankruptcy will be larger.

Apart of a concept of cash flow of Beaver (1966), Amuzu (2010) found that the bankruptcy firms tend to have unstable components of cash flow: operating, investing, and financing activities.

2.2 Definition of Bankruptcy

Ohlson (1980) mentioned that the definitions of bankruptcy are various significantly across studies. Moreover, Ohlson (1980) found that other researchers faced difficulty in defining the bankruptcy. Although the definitions of bankruptcy are difficult to define, several researchers still defined the definition of bankruptcy significantly and clearly. The study of Edmister (1972, p.1477) cited the definition of bankruptcy of Beaver (1966) and Blum (1969) as "a business defaulting on interest payment on its debt, overdrawing its bank account, or declaring bankruptcy" and "entrance into a bankruptcy proceedings or an explicit agreement with creditors which reduce the debt of company", respectively. In addition, Blum (1974, p.3) defined bankruptcy as "events signifying an inability to pay debt as they come due, entrance into a bankruptcy proceeding, or explicit agreement with creditors to reduce debts". Moreover, Altman (1968, p.589) defined the term of bankruptcy that "firms that are legally bankrupt and either placed in receivership or have been granted the right to re-organize under the provisions of the National Bankruptcy Act". Keskinkilic and Sari (2006, p.2) mentioned the definition of bankruptcy that "bankruptcy companies are unprofitable, high leverage, has liquidity problem, and less financial flexibility to invest in itself". Laitinen (2001, p.1) defined bankruptcy as "company is inability to pay its financial obligation".

Since the term "bankruptcy" has been defined differently from one research to others, this study defines the term of bankruptcy as "a firm that went into the process of liquidation and did not continue their business" which follows the definition of bankruptcy of Business Online Public Company Limited (BOL).

2.3 Empirical Studies on the Relationship between Financial Ratios and the Probability of Bankruptcy

2.3.1 Relationship between a ratio of net working capital to total assets and probability of bankruptcy

A ratio of net working capital to total assets measures ability of company to pay its short-term liabilities by comparing its result of current assets minus current liabilities to its total assets. Practically, increasing in net working capital to total assets ratio shows that liquidity of company is improving over time (Spireframe, 2012). There are several researchers who used this ratio to predict bankruptcy such as studies of Merwin (1942), Altman (1968), Blum (1969), and Grammatikos and Gloubos (1983).

Merwin (1942) found that a ratio of net working capital to total assets was one out of three independent variables for bankruptcy prediction for five industries. The method which was used for variable selection was the trial and error method. The samples of prediction were 200 companies from five industries that consist of banking industry, clothing for men industry, furniture industry, stone-clay industry, and machine tool industry. Merwin (1942) asserted that relationship between a ratio of net working capital to total assets and bankruptcy is negative. This means that the performance of firm will be higher and chance of bankruptcy will decrease if there is an increase in a ratio of net working capital to total assets of firm.

In addition, Altman (1968) found similar results to Merwin (1942). Using the Multiple Discriminant Analysis (MDA) and sample of sixty-six companies, Altman (1968) concluded that a ratio of net working capital to total assets is a significant variable for bankruptcy prediction and there is negative relationship between a ratio of net working capital to total assets and bankruptcy.

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For the study of Blum (1969), a ratio of net working capital to total assets was also used for bankruptcy prediction. Blum (1969) examined one hundred and fifteen industrial firms by using the method of discriminant analysis and found that a ratio of net working capital to total assets can be used to predict the probability of bankruptcy. And there is a negative relationship between a ratio of net working capital to total assets and bankruptcy.

Lastly, Grammatikos and Gloubos (1983) employed two major statistical models; Multiple Discriminant Analysis and Linear Probability Model to study the bankruptcy prediction. A total of 29 failed industrial firms were matched with healthy ones in the same industry with the similar size of asset and the same calendar year. The results showed that this ratio starts to fall for the distressed firms at least years before the crisis happened and there is a negative relationship between net working capital to total assets and bankruptcy.

In summary, all of four researchers found that relationship between net working capital to total assets and bankruptcy is negative. Therefore, if there is an increase in net working capital to total assets of firm, performance of firm will be higher and chance of bankruptcy will decrease.

2.3.2 Relationship between a ratio of total liabilities to total assets and probability of bankruptcy

A ratio of total liabilities to total assets is a class of debt management ratio and measures the percentage of funds provided by creditors (Brighan & Houston, 2010). There are several researchers who mentioned about the relationship between a ratio of total liabilities to total assets and probability of bankruptcy.

Firstly, according to Beaver (1966), group of samples were selected by using 79 failed firms matched with healthy ones in the same industry with the similar size of asset. Moreover, ratio analysis was used to analysis the firm's performance and bankruptcy prediction. This study was found that a ratio of total liabilities to total assets can be used to predict bankruptcy, but not all ratios tested predict the chance of bankruptcy equally well. Moreover, Beaver (1966) concluded that there is a positive relationship between a ratio of total liabilities to total assets and bankruptcy. Besides Beaver (1966), Ohlson (1980) applied Multivariate Discriminant Analysis to group of sample in order to predict

bankruptcy. The conclusion of the study was that the relationship between total liabilities to total assets and bankruptcy was positive. In addition, Fulmer et al. (1984) used step-wise multiple discriminant analysis to evaluate forty financial ratios by using the sample of sixty companies. Results of Fulmer et al. (1984) found that a ratio of total liabilities to total assets is positively related to bankruptcy.

