Research Article

EARLY WARNING OF PROBLEMATIC FIRMS LISTED IN THE STOCK EXCHANGE OF THAILAND: AN INVESTIGATION OF FINANCIAL RATIOS

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Received: 2021-05-12
Revised: 2021-06-26
Accepted: 2021-07-02

ABSTRACT

This paper aims to study early warning signs of financial ratios in problematic companies listed on the Stock Exchange of Thailand. The study samples consisted of 122 companies. The researcher observed 61 companies marked C (Caution) and NC (Non-Compliance) from listed companies on the Stock Exchange of Thailand during 2013-2019, represented by group 1, as problematic companies. In addition, the sample group included 61 unmarked C and NC companies, which were considered to be non-problem companies, represented by group 0. In this study, the researcher used the financial ratios calculated from the financial statements obtained from the SETSMART (SET Market Analysis and Reporting Tool) database on the website of the Stock Exchange of Thailand. The study found that financial ratios were statistically significant for demonstrating the pre-warning signs of problematic companies. Specifically for three years before the company was marked with C and NC, financial ratios included debt ratio, debt to equity ratio, return on equity and return on assets were found to be the warning signs. Two years before the company was marked with C and NC, the warning signs were given by 6 financial ratios:

current ratio, debt to equity ratio, return on equity, asset turnover ratio, return on assets, and fixed asset turnover ratio. However, one year before the company was marked with C and NC, it was found that the four financial ratios demonstrated as the warning signs were: debt ratio, assets turnover ratio, return on assets, and fixed asset turnover ratio. These factors can explain the change in the dependent variable, namely a problematic company being, 81.1 percent, 83.6 percent, and 86.9 percent respectively.

Keywords: Early Warning Signs, Financial Ratios, Problematic Companies

Introduction

The Stock Exchange of Thailand (SET) is the country's largest funding source. It can raise savings from a wide variety of economics units such as the general public, business units, government agencies, and foreign entities. The companies that want to raise large amounts of capital to expand their business or increase production, therefore, have come to raise funds on the Stock Exchange of Thailand. Those companies will sell their ordinary shares to investors who are interested in investing. Investors will want to get a return on their shareholding, or investors may want a return on the difference in the price of the securities. The returns that investors will receive depend on the performance of the listed companies. Therefore, investors must carefully study the information of the company before deciding to invest, so to reduce the investment risk. If there are any irregularities in the securities, this information can also be used to make timely decisions about changes in the holdings of the securities. A tool that can signal whether to continue holding the stock or not is essential for investors.

The Stock Exchange of Thailand (SET) has a tool to regulate and allow listed companies to comply with such tools. If the company does not comply, the securities trading will be halted and may lead to further delisting in order to avoid troubled securities trading. For the delisting of the listed securities of the SET, there are rules and conditions regarding the delisting to protect the rights of shareholders. Practiced because the delisting affects the rights and interests of shareholders, and the liquidity of the shareholders' securities. The SET has criteria for consideration, such as financial status and operating results, which are not in line with the SET's regulations. The company had sub-zero equity or significantly reduced

assets. The above criteria is considered from financial factors.

Within the context of predicting problem companies, there are several studies looking at the warning signs of problem companies by collecting statistics. These include Altman (1968), Altman et al. (2014), Bauer & Agarwal (2014), Altman (2016), Liang et al. (2016), Bagher & Milad (2016), Bauweraerts (2016), Laitinen & Suvas (2016), Klepac & Hampel (2017), Manodamrongsat (2019), Manodamrongsat et al. (2020). The results of many of the studies mentioned above can summarize the causes of problem companies in terms of economic, financial, negligent, and fraud factors.

Altman's study (1968) used the statements of financial position and income statements from 1946-1965. He used Discriminant Scores or Z-Scores, to classify variables, so to determine the financial ratios relative to the opportunity for the business bankruptcy. The study found that there are five financial ratios which are important in categorizing the bankrupt manufacturing businesses and the stable financial business. It can be sorted by importance, including return on total assets, sales to total assets, market capitalization of equity to total liabilities, retained earnings to total assets, and working capital to total assets. The accuracy of the model being built at 95% can be considered highly accurate in forecasting.

