

# Early Warning Signs of Problem Firms

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This research aims to identify factors considered as pre-warning signs of problem firms listed on an emerging market. The data set comprises companies listed in the emerging the Stock Exchange of Thailand (SET). The study newly introduces problem firms when the SET marks up with the signs of Trading Suspension (SP), Caution (C), Notice Pending (NP) and Non-Compliance (NC) during 2013 - 2016. Match-pair sampling totalling 232 problem and non-problem firms are included in the dataset. Potential factors both adopted from previous studies and introduced by the present study, cover two main areas: financial ratios and corporate governance mechanisms. Conditional probability, mainly logit regression and descriptive statistics are employed in the analysis. The findings indicate that the potential factors are both financial ratios and corporate governance mechanisms at different accuracy rate during 3-year period before being marked as problem firms. The in-depth analysis finds, at significant level 0.05 - 0.10, in the 3-year and 2-year before considering as problem firms (i.e. being marked of the signs), financial ratios including current ratio, debt to equity and return on assets enables to predict problem firms. For corporate governance factors, the study finds out that percentage of independent board is the most likely to predict problem firms in the 3-year, but no corporate governance factors do not relate to problem firms in the 2-year before being marked. The prediction accuracy rate of the 3-year prediction model equals 71.1% and 67.7% in the 2-year before being marked. Furthermore, in 1-year before being marked, the same financial ratios as in 3-year and 2-year before being marked enables to predict problem firms, while directors who also hold positions in other companies could be anticipated problem firms. The prediction accuracy rate equals to 79.3% in 1-year before being marked. This study inserts significant finding to literature. Investors and regulators should consider specific financial ratios and corporate governance factors before problem firms turn to be failed firms.

**Key words:** *Failed firms, firm distress, SET, corporate governance, bankruptcy.*

## Introduction

Failure prediction studies have been carried out since the work of Beaver (1966) and Altman (1968). Researchers have continuously developed prediction models until recent, for example, the work of Ahn, et. al. (2000) stated that pre-warning signals of failed firms are vital information. If problem firms could not be identified before failed, retail investors, institutions trade, payables, financial institutions and relevant stakeholders are directly and indirectly affected. McKee (2000) inserted that local, perhaps global, economy would be threatened by failed businesses. As a result, precautionary indicators should be identified before the crisis. This is to enable stakeholders to use the information from alarms to make informed decisions. Businesses can use it effectively to manage their business, and regulators can use it to plan and prevent future disasters.

The Stock Exchange of Thailand (SET) as a representative of an emerging market, is a medium for trading, savings from the public sector, government and foreign. It has a duty to oversee listed companies that are significant to the country's economic and social development, like other agencies in the economy. The operation and stability of listed companies in the SET have an impact on the public and society as a whole. Thus, listed companies play an important role in the country's economic system. SET realizes the failure issue of Thai listed companies and sets up pre-warning condition called "trading sign" before problem firms are delisted. It is ensure fair and efficient trading. SET uses special supervisory signs to regulate trading and inform investors of special situations and conditions that may affect the securities of a listed company. For example, SP (Trading Suspension) is a sign that listed companies are temporarily suspended, while NC (Non-Compliance) means that the securities of listed companies may be delisted. However, although SET have the warning systems, it seems not to inform what the reasons of posted signs and sometimes problem firms are identified when it is too late. This opens to research opportunity what are the earliest warning factors indicate problems firms before turning to be failed firms.

Financial statements are one warning sign that reflects the financial position of the business. Previous studies, for example, Acosta-González (2019), McKee and Lensberg (2002) and Shin, et, al. (2005) successfully introduced pre-warning signals using financial failure analysis. The studies stated that financial analysis using financial ratios is the use of historical accounting data to help predict the direction and future of the business. Together with financial ratios, researchers have also included other important factors in the analysis. For example, the researches included corporate governance factors in failure prediction models. This is because corporate governance is the system based on governance and

management. The concept of corporate governance separates control and ownership in the company (Omankhanlen & Taiwo, 2013) to prevent organizational failure and unethical business practices (Isaac, 2014). The integration of corporate governance increased investor confidence in the economy (Nworji et. al, 2011). Therefore, finding many case studies may help increase profits and prevent future business failures.

Therefore, this research aims to explore the earliest warning signs of problem firms listed on an emerging market. The warning signs of SET should imply the financial distress, business failure and risks of problem firms before failed. Moreover, the study aims to answer whether the trading signs in SET should be considered as pre-warning signals of trading securities to the public and investors about the special circumstances and conditions that may affect the securities. The people or entities can access the information quickly and accurately.