In conclusion, Beaver (1966), Ohlson (1980), and Fulmer et al. (1984) concluded that there is a positive relationship between a ratio of total liabilities to total assets and bankruptcy. Therefore, if there is an increase in total liabilities to total assets, performance of firm will be lower and chance of bankruptcy will increase.

2.3.3 Relationship between total asset turnover and probability of bankruptcy

Total asset turnover is a class of asset management ratios and measures a firm's efficiency by using assets of firm to generate sales or revenue (Brigham& Houston, 2010). Several researchers use this ratio to predict bankruptcy. Altman (1968) and Fulmer et al. (1984) found that total asset turnover is a significant independent variable for bankruptcy prediction. In addition, these two researchers concluded that there is a negative relationship between total asset turnover and bankruptcy. Moreover, Springate (1978) employed a step-wise multiple discriminant analysis and found that total asset turnover is one out of four financial ratios which is beneficial for prediction of bankruptcy. He also found a negative relationship between total asset turnover and bankruptcy. In addition, his model achieved an accuracy rate of prediction of 92.5 percent by using forty companies.

In all, results of three researchers concluded that there is a negative relationship between total asset turnover and bankruptcy. Therefore, if there is an increase in total asset turnover, performance of firm will be higher and chance of bankruptcy will decrease.

2.3.4 Relationship between a ratio of earnings after taxes to total assets and probability of bankruptcy

This ratio acts as a complementary appraisal of net profits related to investment (Bernstein & Wild, 2000). Beaver (1966) asserted that there is a negative relationship between earnings after taxes to total assets and bankruptcy. Therefore, if there is an

increase in earnings after taxes to total assets, the performance of firm will be higher and chance of bankruptcy will decrease.

Table 2.1 reports a summary of relationship between financial ratios and bankruptcy in prior studies.

Table 2.1: A Summary of Relationship in Prior Research

Independent variables	Relationship	Researchers
A ratio of net working capital to total assets	Negative	• Merwin (1942) • Altman (1968) • Blum (1969) • Grammatikos and Gloubos (1983)
A ratio of total liabilities to total assets	Positive	• Beaver (1966) • Ohlson (1980) • Fulmer et al. (1984)
Total asset turnover	Negative	• Altman (1968) • Springate (1978) • Fulmer et al. (1984)
A ratio of earnings after taxes to total assets	Negative	• Beaver (1966)

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CHAPTER III

RESEARCH METHODOLOGY

This chapter contains the data collection, explanation of methodology for bankruptcy prediction, variables selection, and hypothesis testing.

3.1 Data Collection

This research uses both Income statement and Balance sheet of SMEs in form of companies limited in Thailand. These data are obtained from the database of Business Online Public Company Limited (BOL). According to the database of BOL, manufacturing industry is the biggest industry in Thailand whereas the biggest industry of SMEs group is trading, service, and manufacturing respectively. In addition, the number of all SMEs and SMEs in manufacturing industry is reported in Table 3.1.

Table 3.1: Number of all SMEs and SMEs in Manufacturing Industry from 2005-2010

Year	Number of SMEs	Number of SMEs in Manufacturing Industry	Percentage (%)
2005	2,249,718	686,965	30.54
2006	2,287,057	675,395	29.53
2007	2,375,368	668,185	28.13
2008	2,836,377	547,614	19.31
2009	2,900,759	548,863	18.92
2010	2,924,912	549,704	18.79

Source: Annual report of the Office of Small and Medium Enterprises Promotion
2005-2010

Moreover, data of BOL specified that more than 1,000 limited companies in this industry went bankrupt in 2005 to 2009. Essentially, number of bankruptcy companies in manufacturing industry is the largest group, comparing to other industries. As a result, this

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study uses the Small and Medium Enterprise (SMEs), classified as manufacturing companies as a primary group of sample.

For sample selection, firstly, this study selects the bankrupt companies in which they are the companies that were classified by BOL as bankruptcy or any companies that went into the process of liquidation and did not continue their business. Later, this study applies the same method of sample selection as Altman (1968). That method is one-to-one matching method in which a bankrupt firm was matched with a non-bankrupt firm by using the similar size of total asset as criteria.

In addition, this study uses the period of data between 2005 and 2008 in order to create the prediction model and data in 2009 will be used to measure predictive ability of model by comparing with the actual data of 2010. The table 3.2 shows the number of sample of bankrupt and non-bankrupt company which will be used for model creation and testing. In addition, Appendix A shows a list of companies that are used in the sample.

Table 3.2: The number of sample of bankrupt and non-bankrupt companies

Model Creation			Testing		
Bankruptcy	Non-Bankruptcy	Total	Bankruptcy	Non-Bankruptcy	Total
55	55	110	25	25	50

3.2 Methodology

In this stduy, logistic regression is the most appropriate statistical technique because this methodology is suitable for the dependent variable which is a binary variable, e.g. bankruptcy and non-bankruptcy, and the independent variables which are metric variables, e.g. financial ratios (Vanichbancha, 2003). For the dependent variable in this study, "1" is set as bankrupt company and "0" is set as non-bankruptcy company.