Klepac & Hampel (2017) analyzes the role of financial ratios of financially troubled companies. The sample consisted of 250 agricultural companies in the European Union, of which 62 of them defaulted on debt and filed for bankruptcy in 2014. The results of the study showed that return on assets: ROA provided the most accurate picture two years before the first signs that the company had found itself experiencing financial distress. In addition, they also found that ROA was most important in predicting financial defaults in the last year before the company went bankrupt.

It can be said that the company's performance is a key factor in its success or failure and it is also a tool that the Stock Exchange uses to regulate listed companies. This includes analyzing and monitoring the financial status and operating results of listed companies, which are reflected in the form of financial statements and financial ratios.

In this study, the researcher used the financial ratios calculated from the financial statements from the SETSMART (SET Market Analysis and Reporting Tool) database

on the website of the Stock Exchange of Thailand. It is public information that everyone has access to information of listed companies. There are eight financial ratios that researchers use in forecasting to determine whether these financial ratios are sufficient to signal investors as a problematic listed company.

Research Objectives

The purpose of this research is to study early warning signs of financial ratio variables on problematic companies in the Stock Exchange of Thailand.

Expected Benefits

The data obtained from the study can identify the value and benefit of accounting information for forecasting economic decisions to users of financial statements.

The stakeholders of listed companies can be used to analyze and assess the company's status of potential future financial problems. They can be used for planning operations or for making economic decisions.

The investors can consider investing in listed companies and using it as a means to monitor the financial health of listed companies. It can avoid any risky investments or for determining the return on investment.

The regulators of listed companies are able to analyze the risks of the companies on the stock exchange and can analyze the information effectively. This to be used as a guideline for corporate governance and control of the damage caused by financial failures.

Research Scope

The population used in the study were companies listed on the Stock Exchange of Thailand, only those who traded in ordinary shares. The study sample consisted of 122 companies. The researcher led 61 companies marked C and NC from listed companies in the Stock Exchange of Thailand during 2013-2019, represented by group 1, as problematic companies. In addition, the sample group included 61 unmarked C and NC companies, which were considered to be non-problem companies, represented by group 0.

The Stock Exchange of Thailand issues "C" (Caution) marking on the securities of listed companies. It is a warning to investors if listed companies have events that may affect their financial position and business operations. The investors must purchase such securities with a cash balance

only. As for the "NC" (Non-Compliance) mark, it is the securities of listed companies that is subject to possible delisting or in the process of opening a temporary trading.

Literature Review

The determination of the variables used in this study, was derived from the compilation of previous studies. Keasey & Guinness (1990) suggested that a variant of the profitability ratio of the year prior to the date of a financial failure was a key failure indicator. Bunn & Redwood (2003) found that an increase in capital gearing (the debt to assets ratio) has the potential for a company to fail. While the higher liquidity, as measured by the current ratio, reduces the likelihood of a company's failure. In addition, the low profitability coupled with the high debt to assets ratio increases the accuracy of the company's failure prediction. When comparing situations where profitability and debt to asset ratios were considered separately, the correct predictions of the company's failure were reduced.

Kholisoh & Dwiarti (2020) used logistic regression to identify and describe financial indicators and macroeconomic in predicting financial distress. The sample group consisted of 23 property and real estate companies, of which 5 companies are in a financial crisis and 18 companies are not in a financial crisis. These companies were traded on the Indonesia Stock Exchange in 2014-2018. The independent variables have 4 financial ratios: current ratio, debt to assets ratio, return on equity, and total asset turnover ratio. The results of the study concluded that return on equity is the only independent variable that has a significant negative impact on companies experiencing financial difficulties. While the remaining independent variables do not have a significant effect on the possibility of the company encountering financial difficulties.

Conceptual Framework

The variables used in this study were divided into dependent and independent variables as follows.