## **Literature Reviews**

### ***Definition of Problem Firms in General***

Prior studies on failure prediction have initially attempted to identify which stages should be considered as the earliest point of problem firms. The word “problem firms” is both emotive subject and problematic issues with ambiguity (Storey et. al., 2016). Tavlin et, al. (1989) categorized the problem firms into three types (1) economic failure occurs when the company’s expenses are higher than the revenue or the return on investment of the company is lower than the rate of return on investment in businesses that are significantly similar. (2) Technical insolvency occurs when the company is unable to comply with the statutory requirements imposed by the creditor’s prosecution when unable to repay the debt. (3) Bankruptcy occurs when the liabilities of the company are greater than the fair market valuation of assets, which represents a negative real net worth. The least severe thing is economic failure. It occurs when the company’s expenses are higher than revenue or when the internal rate of return is lower than the cost of capital of the company. Technical insolvency occurs when the company is unable to pay the debt. In other words, the situation is that the company does not have sufficient liquidity to pay the debt. The most serious business failure is bankruptcy when a company has a negative net worth and leads to a legal process of organizational restructuring or dissolution.

Previous studies have interpreted failed firm in various ways. Cho (1994), Lussier and Pfeifer (2000) and Irabor (2014) recommended that problem firms should be when companies faced 3-consecutive years or more losses. However, Bongini et. al. (2000) stated that previous studies that not all companies facing financial difficulties would end up with reorganization or bankruptcy. Financial difficulty was temporary failure and could be recovered if the problem was corrected at the specified time. Johnsen and Melicher (1994) recommended that

the analysis should use bankruptcy point as the most severe failure because it indicated the most financial weakness.

This present study prefers to use the definition of problem firms when companies encounters economic failure, which is the least severe failure. This is to identify the earliest warning problems of listed companies.

### ***Problem Firm Definition in This Study***

The Stock Exchange of Thailand (SET) using a computer system to help monitor the movement of the market called “Stock Watch”. The system will detect the movement of price abnormal or trading volume of securities and send out a warning sign when something goes wrong and to reassure investors in the accuracy and efficiency of trading securities. The SET uses special symbols to oversee trading and informs investors about the situation and special conditions that may affect the securities. It is essential that investors know the meaning of these symbols when investing in the stock market. This study examines only the signs that prohibit or warn investors to be cautious on issues including:

1. H (trading Halt): prohibition of temporary securities trading. There may be news that affects stock prices, but the company has not yet disclosed information or pending disclosure of information or other causes that may seriously affect the trading.
2. SP (Trading Suspension): prohibition of temporary trading. At the same time as the H sign, the company can not disclose information to the SET or may be violate, omission not to comply with the law or do not send the financial statements within the specified time.
3. NP (Notice Pending): the company has information to report and the SET is waiting for information from the company.
4. NC (Non-Compliance): the company was possible delisted from the SET.

There are other warning signs, for example, H (Trading Halt) and NR (Notice Received). However, the study does not include in the dataset. This is because based on the initial analysis the companies marked up with the two signs, later these companies are back to normal condition.

### ***Signalling Theory***

Normally, a company needs to signal to the public about its various operations. In order to gain benefit, it discloses causes of future events, such as increases or decreases in stock prices. This theory describes two types of voluntary disclosures. For traditional voluntary disclosure, executives disclose information to signal the capital market about future expectations of the company’s performance. Non-traditional voluntary disclosure, executives

disclose social and environmental information to inform the public that the company attaches great importance to the environment. This is considered a good news, but not disclosure is a negative news or bad news (Blacconiere & Patten, 1994). Spence (1978) stated that a signaling theory explains why a person or entity with more information attempts to signal their own information to the other party because business is obligated to maintain their business status as trustworthy. However, businesses may choose to act by providing false information, or attempt to disclose the truth to the minimum to pretend businesses in good positions.

### ***Financial Ratios and Financial Distress Prediction***

Theoretically and practically, there is no doubt that financial reports provide information about an entity's financial position, as well as the results of operating business activities in a single and aggregate period. However, it is doubtful whether financial reports could be useful information in the area of prediction. Scholars have attempted to determine whether accounting information provides any predictive value for a long period. A reasonable argument for the predictive value of accounting information comes from the idea of a positive accounting approach described by Keynes (2017), namely that: a positive science can mean that it is a knowledge system that studies the truth or that it is a true.

From the above definition could be applied to the accounting context so that accounting information regarded as is a positive science. This is because the primary goal of an accounting theory is to explain which accounting alternative should be used. Also, accounting theories have relied on standardised concepts, for instance, relevance, usefulness, objectivity, fairness, reliability, and verifiability (ASSC, 1975) to outline accounting alternatives. No suggestion derived from accounting standards ranks alternatives in accordance with preference and beliefs. On the other hand, accounting standards provide choices and allow users to view them according to their expectations. Therefore, users should look for "what is" in accounting information rather than "what ought to be".