For logistic regression, it is a nonlinear regression in which its equation is used to describe the outcomes that are slightly more complex than those for multiple regression. The outcome variable, $\hat{Y}$, is the probability of having one outcome or another based on a

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nonlinear function of the best linear combination of predictors; bankrupt and non-bankrupt company (Vanichbancha, 2003):

$$\hat{Y}_i = \frac{e^u}{1+e^u}$$

where $\hat{Y}_I$ is value of probability of bankruptcy that can be any value between zero and one. This probability value will be estimated to be a value in one of categories. For u, it stands for the usual linear regression equation:

$$u = A + B_1 X_1 + B_2 X_2 + ... + B_k X_k$$

with constant A, coefficients B_j, and predictors, X_j for k predictors ($j = 1,2,...k$)

For procedure of odds ratio calculation, the regression coefficient ($B_o, B_1, B_2,..., B_n$) is the estimated increase in log odds of the outcome per unit increase in the value of the exposure. In other words, the exponential function of the regression coefficient ($e^{B_0 + B_1 X_1 + ... + B_n X_N}$) is the odds ratios associated with a one-unit increase in the exposure (Vanichbancha, 2003). The regression for odds ratio calculation is the following:-

$$\frac{PROB\ (bankruptcy)}{PROB\ (non-bankruptcy)} = e^{B_0 + B_1 X_1 + ... + B_n X_N}$$

Several researchers used the logistic regression for prediction of bankruptcy, such as Erdogan (2008); Blanco, Irimia, and Oliver (2012); and Ahmadi, Soleiman, Vaghfi, and Salimi (2012) because the logistic regression provides many benefits. Firstly, scores are interpretable in terms of log odds. Secondly, constructed probabilities have chance of being meaningful. Thirdly, it is modeled as a function directly rather than as of two densities. Lastly, it is a good default tool to use when appropriate, especially, combined with feature of creation and selection. Although the benefits of logistic regression are various, it still has a disadvantage that is logistic regression invites to an over-interpretation of some parameters (Iscanoglu, 2005).

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3.3 Model Specification

Due to available data, this study examines merely four financial ratios which are tested mainly by several researchers, e.g. Beaver (1966), Blum (1969), Altman (1986), and etc. These four ratios are significant variables for prediction of bankruptcy. Four financial ratios that will be used for significant testing are shown as the following;

1) A ratio of net working capital to total assets (NWTA)
2) A ratio of total liabilities to total assets (TLTA)
3) Total asset turnover (TATO)
4) A ratio of earnings after taxes to total assets (EATA)

From model development, the data during 2005-2008 are used. Initially, all four financial ratios are included in the regression model and later the financial ratios that have non-significant value at 10% significance level (*p*-value is more than 0.1) will be deleted from the model until only significant variables included in the model. The final model including only significant variables will be used for the bankruptcy prediction in which the data in 2009 will be tested and compare the result with the actual status of company in 2010 in order to find percentage of predictive error. The logistic regression will be presented in form of the following regression;

$$\text{Probability of bankruptcy} = \frac{e^{a+bNWTA+cTLTA+dTATO+eEATA}}{1+e^{a+bNWTA+cTLTA+dTATO+eEATA}}$$

3.4 Hypothesis Testing

3.4.1 Relationship between a ratio of net working capital to total assets and probability of bankruptcy

Since a ratio of net working capital to total assets measures ability of company to pay its short-term liabilities, it means that if net working capital to total assets is high, probability of bankruptcy will be low (Altman, 1968; Blum, 1969; Grammatikos & Gloubos, 1983; Merwin, 1942). The following is the testable hypothesis;

Ho$_1$: There is no relationship between net working capital to total assets and probability of bankruptcy.

H_1 : There is a relationship between net working capital to total assets and probability of bankruptcy.

3.4.2 Relationship between a ratio of total liabilities to total assets and probability of bankruptcy

Since a ratio of total liabilities to total assets measures financial risk of companies by consideration from the asset of company that has been financed by debt, it means that if total liabilities to total assets are high, probability of bankruptcy will be high (Beaver, 1966; Fulmer et al., 1984; Ohlson, 1980). The following is the testable hypothesis;

Ho_2: There is no relationship between total liabilities to total assets and probability of bankruptcy.

H_2 : There is a relationship between total liabilities to total assets and probability of bankruptcy.

3.4.3 Relationship between total asset turnover and probability of bankruptcy

Since a ratio of total asset turnover measures efficiency of company by using assets of firm to generate sales or revenue, it means that if total asset turnover is high, probability of bankruptcy will be low (Altman, 1968; Springate, 1978; Fulmer et al., 1984). The following is the testable hypothesis;

Ho_3: There is no relationship between total asset turnover and probability of bankruptcy.

H_3: There is a relationship between total asset turnover and probability of bankruptcy.