1. The dependent variable is problem firms as qualitative data. It represents as "1" for a problematic listed company and is marked C and NC from the Stock Exchange of Thailand. Alternatively, as "0" if it is a listed company without problems and is not marked C and NC from the Stock Exchange of Thailand.

2. The independent variables consisted of 8 quantitative data:

Table 1 The independent variables used in the study

Independent Variable	Acronym	Measurement	Interpretation
current ratio	(CR)	Current assets / Current Liabilities	If the liquidity ratio is high, the company has the ability to pay off its short-term debt, resulting in more stability (Bunn & Redwood, 2003; Zhai et al., 2015).
quick ratio	(QR)	(Current assets – inventory) / Current liabilities	The quick ratio is a ratio that provides a better view of short-term liquidity than current ratio. It shows a firm's ability to pay off short-term debt with current assets that convert to cash quickly. It gives an idea of the true liquidity of the company (Zhai et al., 2015).
debt ratio	(DA)	(Total Debt / Total Assets) x 100	A company with a high debt ratio indicates that the company has a high level of debt compared to the owner's money. In addition to the company will have to pay interest. In the future, if the company has liquidity problems, it is still difficult to

Table 1 (to)

Independent Variable	Acronym	Measurement	Interpretation
			borrow more, thus increasing the bankruptcy risk (Bunn & Redwood, 2003; Alifiah, 2014; Zhai et al., 2015; Ashraf et al., 2019; Manodamrongsat, 2019; Manodamrongsat et al., 2020).
debt to equity ratio	(DE)	(Total Debt / Total equity) x 100	The D/E ratio shows the risks of creditors and business owners. If the ratio is high, it means that the company has a risk from borrowing money to use in its business operations. It could affect the stability of the company (Bunn & Redwood, 2003; Zhai et al., 2015).
return on assets ratio	(ROA)	(Net Income / Total Assets) x 100	A high ROA indicates the company uses its assets effectively, resulting in higher business stability (Alifiah, 2014; Manodamrongsat, 2019; Manodamrongsat et al., 2020).

Table 1 The independent variables used in the study

Independent Variable	Acronym	Measurement	Interpretation
return on equity ratio	(ROE)	(Net Income / Shareholders' equity) x 100	The ROE ratio reflects the management's ability to generate returns to the shareholders who own the business. The high ROE indicates the company is highly profitable, resulting in a higher stability of the company (Maricica & Georgeta, 2012; Zhai et al., 2015).
assets turnover ratio	(AT)	Sales / Total Assets	It is a ratio that represents the efficiency of the use of all assets of a company to generate income relative to sales. If the asset turnover ratio is low, the company may not fully use its existing assets. If a high asset turnover ratio indicates that the company is efficient in utilizing assets and using the asset effectively (Alifiah, 2014; Manodamrongsat, 2019; Manodamrongsat et al., 2020).

Table 1 (to)

Independent Variable	Acronym	Measurement	Interpretation
fixed asset turnover ratio	(FT)	Sale / total fixed asset	It is a ratio that shows the efficiency of the company in using its fixed assets. If the value is low, it is likely that the entity has some fixed assets that do not generate income. The company may consider selling to reduce expenses and then use the money to buy other fixed assets or invest in other parts (Zhai et al., 2015).

Methodology

After all the data has been collected, the researcher will use a statistical package to analyze the data. The samples were divided into 2 groups. The first group were problem firms and were C and NC marked by the Stock Exchange of Thailand. The other group is a collection of non-problem firms and is not marked with C and NC from the Stock Exchange of Thailand. Therefore, the logistic regression analysis techniques were selected.

Research Instrument

This research uses secondary data from the financial statements and financial ratios of listed companies on the Stock Exchange of Thailand. The data were collected for 3 years before the company was posted on the C and NC marks from 22/2/2013 to 9/4/2019. The financial statements and financial ratios are collected from the SETSMART (SET Market Analysis and Reporting Tool), which is a database service of the Stock Exchange of Thailand

online. The researcher collates the data in Microsoft Excel and analyzes the data.