Financial ratios have been employed in various areas. In the area of prediction, financial ratios have been widely adopted. Belkaoui (2000) found that ratios have been employed in predictive areas in three main areas. First, financial ratios are useful when researchers would like to predict certain situations or events. Specific prediction areas include bond premiums and bond rating predictions, the predictions of corporate restructuring behaviour, such as corporate take-overs and merger and acquisitions and credit and bank-lending decisions. Secondly, financial ratios could be suitable for time-series analysis. Time-series analysis assumes that accounting variables could be best described as random variables, thus past values of a single data set enables clues regarding future realization of the same data set. The most predictive area in time series-analysis related to the prediction of future earnings. Future

earnings prediction was based on the theory that accounting figures have aggregated numbers in two dimensions: temporal (i.e. quarterly earnings) and compositional (i.e. annual earnings). Examples of time-series analysis included using past annual earnings to predict future earnings, using past quarterly earnings to predict future earnings and using earnings components to predict future earnings. Finally, financial ratios are widely used to predict financial distress. This is because firm failure costs are considerable to investors, especially minor ones. The main objective of these types of research is to provide a pre-warning signal prior to firm failure (Belkaoui, 2000).

In this present study, the successful ratios relating firm distress prediction are employed in the analysis as follows.

**Current Ratio:** Current ratio is the most commonly used ratio of the entire balance sheet ratio. It measures liquidity and the margin of safety of the company (Anthony, Hawkins, & Merchant, 2011). The current ratio is a company's ability to pay debts by using current assets. If a current ratio is greater than 2.5, the company has good liquidity, but if less than one indicates that the company has insufficient current assets to pay the current obligations. So this company may be considered economically bankrupt (Suarez, 2004).

**Debt Ratio:** Total debt to total assets ratio is calculated be is total liability over total assets. This ratio represents the amount of assets of the company belonging to the creditors. A low debt-to-asset ratio means the company approaches the debt-free operation goal. The company with debt to asset ratio higher than industry average may have problems borrowing money (Suarez, 2004).

**ROA:** Return-on-assets ratio is a measure of the company's performance in deploying company assets and measuring the profitability of assets, as an overall measure of the efficiency of asset utilization to generate profits for shareholders. ROA reflects income from the financial resources of the company, which comes from short-term creditor, long-term creditors, bondholders, and shareholders (Anthony et al., 2011).

**Asset Turnover Ratio:** The efficiency of the investment is measured by the asset turnover ratio as the effective ratio measured the company's ability to generate sales from assets. In other words, this ratio shows that the company can use assets to generate sales effectively (Dodge, 2017).

### ***Corporate Governance in Business Failure***

Corporate governance has played a greater role in predicting bankruptcy of the business due to the concept that good corporate governance results in adding value for the business and

shareholders. Prior studies have started to explore the relationship between corporate governance mechanisms and firm failure for many years, for examples, Alba, Claessens, and Djankov (1999), Simpson and Gleason (1999), Audretsch and Lehmann, (2005), Le (2006), (Goktan, Kieschnick, & Moussawi, 2006) and Aljifri and Moustafa (2007). These attempted to observe the relationship of corporate governance mechanisms to the operational efficiency of the business. The studies found that if proper corporate governance mechanisms are adopted, operational efficiency of the business would be improved and help reduce the bankruptcy of the business. Later in 21<sup>st</sup> century, many researches have continuously carried on to confirm the relationship of corporate governance mechanisms. For example, Lakshan and Wijekoon (2012) studied the influence of corporate governance on company failure. The study found that outside director ratio, the presence of an audit committee and remuneration of board members had a negative relationship with firm failure, while the CEO duality positively correlated with the likelihood of failure of the organization. Board size, auditor's opinion and outside ownership did not find significance.

divided corporate governance into four groups; board composition, ownership structure, management compensation, director and manager characteristics to identify firm failure. The results showed that state control, institutional ownership, salaries to independent directors, the chairperson's age, CEO's education, independent directors and the concurrent position of the CEO had an important relationship with financial risks.

Jamal and Shah (2017) evaluated whether corporate governance affected financial distress. The study used size of board, composition of board, audit committee independence and duality of CEO to find the relationship with financial distress. The results showed that the size of board, composition of board and CEO duality caused financial distress.

Ali and Nasir (2018) examined the relationship between corporate governance mechanisms in terms of board of directors' characteristics including board size, board activity, CEO duality, and board independence of companies experienced financial difficulties. The results showed no significant relationship between the board size, board independence, and CEO duality with companies experienced financial problems.

Ernawati, Handojo, and Murhadi (2018) analysed the impact of financial ratios and corporate governance on financial distress by creating bankruptcy prediction models. Independent variables to measure corporate governance included director ownership, director size, blockholder ownership, independent directors, and audit opinion. The results indicate that the director ownership variable has a significant negative effect on financial distress. The result is consistent with Manzaneque, Priego, and Merino (2016) and Miglani, Ahmed, and Henry (2015).

In this present study, the successful corporate governance factors relating firm distress prediction are employed in the analysis as follows.

**Board Size:** Board size is the number of directors in the board (Coles, Daniel, & Naveen, 2008). Board size is widely used in firm failure, such as Chaganti, Mahajan, and Sharma (1985), Yermack (1996), Conyon and Peck (1998) and Coles et al. (2008). However, there has been a consensus in past literature that large boards are more effective in collaborating to solve problem (Pfeffer & Salancik, 2003), (Hillman & Dalziel, 2003). However, Elsayed (2007) found that the size of the board does not have a significant impact on the efficiency of the organization. This findings is consistent with Parker, Peters, and Turetsky (2002) and, which found that the board size affects survival.