3.4.4 Relationship between a ratio of earnings after taxes to total assets and probability of bankruptcy

Since a ratio of earnings after taxes to total assets measures net profit of company related to investment, it means that if a ratio of earnings after taxes to total assets is high, probability of bankruptcy will be low (Beaver, 1966). The following is the testable hypothesis;

Ho_4: There is no relationship between earnings after taxes to total assets and probability of bankruptcy.

H_4 : There is a relationship between earnings after taxes to total assets and probability of bankruptcy.

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CHAPTER IV

RESULTS

This section reports the result and analysis of the findings. First of all, descriptive statistics of all variables and logistic regression results are analyzed; then, the ability of predictive model is explained.

4.1 Descriptive Data

Table 4.1 presents the mean, standard deviation, Skewness, and Kurtosis of all variables for bankruptcy prediction. This table shows the mean of a ratio of net working capital to total assets (NWTA), total asset turnover (TATO), a ratio of total liabilities to total assets (TLTA), and a ratio of earnings after taxes to total assets (EATA) are -831.767, 1.865, 105.186, and -1.310, respectively. Moreover, distribution of data of NWTA and EATA are negatively skewed or skewed left. It means that the most of data of NWTA and EATA is at the low level and the left tail of the distribution is longer than the right. On the other hand, the most data of TATO and TLTA are at high level and the right tail of distribution is longer than the left because the value of skewness shows positive sign. For kurtosis, all of variables are leptokurtic because distribution with kurtosis is more than 3. Compared to a normal distribution, its central peak is higher and sharper and its tails are longer and fatter.

Table 4.1: Descriptive statistics of all variables

Variable	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
NWTA	-357712.560	99.930	-831.767	17055.374	-20.965	439.689
TATO	-0.250	76.840	1.865	6.150	8.550	87.906
TLTA	0.000	3316.650	105.186	320.969	7.470	67.768
EATA	-459.690	1.810	-1.310	21.959	-20.816	435.408
N			440			

4.2 Logistic Regression and Hypothesis Testing

According to step 1 in table 4.2, all four independent variables; NWTA, TATO, TLTA, and EATA, are tested. The results show that the null hypotheses of TATO and EATA are rejected because table 4.2 for step 1 indicates that TATO and EATA are statistically significant at the 0.10 confidence level ($p < 0.10$). On the other hand, it is found that the null hypotheses of NWTA and TLTA cannot be rejected because both are statistically insignificant at the 0.10 confidence level ($p > 0.10$). Although model chi-square of 8.253 with 8 degree of freedom points out that this model fits with the data, there are insignificant variables included. Therefore, initially, NWTA have to be cut out from the model in order to find the new model that is fit with the data than model in step1.

According to step 2 in table 4.2, only three independent variables; TATO, TLTA, and EATA, are tested. The results show that the null hypotheses of TATO and EATA are rejected because table 4.2 for step 2 indicates that TATO and EATA are statistically significant at the 0.10 confidence level ($p < 0.10$). On the other hand, it is found that the null hypotheses of TLTA cannot be rejected because it is statistically insignificant at the 0.10 confidence level ($p > 0.10$). Although model chi-square of 10.655 with 8 degree of freedom points out that this model fits with the data, there is an insignificant variables included. Therefore, TLTA have to be cut out from the model in order to find the new model that is fit with the data than model in step2.

Table 4.2: Results of regression and hypothesis testing

Step1: Include all four independent variables

Variable	Coefficient	P-value	Odds Ratio
NWTA	0.000	0.311	1.000
TATO	-0.426	0.000	0.653
TLTA	0.001	0.135	1.001
EATA	-0.351	0.062	0.704
Constant	0.323	0.019	1.382

Step	Chi- square	Df	Sig.
1	8.253	8	0.409

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Step 2: Exclude one insignificant variable, NWTA

Variable	Coefficient	P-Value	Odds Ratio
TATO	-0.433	0.000	0.649
TLTA	0.001	0.123	1.001
EATA	-0.365	0.053	0.694
Constant	0.326	0.018	1.386

Step	Chi- square	Df	Sig.
2	10.655	8	0.222

Step 3: Exclude the other insignificant variable, TLTA; Only significant variables remained

Variable	Coefficient	P-Value	Odds Ratio
TATO	-0.467	0.000	0.627
EATA	-0.341	0.070	0.711
Constant	0.433	0.000	1.542

Step	Chi- square	Df	Sig.
3	18.943	8	0.105

According to step 3 in table 4.2, two independent variables; TATO and EATA, are tested. The results show that the null hypotheses of TATO and EATA are rejected because table 4.2 for step 3 indicates that TATO and EATA are statistically significant at the 0.10 confidence level ($p < 0.10$). In summary, total asset turnover and a ratio of earnings after taxes to total assets are negatively related to probability of bankruptcy. It means that if total asset turnover and a ratio of earnings after taxes to total assets are high, probability of bankruptcy will be low. Furthermore, the value of model chi-square in step 3 is higher than that of model in step 2. It means that model in step 3 is better fit with the data than the model in step 2. Therefore, the model that includes only significant variables, TATO and EATA is employed to test the ability of prediction for out-of-sample data.