This study collected company data for each unit pair. Then the data was analyzed for the past, divided into 1-year, 2-years, and 3-years before being announced on the C and NC signs. This is to use statistical testing to determine which financial ratio indicators will be effective and accurate in forecasting problematic companies of listed companies.

Results Conclusion and Discussion

1. Results Conclusion

A study of the warning signs of C and NC markings of the Stock Exchange of Thailand from 8 independent variables of financial ratios. The research results are as follows.

1.1 The multicollinearity test is a test of the relationship of each variable. The Pearson product-moment correlation coefficient was used to detect multicollinearity. A simple correlation matrix was used between the 8 independent variables to prevent the variables from being completely correlated with themselves. Kennedy (1998) and Midi et al. (2010) estimated the absolute value of 0.8 or 0.9 of the correlation coefficient. Therefore, the researcher has set the criteria for the detection of multicollinearity according to the criterion. That is, if the correlation is greater than 0.80 or -0.80, then those variables are completely correlated with themselves.

From examining the multicollinearity problem of all 8 independent variables, it was not found that independent variables were highly correlated. The researcher used a total of 8 independent variables for further analysis.

1.2 The verification of the suitability of the Logistic Response Function based on the Nagelkerke R Square or Pseudo R Square statistic. The resulting value indicates a proportion or percentage that can explain variations in the Logistic Response Function (Ghozali, 2006; Okwoche et al., 2015; Sari & Dwirandra, 2019; Herliansyah et al., 2020; Manodamrongsat, 2019; Manodamrongsat et al., 2020).

3-years before being marked C and NC, this had a Nagelkerke R Square of 0.490. It meant that the variation in which the independent variable can be described is 49.0%, while the remaining 51.0% is the result of variables outside the research model.

2-years before being marked C and NC had a Nagelkerke R Square statistic of 0.636. It represents a predictive model

that was able to explain the variation of the dependent variable as 63.6%

1-year before being marked C and NC, this had a Nagelkerke R Square statistical value of 0.714. It represents a predictive model that was able to explain the variation of the dependent variable equal to 71.4%.

A validation of the suitability of the Logistic Response Function, considering the Model's Chi-square value approaching 0, indicates that the Logistic Response Function equation is appropriate (Manodamrongsat, 2019; Herliansyah et al., 2020; Manodamrongsat et al., 2020).

3-years before being marked C and NC, this had Model's Chi-square of 55.918 and significant of 0.000.

2-years before being marked C and NC, this had Model's Chi-square of 79.002 and significant of 0.000.

1-year before being marked C and NC, this had Model's Chi-square of 93.543 and significant of 0.000.

When considering test statistics Hosmer-Lemeshow, it is significantly greater than the 0.05 level, which indicates that the Logistic Response Function equation is appropriate (Herliansyah et al., 2020; Manodamrongsat et al., 2020).

3-years before being marked C and NC, the statistical test of Hosmer-Lemeshow has a significant value of 0.543. 2-years before being marked C and NC, the statistical test of Hosmer-Lemeshow has a significant value of 0.210.

1-year before being marked C and NC, the statistical test of Hosmer-Lemeshow has a significant value of 0.437.

1.3 The computation of the forecast probability of the model was the percentage correct prediction between the predicted value and the observed value. If the percentage correct prediction is high, the model has good forecasting accuracy.

From table 2, it is found that the Logistic Response Function has the ability to accurately predict the likelihood that the company will encounter problems and be marked with C and NC.

In the third year before companies were C and NC marked, they had the overall correct forecast percentage of 81.1% (99 companies). It shows the ability to predict 83.6% of companies that are not problematic and not marked C and NC (51 companies). It has 78.7% (48 companies) accurate forecasting of problem companies and marked with C and NC.

In the second year before C and NC were marked, it had an overall correct forecast percentage of 83.6% (102 companies). The ability to forecast companies that are not problematic and not marked C and NC are 88.5% accuracy (54 companies). It is capable of accurately forecasting 78.7% (48 companies) of the problem companies and marked C and NC.