**Board Independence:** Board independence is one of important corporate governance mechanisms in the area of operating efficiency. The recent study relating to firm failure, for example, Erkens et al. (2012) confirmed that increasing the number of non-executive directors on the board could resulted in significant losses and risks that occurred before the crisis, which may have a negative impact on the company when a crisis occurred.

**Age Diversity:** Based on past empirical studies, there is a variety of age diversity on the results of operations. Kilduff, Angelmar, and Mehra (2000) also inserted that different ages of team members positively affected overall performance. Zimmerman (2008) examines the relationship between the diversity of high-level management and the capital increase by offering shares to the public. The study found that the differences in the working background and educational background were associated with funding but did not find significant of age differences in funding. Mahadeo et al. (2012) found that the diversity of age has a positive effect on short-term performance.

**Busy Boards:** Empirical research has found that boards serving in more than companies showed effectiveness of those boards. Miwa and Ramseyer (2000) found that a director serving in many companies had a positive impact on the company's performance. Sarkar and Sarkar (2009) found a positive relationship between being a director in many companies and the value of the business, but only in the case of holding positions in many companies of independent directors.

**Board Meeting Frequency:** The meeting of the board of directors aims to communicate and exchange information among boards as well as help solve problems that occur in accordance with the company's strategy. The number of meetings of the board of directors shows effective of the board. Mangena and Taurigana (2006) found that if the greater of number of meetings governance mechanism would improve, and should benefit the business performance.

**Director's Fee:** Executive compensation are more likely to improving corporate governance studied the relationship between director remuneration and the wealth of shareholders of large corporations. The results showed that the directors' remuneration was an important factor of good corporate governance, which enabled the company having better operating results.

**Directors' Ownership:** Ownership structure is an important factor that causes agency problems due to conflicts between management and business owners. However, the results are mixed whether internal shareholding by the board of directors and outside shareholders improve firm performance. Jensen and Meckling (1976) said that when the interests of company ownership and executive directors were aligned, for example, they hold more shares in the company, both the board and the executives. It would have more motivation to work hard. (Warfield, Wild, & Wild, 1995). Hermalin and Weisbach (1991) found that the shareholding of executive directors improved performance. Agrawal and Knoeber (1996), Mehran (1995), Balotti, Elson, and Laster (2000), and Farrell and Whidbee (2000) found that holding by external directors was the key to effective corporate governance.

### **Problem Statement**

Previous studies have vital concern when should be a point of time before companies turn to be failed firms. This is to give pre-warning signal to financial statements' users, especially investors in stock exchanges. This study introduces a new point of problem firms using the mark up sign warned by the Stock Exchange of Thailand. Both successful financial ratios used in previous studies of financial distress and important signals of corporate governance mechanisms in financial distress are employed in the analysis. This is to attempt to find useful pre-warning signals of problem firms before turning to be failed firms.

### **Method**

The study uses logistic regressions (logit) in the analysis. An important study on business failure using logit was Ohlson (1980). Li and Wang (2014) said that in the last 20 years, there has been a lot of research that studies the efficiency of intelligent models on financial early warning models. However, the logit model was still very popular because it was well-known for predicting financial early warning and easy to interpret and explain. Many logit models are used more often and more widely because they are less demanding than multivariate discriminant analysis (Kaminsky, Lizondo, & Reinhart, 1998). Many studies stated how useful of logit in predicting financial risks as follows. (1) Logit model is widely used. It is a non-linear probability model which is suitable for financial early warning because financial predictions are usually non-linear (Brezigar-Masten & Masten, 2012); (2) Logit model is

quite easy to understand and is available in almost every software package. It does not assume multivariate normality, but gives a clear relationship between the explanatory variable and the response based on the information received (Wang & Zhang, 2002). Logit model easily explains the reason why a financial crisis occurs or does not occur (Demirgüç-Kunt & Detragiache, 1998); (3) Logit model is more accurate and stable than many other models. (4) Logit model does not require quality and complete data, so it can be used more applicable than intelligent techniques in situations where there is no high quality data, especially in developing countries.

### ***Data Collection***

This research uses secondary data from the Stock Exchange of Thailand. The data collection based on the SETSMART database (SET Market Analysis and Reporting Tool), which is an online database service of the Stock Exchange of Thailand, financial statements and annual registration statements (Form 56-1) from the published documents of the company issuing and offering securities by the Securities and Exchange Commission, Thailand (SEC). The data to identify problem firms was from 22/2/2013 until 9/4/2019. The data was divided into three groups.

1. Problem firms mean listed companies on the Stock Exchange of Thailand that have been marked C, NC, SP and NP totalling 116 companies covering a period of three years before the company was put up.
2. Non-problem firms mean a listed companies that are not up to the mark on the Stock Exchange of Thailand of 116 companies covering a period of three years in the same industry, with total assets and revenues close to companies marked C, NC, SP and NP.