For the part of odds ratio, it estimates the change in the odds of the probability of bankruptcy for one unit increase in TATO or EATA. It means that if TOTA and EATA increase one unit, the probability of bankruptcy will decrease 0.627 and 0.711 respectively.

For comparing the result of this research with the previous research, TATO is a significant variable with negative relationship, consistent to Altman (1968), Springate (1978), and Fulmer et al. (1984). For EATA, the result shows that it is a significant variable with negative relationship in this study, similar to Beaver (1966).

4.3 Predictive Ability

According to the result of the best fit model finding, it is found that the probability of bankruptcy of SMEs will be predicted by the following regression:-

$$probability\ of\ bankruptcy = \frac{e^{(0.433-0.467TATO-0.341EATA)}}{1+e^{(0.433-0.467TATO-0.341EATA)}}$$

According to table 4.3, financial data of 2009 are used to measure ability of the model to predict probability of bankruptcy in 2010 and compare the result with actual status. Result of testing finds that a total of 17 companies or 68% of bankruptcy group was predicted correctly. For non- bankruptcy group, a total of 15 companies or 60% of this group was predicted correctly. However, overall result of measuring the accuracy of predictive model shows that it can predict 64% of all samples correctly. The results of bankruptcy prediction are shown in detail in Appendix B.

Table 4.3: Result of bankruptcy prediction by using predictive model

Observed	Predicted		
	Bankrupt	Non-bankrupt	Percentage Correct
Bankrupt	17	8	68
Non-bankrupt	10	15	60
Overall Percentage			64

Finally, result of this study suggests that the SMEs should particularly make ratio of earnings after taxes to total assets and total asset turnover be high by increasing in volume of sales in order to avoid bankruptcy in the future.

CHAPTER V

SUMMARY, DISCUSSION AND RECOMMENDATIONS

This chapter summarizes the research study and gives some suggestions for further studies.

5.1 Summary of the Findings

The answer to the research questions are obtained from the logistic regression tests of four financial ratio; a ratio of net working capital to total assets, a ratio of total liabilities to total assets, total asset turnover, and a ratio of earnings after taxes to total assets.

Result of the study finds that two financial ratios; total asset turnover and a ratio of earnings after taxes to total assets, can predict probability of bankruptcy of SMEs in Thailand significantly. The other two ratios; a ratio of net working capital to total assets and a ratio of total liabilities to total assets, are insignificant for bankruptcy prediction of SMEs in Thailand. Therefore, the result of hypothesis testing can be summarized that there is a relationship between total asset turnover and a ratio of earnings after taxes to total assets and probability of bankruptcy. And there is no relationship between net working capital to total assets and total liabilities to total assets and probability of bankruptcy.

For predictive ability of the model, percentage of accuracy of bankruptcy prediction is higher than percentage of accuracy of non- bankruptcy. However, for the overall predictive ability of the model, precision of prediction of companies' status is quite good.

5.2 Discussion

Generally, many previous studies reported that four financial ratios; a ratio of net working capital to total assets, a ratio of total liabilities to total assets, total asset turnover, and a ratio of earnings after taxes to total assets, are related to the probability of bankruptcy significantly but result of this study shows that only ratio of net working capital to total assets and ratio of total liabilities to total assets are not significant predictors for bankruptcy prediction of SMEs in Thailand. Causes of the different result will be presented as follows:-

Firstly, for the ratio of net working capital to total assets, most of bankruptcy data report the positive values instead of the negative values. On the other hand, most of non-bankruptcy data show the negative values instead of the positive values ones. Cause of the negative values of the ratio of net working capital to total assets in non-bankruptcy data is amount of current liabilities are higher than the amount of current assets. In addition, important cause of high liability in SMEs is owners of SMEs want to pay tax as little as possible.

Secondly, causes of insignificant variable of a ratio of total liabilities to total assets in this study is value of total liabilities is higher than total assets in both data of bankruptcy and non-bankruptcy. Therefore, there is no difference between a ratio of total liabilities to total assets of bankruptcy and non-bankruptcy data.

However, result of this still show that there is a relationship between total asset turnover and a ratio of earnings after taxes to total assets and probability of bankruptcy. These two ratios are significant independent variables because the data of bankruptcy and non-bankruptcy for these two ratios are different clearly and significantly.

5.3 Recommendations for Future Research

Because number of bankruptcy of SMEs increase continuously, a tool for bankrupt prediction is important for decreasing in the number of bankrupt company. Besides financial ratios, the corporate governance structure is an important factor. As Daily and Dalton (1994) found that the good constituent common stock, board of director quantity, and corporate governance structures of the firm can decrease the chance of bankruptcy. Therefore, this variable can be an independent variable in the future research in order to increase the accuracy of bankrupt prediction of SMEs in form of companies limited in Thailand.