In year 1 before the company was marked C and NC, it had an overall correct forecast percentage of 86.9% (106 companies). It has the ability to accurately predict 90.2% (55 companies) of companies that have no problems and are not marked with C and NC. The forecasting ability of problematic companies and marked C and NC is 83.6% correct (51 companies).

Table 2 Testing the Accuracy of Models in Forecasting Problem Firms (The cut value is .500)

Observed	Year before the sign C and NC					
	Predicted of 3-year		Predicted of 2-year		Predicted of 1-year	
	Non-Problem firms	Problem firms	Non-Problem firms	Problem firms	Non-Problem firms	Problem firms
Non-problem firms	51 (83.6%)	10 (16.4%)	54 (88.5%)	7 (11.5%)	55 (90.2%)	6 (9.8%)
Problem firms	13 (21.3%)	48 (78.7%)	13 (21.3%)	48 (78.7%)	10 (16.4%)	51 (83.6%)
Overall	99 (81.1%)		102 (83.6%)		106 (86.9%)	

1.4 Binary Logistic Regression Analysis

The researcher used data from 8 independent variables of the financial ratios of problematic companies and marked C and NC. The data was divided into 3 groups: 3-years before being marked C and NC, 2-years before being marked C and NC, and 1-year before being marked C and NC.

In describing the relationships of variables, it can be determined from the calculated coefficient. The sign can describe the relationship of the variable. If the sign in front of the variable is positive, it means that if the company has increased the value of this variable, the chances of membership of group 1 or the chances of becoming a problematic company and marked C and NC are increased. On the other hand, if the sign in front of a variable is negative, it means that if the company has an increased value of that variable, the chances of being a member of group 0 or the likelihood of being a company that is not problematic and not marked C and NC will increase.

From table 3, the research results showed that 3 years before becoming a problematic company and marked C and NC, there were 3 financial ratios that positively correlated with the warning signs of problematic firms and marked C and NC; debt ratio (DA), debt to equity ratio (DE), return on equity ratio (ROE). The return on assets ratio (ROA) was negatively correlated with the warning signs of problem companies and marked C and NC.

2 years before companies were C and NC marked, there were 4 financial ratios that were positively correlated with warning signs of a problematic company and marked C and NC; current ratio (CR), debt to equity ratio (DE), return on equity ratio (ROE), and assets turnover ratio (AT). The return on assets ratio (ROA), fixed asset turnover ratio (FT) has a negative correlation with the warning signs of a problematic company and marked C and NC.

1 year before the company was marked C and NC, there were 2 financial ratios that were positively correlated with warning signs of a problematic company and marked C and NC; debt ratio (DA), assets turnover ratio (AT). The return on assets ratio (ROA), fixed asset turnover ratio (FT) has a negative correlation with the warning signs of a problematic company and marked C and NC.

Table 3 Variables in the Equation

	Year before the sign C and NC											
	3-year				2-year				1-year			
	B	Wald	Sig.	Exp(B)	B	Wald	Sig.	Exp(B)	B	Wald	Sig.	Exp(B)
CR	-.281	1.742	.187	.755	.188	4.454	**.035	1.207	.065	.235	.628	1.068
QR	.486	2.889	.089	1.626	-.046	1.106	.293	.955	.669	2.586	.108	1.953
DA	.021	4.482	**.034	1.021	.003	.110	.740	1.003	.023	3.902	**.048	1.023
DE	.005	13.165	**.000	1.005	.005	7.739	**.005	1.005	.001	1.259	.262	1.001
ROA	-.101	19.427	**.000	.904	-.234	30.381	**.000	.792	-.276	31.686	**.000	.759
ROE	.013	4.192	**.041	1.013	.018	10.826	**.001	1.018	.007	1.156	.282	1.007
AT	-.133	.148	.700	.876	1.526	4.914	**.027	4.599	2.831	9.288	**.002	16.964
FT	-.006	.027	.868	.994	-.476	4.427	**.035	.621	-.596	3.923	**.048	.551
Constant	-1.715	6.604	.010	.180	-1.523	6.357	.012	.218	-3.494	18.787	.000	.030

**significant at the 0.05

2. Discussion

The financial statement analysis is a method of evaluating an entity's performance from the financial statements of a business and from those of the same industry. The objective of the financial statement analysis is to find facts about the financial position and operating results of the entity that has operated for each accounting period. The executives, creditors, investors, and related parties can use such factual information in making operational decisions.