There were totalling 232 companies to analyse and there were three sets of time matching in this study; 1 year, 2 years and 3 years before the signs of C, NC, SP and NP.

### ***Study Model***

The study model sets up equation based on the literature reviews and composes the dependent variables and independent factors of early warning signs of problem firms as shown below.

$$Y = \beta_0 + \beta_1 \text{Board}_S + \beta_2 \text{BoardInd} + \beta_3 \text{Age} + \beta_4 \text{Busy} + \beta_5 \text{Meeting} + \beta_6 \text{Direct}_F + \beta_7 \text{Direct}_O + \beta_8 \text{Current} + \beta_9 \text{DebtTA} + \beta_{10} \text{ROA} + \beta_{11} \text{SalesTA} + \varepsilon$$

Table 1 shows the definitions of variables of this present study.

**Table 1:** The definition of variables of the study

Variables	Measurement
Independent variables	
Corporate governance	1. Board size (Board_S) = Number of board members at the end of the year
	2. Board independence (BoardInd) (%) = (Number of outsider directors/board Size) x 100
	3. Age = Mean of board age
	4. Busy Boards (Busy) (%) = (Board positions at 3 or more other companies/board size) x 100
	5. Board Meeting Frequency (Meeting) = The number of meetings of the board of directors per year
	6. Director's Fee (Direct_F) (%) = (The remuneration for directors / the executive remuneration)
	7. Directors' Ownership (Direct_O) (%) = (Number of ordinary shares of the company director / total paid-up ordinary shares) x 100
Financial Ratios	1. Liquidity Current Ratio (Current) = Current assets/Current liabilities
	2. Gearing Debt Ratio (DebtTA) (%) = (Total liabilities/Total assets) x 100
	3. Profitability ROA (%) = (NI/Total assets) x 100
	4. Efficiency Asset Turnover Ratio (SalesTA) = Sales/Total assets
Dependent variables	
Problem Firms	Listed companies marked up with C, NC, SP and NP = 1; otherwise 0

## Results and Discussion

### *Descriptive Statistics*

Table 2 represents the descriptive statistics for corporate governance mechanisms used in this study including maximum, minimum, mean, standard deviation during the period of 3 years, 2 years and 1 year before being marked as C, NC, SP and NP of problem firms and non-problem firms, which are matched.

**Board Size:** Descriptive statistics shows that problem firms has 5 – 21 executive boards at the average of 9.6 persons in all three years before marked up with C, NC, SP and NP, while

non-problem firms has 6 – 19 executive boards at the average of 10.2 persons in all three years.

**Board Independence:** The average number of independent directors is more than one-third of the total number of directors of problem firms 15% - 39.3%, at the average of 39.3% in all three years before marked up the signs, while the average number of independent directors is more than one-third of the total number of directors of non-problem firms 10.5% - 70% at the average of 36.7% in all three years.

**Age:** The means of board age are not different between problem and non-problem firms ranging between 56-58 years. However, the average board age of non-problem firms is higher than problem firms is in all three years.

**Busy Boards:** The means of numbers of board serving as a board in other companies are not different between problem and non-problem firms ranging between 0% – 100% in all three years.

**Board Meeting Frequency:** The number of board meetings of problem firms and non-problem firms are similar at average of 7 - 8 times per year in all three years.

**Director's Fee:** The average percentage of director remuneration over executive remuneration of problem firms and non-problem firms are similar ranging from 0.30% - 18.4% in all three years. However, the percentage of non-problem firms is higher than problem firms is in all three years.

**Directors' Ownership:** The directors' ownership percentage of problem firms and non-problem firms are very similar ranging from 0% - 73% in all three years. However, the percentage of non-problem firms is higher than problem firms is in all three years.

In sum, the corporate governance mechanisms of problem and non-problem firms are quite similar, except director's fee. Non-problem firms are more likely to pay more remunerations to their directors than problem firms do.