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APPENDIES

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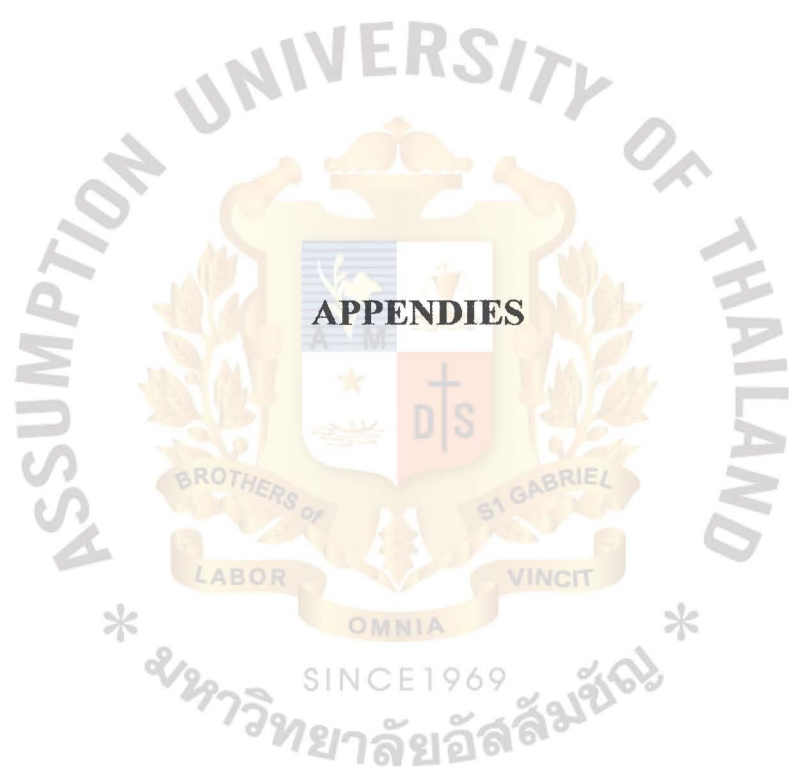
Appendix A

List of Company in the Sample

Panel A: A company sample for constructing the model

No.	Bankruptcy		Non-bankruptcy	
	Company's name	Total Asset	Company's name	Total Asset
1	BOONTIP FOOD PRODUCT CO.,LTD.	162,149,949.84	PROTECTOR NUTRITION (THAILAND) LTD.	162,927,653.58
2	T M FOODS CO.,LTD.	97,813,345.50	WANG PHETCHABUN SUGAR CO.,LTD.	97,871,805.83
3	3.GLOW DEMIN WATER COMPANY LIMITED	78,894,891.00	KISCO (THAI) CO.,LTD.	78,516,096.44
4	PORN CHAI INDUSTRY CHONBURI (2003) CO.,LTD.	73,529,213.09	VANGUARD FOODS (THAILAND) CO.,LTD	73,521,417.26
5	NESTLE FOODS (THAILAND) LIMITE	63,695,770.00	KHOW CHANG EAH TAPIOCA AND SAGO INDUSTRY CO.,LTD.	63,691,276.49
6	GOLDEN FOOD SERVICES CO.,LTD	56,059,260.00	MAHBOONKRONG SIRICHAI 25 COMPANY LIMITED	56,037,086.67
7	SOEM-O-CHA CO.,LTD	35,872,521.39	B.P. FOODS CO.,LTD	35,892,544.66
8	PRESIDENT-DANISH FOODS CO.,LTD	24,431,633.00	SAENG PRATEEP 1977 RICE MILL CO.,LTD.	24,460,216.19
9	L.T.I. QUALITY PRODUCTS CO.,LTD	20,134,008.74	SIRIPAISAN AGRICULTURE CO.,LTD.	20,135,396.51
10	UNIVERBUSSAN INDUSTRY LIMITED	19,145,638.04	RUAMJAISAMAKKEE FISH MEAL CO.,LTD.	19,087,336.61
11	KRISPY SNACKS CO.,LTD	15,133,278.00	A & A RUNG-O-LAN CO.,LTD.	15,160,222.04
12	TANAPOL FOODS CO.,LTD	14,408,499.80	IAM INTERNATIONAL AGRICULTURAL AND MANAGEMENT CORP.,LTD.	14,445,023.03
13	PROVIS CO.,LTD	11,319,166.07	THAI PALM PRODUCTS CO.,LTD.	11,399,629.01
14	SINN POON SAB ICE FACTORY AND COLD STORAGE CO.,LTD	8,294,536.43	YASOTHON KIJWAREE CO.,LTD.	8,301,389.67