The financial ratios are the key to identifying opportunities for a problematic company and are marked C and NC. Before the company was marked C and NC, it needed to have a high debt ratio compared to total assets and a high debt ratio compared to equity in order to use a portion of the loan, so to improve the liquidity of the company. Therefore, the current ratio was positively correlated with the alarm two years before the company became a problematic company and was marked with C and NC. It implies that a company with a large portion of its capital from leverage will create contingent obligations and risks to future ventures. The chances of a company experiencing a financial failure are high (Bunn & Redwood, 2003; Maricica & Georgeta, 2012; Alifiah, 2014; Ashraf &

Serrasqueiro, 2019; Manodamrongsat et al., 2020).

Before a company became a problematic company and was marked C and NC, it had a low return on asset ratio. Since the company has a loss of operating results, the shareholders' equity, which is the denominator, is reduced. This results in the company having a high return on equity ratio. It implies that for a company with a low return on assets ratio, the likelihood that the company will suffer a financial failure is high (Bunn & Redwood, 2003; Maricica & Georgeta, 2012; Alifiah, 2014; Manodamrongsat et al., 2020).

Before becoming a problematic company and was marked C and NC, the company had a high asset turnover ratio. It demonstrates the efficiency and cost-effectiveness of the company's assets (Alifiah, 2014; Manodamrongsat et al., 2020). When considering the efficiency of a firm's fixed assets, it is low. This indicates that the company has a high level of efficiency in total assets, but the efficiency of fixed assets is low, the likelihood of a financial failure is high. It is possible that the company has some fixed assets that do not generate income.

Zhai et al. (2015) said corporate borrowing could increase the return on equity. The operations of the company come from massive loans. The company risks bankruptcy, if the company is unable to pay the debt and cannot find a new lender in the future.

It is noteworthy that a lower return on assets ratio (ROA) is a strong indicator of a warning signal in 3-years, 2-years, and 1-year before companies were C and NC marked. It is consistent with the research of Manodamrongsat et al. (2020). Klepac & Hampel (2017) also found that return on assets (ROA) provides the most accurate picture two years before the first sign that the company finds itself as a problematic company. They found that ROA was most important in forecasting financial defaults in the last year before bankruptcy.

Suggestions and Recommendations

This study used only financial ratios to find factors that could indicate the warning signs of a problematic company in 3-years, 2-years, and 1-year before companies were C and NC marked. These factors can explain the change in the dependent variable, namely a problematic company, 81.1 percent; 83.6 percent, and 86.9 percent respectively. This suggests that these factors can only describe a part of a problematic company. There are also other

independent variables that can explain a problematic company, such as the Gross Domestic Product (GDP), the interest rate, and the inflation rate. It can associate macroeconomic factors with micro-financial data. This may lead to more effective information on financial failures.

The researchers did not analyze companies in each industry. If the next research is analyzed by industry with more historical data collected to study trends in data change from year to year. The results of the study may be more accurate.

REFERENCES

Alifiah, M. N. (2014). Prediction of financial distress companies in the trading and services sector In Malaysia using macroeconomic variables. **Procedia-Social and Behavioral Sciences, 129**, 90-98.

Altman, E.I (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. **Journal of Finance, 23**(4), 589-609.

Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E.K, Suvas, A. (2014). **Distressed Firm and Bankruptcy prediction in an international context: a review and empirical analysis of Altman's Z-Score Model.** Working paper.

Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E.K, Suvas, A. (2016). Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman's Z-Score Model. **Journal of International Financial Management & Accounting**, DOI: 10.1111/jifm.12053.

Ashraf, S., GS Félix, E., & Serrasqueiro, Z. (2019). Do traditional financial distress prediction models predict the early warning signs of financial distress?. **Journal of Risk and Financial Management, 12**(2), 55.