**Table 2:** Descriptive Statistics for Corporate governance

Variable	Problem Firms				Non-Problem Firms			
	Min	Max	Mean	SD.	Min	Max	Mean	SD.
<b>Board Size (Board_S)</b>								
Years 3	5	21	9.733	2.733	6	20	10.267	2.433
Years 2	5	21	9.612	2.797	6	18	10.164	2.344
Year 1	5	21	9.578	2.767	5	19	10.181	2.358
<b>Board independence (BoardInd) (%)</b>								
Years 3	16.667	66.667	39.555	9.287	10	66.667	36.707	9.893
Years 2	16.667	80	39.386	10.121	11.111	70	37.023	9.973
Year 1	15	66.667	39.062	9.257	10.526	71.429	37.642	9.773
<b>Age</b>								
Years 3	42.750	69.214	56.387	5.993	46.111	71.818	57.532	5.435
Years 2	35.375	68.571	56.285	6.063	45.200	72.818	57.845	5.523
Year 1	40.714	69.571	57.022	5.846	43.500	73.818	58.485	5.194
<b>Busy Boards (Busy) (%)</b>								
Years 3	0	81.818	29.667	22.612	0	100	29.176	24.744
Years 2	0	85.714	29.965	23.657	0	88.889	29.661	23.571
Year 1	0	100	31.860	26.249	0	86.667	29.915	23.122
<b>Board Meeting Frequency (Meeting)</b>								
Years 3	4	18	7.759	3.642	4	23	7.207	3.332
Years 2	4	21	7.991	3.555	4	20	7.448	3.345
Year 1	4	24	8.638	3.770	4	33	7.655	4.112
<b>Director's Fee (Direct_F) (%)</b>								
Years 3	0.300	67.819	15.864	13.625	0.327	72.917	18.435	16.243
Years 2	0.313	95.037	17.547	15.955	0.610	80.202	18.493	15.269
Year 1	0.286	61.697	17.317	14.492	0.600	66.311	18.558	14.497
<b>Directors' Ownership (Direct_O) (%)</b>								
Years 3	0	71.376	19.369	20.324	0	76.340	20.246	20.574
Years 2	0	73.204	17.935	18.649	0	74.860	19.703	20.092
Year 1	0	70.680	15.781	16.910	0	72.032	18.715	19.419

Table 3 represents the descriptive statistics for financial ratios including maximum, minimum, mean, standard deviation of current ratio, debt ratio, debt to equity ratio, ROA, asset turnover ratio, and fixed asset turnover ratio during the period of 3 years, 2 years and 1 year before the sign of C, NC, SP and NP of problem firms and non-problem firms.

Problem firms have the average current ratio of 2.58 in years 3 and 2.97 in years 2 and 5.61 in year 1 before being marked C, NC, SP and NP of problem firms, while non-problem firms



have the average current ratio of 2.55 in years 3 and 2.92 in years 2 and 2.68 in year 1. It is noticed that one year before being marked up, the average current ratio of problem firms is double from previous years.

When considering the average debt ratio, it is found that the problem firms have a higher average of debt ratio ranging from 54.27% – 63.14% than non-problem firms have ranging from 41.48% - 43.31% in all three years.

When considering the average ROA, problem firms have a negative ROA ranging from - 4.50% -11.15% and increase from previous years, while non-problem firms have a positive ROA ranging from 5.95% - 7.54%. Noticeably, non-problem firms have positive ROAs in all three years, while problem firms have negative ROAs with accelerated rate during three-year period.

The average asset turnover ratios of problem and non-problem firms are quite similar ranging between 0.8% - 0.9% in all three years.

In sum, the ratios of problem firms are more like to indicate pre-warning signs, especially ROA. ROA of problem firms are negative and increase with accelerated rate in all three years. In addition, debt ratios of problem firms are higher than non-problems in all three years. Furthermore, one year before being marked as problem firms, current ratio of problem firms surprisingly increase from year 2, however, ROA decreases twice from year 2.

**Table 3:** Descriptive Statistics for Financial Ratios

Variable	Problem Firms				Non-Problem Firms			
	Min	Max	Mean	SD.	Min	Max	Mean	SD.
<b>Current Ratio</b> (Current)								
Years 3	0.073	47.083	2.582	5.420	0.152	20.811	2.546	2.740
Years 2	0.058	47.885	2.974	6.400	0.284	52.194	2.918	5.134
Year 1	0.055	310.426	5.610	29.185	0.426	15.595	2.684	2.774
<b>Debt Ratio</b> (DebtTA) (%)								
Years 3	1.418	97.827	54.272	25.414	3.042	129.773	43.305	23.814
Years 2	2.533	232.015	57.393	32.614	2.076	92.845	42.634	21.808
Year 1	0.266	223.945	63.138	37.215	2.381	93.438	41.483	20.968
<b>ROA</b> (%)								
Years 3	-183.539	30.523	-4.501	22.255	-36.908	238.975	7.543	23.211
Years 2	-143.243	296.200	-5.651	37.677	-10.048	55.560	6.972	9.037
Year 1	-142.446	35.289	-11.154	23.728	-11.555	29.555	5.945	6.862
<b>Asset turnover ratio</b> (SalesTA)								
Years 3	0.011	5.765	0.920	1.001	0.031	6.722	0.950	0.772
Years 2	0.024	7.338	0.946	1.184	0.024	5.236	0.896	0.677
Year 1	0.011	8.359	0.874	1.052	0.051	3.292	0.849	0.539

### ***Logistic Regression Results***

In this section, the logistic regression results are demonstrated. It is to search for independent variables that are expected to indicate the companies with being marked up with the signs of C, NC, SP and NP. The analysis is divided into 3-year, 2-year and 1-year before being marked up.