No.	Bankruptcy		Non-bankruptcy	
	Company's name	Total Asset	Company's name	Total Asset
15	BORISUTH YODTHIP CO.,LTD	6,903,525.62	BIOSPHARMA COMPANY LIMITED	6,952,388.57
17	MKN INTERNATIONAL CO.,LTD	5,093,750.00	B.LIFE CO.,LTD.	5,115,064.83
18	4 K. THUNYAKIT CO.,LTD	5,008,587.00	KRU-TOH CO.,LTD	5,008,512.56
19	WANG NAM KIEW SEEDS CO.,LTD	3,837,007.38	CHAINGMAI KASEM STORE CO.,LTD.	3,439,245.77
20	TACOR HOME ICE CREAM CO.,LTD	2,939,584.95	WORLD GRAIN RICEMILL CO.,LTD	2,936,910.55
21	UNITY CO.,LTD	2,925,007.00	MODERN TREND TRADING CO.,LTD.	2,926,404.20
22	CHIEN INC. CO.,LTD	2,830,993.67	FOOD TECHNO FOCUS CO.,LTD.	2,830,488.44
23	PP WORLD WIDE COMPANY LIMITED	2,540,769.78	YONG KOO FAH CO.,LTD.	2,540,912.63
24	PURITAS CO.,LTD	2,473,822.19	THAI RATANA TAPIOCA CO.,LTD	2,415,243.95
25	SERI THANYAKIJ RICE MILL CO.,LTD	2,255,572.22	BANGKOK OIL SEEDS PRODUCTS COMPANY LIMITED	2,238,445.16
26	PK BIG FARM CO.,LTD	1,958,000.00	GRAPE CHIANG MAI CO.,LTD.	1,951,000.00
27	JATRO OIL COMPANY LIMITED	1,905,171.07	R.O. GENESIS CO.,LTD.	1,906,648.41
28	THE GRANPUPAN AGRICULTURE COMPANY LIMITED	1,853,636.89	RAUCH KATE CO.,LTD.	1,852,346.54
29	GLOBAL HERB INTERNATIONNAL CO.,LTD	1,399,557.72	ORIENTAL ASTER LIMITED	1,401,654.98
30	KHAOLAK TOP ENTERPRISE CO.,LTD	1,304,303.19	T.WORACHIT THAICHAROEN CO.,LTD.	1,299,265.99
31	PREMIUM FOOD PRODUCT CO.,LTD	1,157,084.40	KEMIC CO.,LTD.	1,155,190.20
32	RL FOOD&CRAFT CO.,LTD	1,149,478.08	MARIN DRINKING WATER CO.,LTD.	1,149,216.08
33	ESAN INDUSTRY COMPANY LIMITED	1,122,097.73	MAHACHAI DEVELOPMENT CO.,LTD.	1,120,802.76
34	LANNA AGRO TRADE CO.,LTD	996,850.00	TAN TAWAN PALM ENGINEERING CO.,LTD.	999,157.54
35	PC GRP CORPORATION CO.,LTD	981,000.00	MUNCHY FOOD (THAILAND) CO.,LTD.	998,080.44
36	CHIANGMAI WONGCHAI GROUP CO.,LTD	975,000.00	FINA DRINKING WATER CO.,LTD.	971,020.80
37	PRASERT HALAL FOOD CO.,LTD	966,116.00	EVERGREEN MANUFACTURING LTD.	968,000.00

No.	Bankruptcy		Non-bankruptcy	
	Company's name	Total Asset	Company's name	Total Asset
38	SIN AGRI-FOODS (2002) CO.,LTD	943,855.35	RAN & TSUBASA PRODUCTS CO.,LTD.	941,606.56
39	SURATAWANCHAI CO.,LTD	909,038.57	SAHAPAIBOON PHOKAPHAN CO.,LTD.	910,623.80
40	WIENGPING WINERY 2004 CO.,LTD	874,675.24	PHITSANULOK ICE CO.,LTD.	874,798.12
41	JEERASARUENG CO.,LTD	870,568.98	FIRST ORGANIC FARM CO.,LTD.	870,899.19
42	CHAO PHYA COMPANY LIMITED	816,607.05	CHIANGKIT RICE MILL (1987) CO.,LTD.	818,816.06
43	NORTH FRUIT INDUSTRY CORP.,LTD	598,854.03	PROFOOD VENTURE CO.,LTD.	585,306.08
44	SUNSHINE VINEGAR INDUSTRY CO.,LTD	592,196.63	TANATAS ICE CO.,LTD.	575,841.00
45	BREWERY HOUSE PATTAYA CO.,LTD	27,340.07	CHAICHAROEN AGRICULTURE PROMOTE CO.,LTD.	27,850.00
46	CROWN BEE INTERNATIONAL CO.,LTD	146,093.84	FRESH PURE DRINKING WATER (THAILAND) CO.,LTD.	145,070.87
47	G C E FOOD CO.,LTD	232,600.00	THEPISARA CO.,LTD.	236,000.00
48	MEDIA FOOD & DRINK CO.,LTD	198,420.39	KHENG YAOWARAJ CO.,LTD.	201,354.39
49	OBJECTIF PLUS CO.,LTD	295,199.29	PRODUCT DEVELOPMENT CO.,LTD.	294,781.03
50	PHATRA KASET COMPANY LIMITED	168,944.39	PLOYCHADA CO.,LTD.	164,326.30
51	S.M. SOUTHERN MARKETING CO.,LTD	382,514.59	MITRBAMRUNG ICE CO.,LTD.	380,039.06
52	SAJAMARK CO.,LTD	96,206.00	AGRI PROCESSING INDUSTRY CO.,LTD.	110,423.87
53	SAMAKI MEESUK NAM DEUM CO.,LTD	172,130.65	CHOMTARN COMPANY LIMITED	173,902.41
54	SIAM DRAGON KEEPING FRESH VEGETABLE AND FRUIT (THAILAND) CO.,LTD	9,942.14	THE PEACE CANNING (CHIANGMAI 1988) CO.,LTD.	11,900.07
55	SRINAWA RICE MILL CO.,LTD	107,146.76	COCO INTER CO.,LTD.	97,435.80
56	WEANGWARIT CO.,LTD	554,481.93	SIAM INTERNATIONAL AGRICULTURE CO.,LTD.	554,784.06

Panel B: A company sample for testing the predictive ability of the derived model

No.	Company's name	No.	Company's name
1	POKPHAND AQUATECH CO.,LTD.	26	SIAM OIL & FAT CO.,LTD.
2	THE UTTARADIT SUGAR INDUSTRY CO.,LTD.	27	SAHA SONG SENG COMPANY LIMITED
3	AMORN-CHAI COMPANY LIMITED	28	PRAKOB BEEF PRODUCTS CO.,LTD.
4	SURATTHANI MARINE PRODUCTS CO.,LTD.	29	BEST FRUIT CO.,LTD.
5	SIRI PATTANA RICE CO.,LTD.	30	RUANGTHAI RICE MILL CO.,LTD.
6	PICHITPAN (2003) CO.,LTD.	31	SUNSAUCE FOODS INDUSTRIAL CORP.,LTD.
7	SUTTHICHAI INTERRICE CO.,LTD.	32	CHIANGRAI RICE (1991) CO.,LTD.
8	THAI UDON RICE MILL COMPANY LIMITED	33	FEED MART CO.,LTD.
9	SAHAYASOTHON (THAILAND) CO.,LTD.	34	YAN WOH YOON CORPORATION GROUP CO.,LTD.
10	TANYARUENG CO.,LTD.	35	TIA CHAI HONG RICE MILL CO.,LTD.
11	CHANG HUA SEAFOOD RANONG CO.,LTD.	36	PHUKET BREWERY COMPANY LIMITED
12	PHOKASUB LANNA CO.,LTD.	37	J.D. FOOD PRODUCTS CO.,LTD.
13	MULTI FEED MILL CO.,LTD.	38	SURIN TIP RICE MILL CO.,LTD.
14	K & M UNION FOODS CO.,LTD.	39	RONGZEEMONGKOLCHAI CO.,LTD.
15	SUPHAN ROYAL FOOD CANNERY LIMITED	40	T.D. DAIRY FOODS COMPANY LIMITED
16	KONG FUJI TRADING CO.,LTD.	41	CHOI CHEW COMPANY LIMITED
17	PHIBULPHORN CO.,LTD.	42	INT FOODS CO.,LTD.
18	BEST MARKETING PRODUCTS CO.,LTD.	43	MV FOOD SUPPLY CO.,LTD.
19	FARMERS PALM OIL (2548) CO.,LTD.	44	BOONSONG BANPAN RICE MILL CO.,LTD.
20	THAINARONG 2007 CO.,LTD.	45	SIAM UNION SAHAMITR COMPANY LIMITED
21	GUANG XI ZHAI CO.,LTD.	46	BUN CO.,LTD.
22	VIPAVADEE PLANT CO.,LTD.	47	NATHON INTERNATIONAL FROZEN FOODS CO.,LTD.
23	SUPHAN INTER FOODS CO.,LTD.	48	ASIA FA CRAM CO.,LTD.

No.	Company's name	No.	Company's name
24	BB. PRESERVED FOOD CO.,LTD.	49	PICHAISANGTAWAN CO.,LTD.
25	TAMNANLUKCHIN CO.,LTD.	50	SIAM MEAT PRODUCTS INDUSTRIAL LIMITED

Appendix B

Results of bankruptcy prediction by using predictive model

No.	Bankruptcy (Actual)	Probability of bankruptcy	Bankruptcy (Predicted)	No.	Bankruptcy (Actual)	Probability of bankruptcy	Bankruptcy (Predicted)
1	1	0.2	0	26	0	0.4	0
2	1	0.5	1	27	0	0.3	0
3	1	0.5	0	28	0	0.4	0
4	1	0.1	0	29	0	0.0	0
5	1	0.4	0	30	0	0.5	1
6	1	0.6	1	31	0	0.5	1
7	1	0.5	1	32	0	0.5	0
8	1	0.2	0	33	0	0.4	0
9	1	0.5	1	34	0	0.6	1
10	1	0.6	1	35	0	0.0	0
11	1	0.6	1	36	0	0.6	1
12	1	0.6	1	37	0	0.4	0
13	1	0.6	1	38	0	0.6	1
14	1	0.6	1	39	0	0.6	1
15	1	0.6	1	40	0	0.2	0
16	1	0.6	1	41	0	0.4	0
17	1	0.6	1	42	0	0.6	1
18	1	0.6	1	43	0	0.5	0
19	1	0.1	0	44	0	0.6	1
20	1	0.6	1	45	0	0.5	0
21	1	0.6	1	46	0	0.4	0
22	1	0.6	1	47	0	0.6	1
23	1	0.6	1	48	0	0.6	1
24	1	0.2	0	49	0	0.3	0
25	1	0.4	0	50	0	0.4	0

*1 = Bankruptcy, 0= Non-bankruptcy
** Probability of Bankruptcy ≥ 0.5 is the model predict "Bankruptcy"
*** Probability of Bankruptcy < 0.5 is the model predict "Non-bankruptcy"