Table 4 shows the results all 3 years before becoming problem firms. In 3-year before being marked as problem firms, it is found at 0.05 significant level, debt ratio (DebtTA) and ROA significantly relate to problem firms. The coefficient of debt ratio is a positive sign, meaning that if the debt ratio is low, it is less likely to be problem firms. Also, the coefficients of ROA is a negative sign, meaning that if ROA is high, it is less likely to be problem firms. At 0.10 significant level, board independence (BoardInd) and current ratio (Current) significantly associate with problem firms. The coefficient of board independence and current ratio are positive signs, meaning that if these two independent variables are high, it is more likely to indicate problem firms.

In 2-year before being marked as problem firms, it is found at 0.05 significant level, debt ratio (DebtTA) significant relates to problem firms. The coefficient is positive, meaning that if the debt ratio is low, the probability to be problem firms is less. At 0.10 significant level,

current ratio (Current) and ROA significantly relate to problem firms. The coefficient of current ratio is a positive sign, while ROA's coefficient is negative.

In 1-year before being marked as problems, it is found that at 0.05 significant level, current ratio (Current), debt ratio (DebtTA) and ROA significantly relate to problem firms. The coefficients current ratio and debt ratio are positive signs and the coefficient of ROA is a negative sign. At 0.10 significant level, busy boards (Busy) and asset turnover ratio (SalesTA) significantly relate to problem firms. The coefficient of both busy boards and asset turnover ratio are a positive sign. It represents a high proportion of the number of directors who hold positions in other companies are more likely to become problem firms. The higher asset turnover ratio (SalesTA) indicates that the more company attempts to uses all assets to generate revenue, the more the company become problem firms.

**Table 4:** Logistic regression results

Model 1	Years 3				Years 2				Year 1			
	B	Wald	Sig.	Exp(B)	B	Wald	Sig.	Exp(B)	B	Wald	Sig.	Exp(B)
Board_S	.017	.058	.809	1.017	-.027	.175	.676	.973	-.071	.820	.365	.931
BoardInd	.031	3.058	*.080	1.031	.019	1.282	.257	1.019	.003	.022	.883	1.003
Age	-.014	.234	.628	.986	-.040	2.315	.128	.960	-.024	.543	.461	.976
Busy	.003	.176	.675	1.003	.003	.166	.683	1.003	.012	2.922	*.087	1.012
Meeting	.003	.003	.953	1.003	.013	.096	.756	1.013	.021	.245	.620	1.021
Direct_F	-.013	1.543	.214	.987	.000	.002	.964	1.000	.001	.008	.927	1.001
Direct_O	-.003	.173	.677	.997	-.007	.782	.377	.993	-.009	1.032	.310	.991
Current	.106	3.495	*.062	1.112	.059	3.448	*.063	1.061	.122	5.356	**0.021	1.130
DebtTA	.025	10.260	**0.001	1.026	.022	9.531	**0.002	1.022	.019	4.871	**0.027	1.019
ROA	-.072	14.968	**0.000	.931	-.023	3.773	*.052	.977	-.130	25.910	**0.000	.878
SalesTA	.119	.468	.494	1.126	.077	.211	.646	1.080	.456	3.695	*.055	1.577
Constant	-1.817	.920	.337	.163	.508	.083	.773	1.663	-.018	.000	.994	.982

\*\*significant at the 0.05

\*significant at the 0.10

### Model Accuracy

This study also indicates the accuracy rate of the models in all 3 years. At the cutting point of 0.5 of probability of problem firms and non-problem firms. This means if the calculated probability is greater than 0.5, it is predicted as problem firms. Conversely, if the value of probability is less than 0.5, it is predicted that non-problem firms.

Table 5 shows accuracy rate of all 3 years before being marked as problem firms. In 3-year before becoming problem firms, it is found that the overall accuracy of 71.1% (165

companies) could be predicted. When considering in detail, the model could correctly identify non-problem firms at 73.3% (85 companies), while the model could correctly identify problem firms at 69.0% (80 companies). However, the model has a type I error, which was a mistake from rejecting  $H_0$  when  $H_0$  was true, by forecasting that it is non-problem firms, but in fact, the problem firms for 31% (36 companies). The model has a type II error that is a mistake from accepting  $H_0$  when  $H_0$  was false, by predicting the problem firms, but in fact, non-problem firms for 26.7% (31 companies).

In 2-year before becoming problem firms, it is found that the overall accuracy of 67.7% (157 companies). The model correctly predicts the problem firms at 63.8% (74 companies) and accurately forecasts the non-problem firms 71.6% (83 companies) with a type I error of 36.2% (42 companies) and type II error of 28.4% (33 companies).

In 1-year before becoming problem firms, it is found that the overall accuracy of 79.3% (184 companies). The model correctly predicts the problem firms at 74.1% (86 companies) and is able to accurately predict the non-problem firms 84.5% (98 companies), with a type I error of 25.9% (30 companies) and type II error of 15.5% (18 companies).

**Table 5:** Model accuracy

Observed	Predicted of Years 3				Predicted of Years 2				Predicted of Year 1			
	Non-Problem Firms	Problem firms	Total	% Correct	Non-Problem Firms	Problem firms	Total	% Correct	Non-Problem Firms	Problem firms	Total	% Correct
Non-Problem Firms	85	31	116	73.3	83	33	116	71.6	98	18	116	84.5
Problem firms	36	80	116	69.0	42	74	116	63.8	30	86	116	74.1
Overall %				71.1				67.7				79.3

a. The cut value is .500

The discussion of the above results is as follows. The descriptive statistics indicate that there is no significant different of corporate governance mechanisms adopted by problem and non-problem firms. It is understandable that corporate governance mechanisms are legally required regulators like the Stock Exchange Commission. All listed firms are more likely to ignore those requirements, just putting corporate governance rules in the paper. Also, no enforcement has been done even if corporate governance becomes issues. This result is consistent with previous works stating that enforcement more than regulations, laws-on-the-books or voluntary codes is key to effective corporate governance in developing countries. This descriptive statistics result is in the same direction of the logistic model indicating that

corporate governance factors are less likely to identify problem firms. The explanation will be mentioned later in this section.

The descriptive statistics of financial ratios reveal that problem firms are motivated to manipulate financial statements by raising current ratios 1-year before being marked as problem firms (see Table 3). However, management of problem firms could not increase ROA and decrease debt to total assets to show the firms are in healthy condition. This means that the problem firms can survive only in short-term period.

The logistic regression results shows that very few corporate governance mechanisms indicate firm disability. Only board independence and busy boards are the most likely to indicate problem firms. The results are consistent with the study of Erkens et al. (2012) confirmed that increasing the number of non-executive directors on the board could result in significant losses and risks that occurred before the crisis. Also, Ferris et al. (2003) found that holding too many positions in many companies may cause directors to have too much responsibilities, which can reduce the ability to supervise executives effectively. It adversely affects the value of the company.

In addition to corporate governance mechanisms, the logistic regression result in current ratio, debt ratio and ROA are the most like to indicate problem firms. This may indicate that problem firms often rely on financial institutions to borrow money when companies have liquidity problems. However, the companies have not enough profitability, this results in unable to repay the loans, then turn to be problem firms. The result is consistent with the study of stating that debt ratio and total assets turnover ratio indicate problem firms. In addition, He (2002) stated that return on assets and financial leverage increase the probability of bankruptcy.

Finally, the model accuracy indicates that the percentage of accuracy of 2-year before being marked as problem firms is the lower than 3-year before being marked. And the percentage of accuracy of 1-year is the highest. This means that problem firms attempt to improve their financial position in short-term or not continuous improvement.

## **Conclusion**

This study attempts to recommend the early warning signs of problem firms. The Stock Exchange of Thailand as a representative of emerging market is used as dataset. The study introduces a new definition of problems by searching for listed companies which are marked as Trading Suspension (SP), Caution (C), Notice Pending (NP) and Non-Compliance (NC) during 22/2/2013 to 9/4/2016. Data collection is from SETSMART (SET Market Analysis and Reporting Tool) which is an online database service of the Stock Exchange of Thailand.

By using match-paired sample, the 116 problem companies and normal status 116 companies that are in the same industry group are used in the dataset. Both successful corporate governance mechanisms and financial ratios relating to financial distress are used as independent variables. Logistic regression is mainly used to analyse the data. The analysis is divided into 3-year, 2-year and 1-year before being marked as problem firms.

The contributions of study show both consistent and inconsistent with prior studies. This study confirms that financial ratios are still benefit to financial statements' users. When firms may be facing financial distress in the near future, profitability ratios including ROA, leverage ratio including debt to total assets could be considered as pre-warning signals. However, current ratios may not be a good indicator. This is because management seems to manipulate liquidity to pretend a company is in a good condition. These conflict financial indicators make financial statements' users analyse the whole picture of financial statements rather than paying attention to specific financial ratios. In addition, the study contradicts to prior studies that corporate governance mechanisms may not be considered as financial distress indicators. There are some reasons to explain this finding. For example, corporate governance is just in the paper. This is to suit with law and regulations. However, both enforcement and continuous implement are one of the concerns of regulators. Finally, this study introduces a new point of problem firms by using the warning signs posted by the Stock Exchange of Thailand. Those signs are benefit to investors to use as decision-making information.

### **Limitations of the Study**

The study pay attention to financial ratios and corporate governance mechanisms. There may have other factors influencing financial distress. In addition, this research provides a definition of problem firms as economic failure, which is the least severe failure. Therefore, it may be causing the proportion of errors in the prediction of problem firms (type I error) was higher than non-problem firms. Furthermore, the predictive model provided by this study is only a preliminary decision support system. If shareholders or related parties receive an alarm and are aware of the consequences considered taking corrective actions in a timely manner, the actual events may change from the forecast results.

### **Suggestions for Future Research**

Researchers can use the process, methods and results of this study to develop an alarm system. Current environmental factors have changed quite a lot. If more extensive research is done, the capital market system in the country will increase. It will further benefit and confidence in warning signs.

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