Bagher, A.N., and Milad, S. (2016). Designing a Bankruptcy Prediction Model Based on Account, Market and Macroeconomic Variables (Case Study: Cyprus Stock Exchange). **Iranian Journal of Management studies. 9**(1), 125-147.

Bauer, J., and Agarwal, V. (2014). Are hazard models superior to traditional bankruptcy prediction approaches?.A comprehensive test. **Journal of Banking & Finance, 40**, 432-442.

Bauweraerts, J. (2016). Predicting Bankruptcy in Private Firms: Towards a Stepwise Regression Procedure. **International Journal of Financial Research, 7**(2). DOI: 10.5430/ijfr.v7n2p147

Bunn, P., & Redwood, V. (2003). **Company accounts based modelling of business failures and the implications for financial stability. Bank of England**. Working Paper, no.210.

Ghozali, I. (2006). **Aplikasi analisis multivariate dengan program SPSS**. Badan Penerbit Universitas Diponegoro.

Herliansyah, Y., Nugroho, L., Ardilla, D., & Putra, Y. M. (2020). **The Determinants of Micro, Small and Medium Enterpreneur (MSME) Become Customer of Islamic Banks (Religion, Religiousity and Location of Islamic Banks)**. In The 1st Annual Conference Economics, Business, and Social Sciences (Vol. 2).

Laitinen, E.K. & Suvas, A. (2016). Financial distress prediction in an international context: Moderating effects of Hofstede's original cultural dimensions. **Journal of Behavioral and Experimental Finance**, DOI: 10.1016/j.jbef.2015.11.003.

Liang, D., Lu, C.C, Tsai, C.F, Shih, G.A. (2016). Financial ratios and corporate governance Indicators in bankruptcy prediction: A comprehensive study. **European Journal of Operational Research, 252**(2), 561–572.

Keasey, K.,&Mcguinness, P. (1990). The failure of UK industrial firms for the period 1976–1984, logistic analysis and entropy measures. **Journal of Business Finance & Accounting, 17**(1), 119–135.

Kennedy, P. (1998). **A guide to econometrics.** The United Kingdom: TJ International.

Kholisoh, S. N., & Dwiarti, E. (2020). The analysis of fundamental variables and macroeconomic variables in predicting financial distress. **Management Analysis Journal, 9**(1), 81-90. doi:10.15294/MAJ.V9I1.36395.

Klepac, V., & Hampel D. (2017). Predicting financial distress of agriculture companies in EU. **Agricultural Economics – Czech, 63**, 347-355. doi: 10.17221/374/2015-AGRICECON.

Manodamrongsat, P. (2019). **Early Warning Signs of Problem Firms and Their Turnaround Strategies.** Doctoral Dissertation, Rajamangala University of Technology Thanyaburi. Faculty of Business Administration. Business Administration.

Manodamrongsat, P., Tongkong, S., & Boonyanet, W. (2020). Early Warning Signs of Problem Firms. **International Journal of Innovation, Creativity and Change, 14**(3), 127-150.

Maricica, M., & Georgeta, V. (2012). Business failure risk analysis using financial ratios. **Procedia-Social and Behavioral Sciences, 62**, 728-732.

Midi, H., Sarkar, S. K., & Rana, S. (2010). Collinearity diagnostics of binary logistic regression model. **Journal of Interdisciplinary Mathematics, 13**(3), 253-267.

Mselmi, N., Lahiani, A., & Hamza, T. (2017). Financial distress prediction: The case of French small and medium-sized firms. **International Review of Financial Analysis, 50**, 67-80.

Okwoche, V. A. O., Eziehe, J. C., & Agabi, V. (2015). Determinants of job satisfaction among extension agents in Benue State Agricultural and Rural Development Authority (BNARDA), Benue State, Nigeria. **European Journal of Physical and Agricultural Sciences Vol, 3**(2).

Sari, I. G. A. D. I., & Dwirandra, A. A. N. B. (2019). The ability of organization commitment and moderate worked motivation by the effect of budget goal clarity in budgetary inaccuracy. **International Research Journal of Management, IT and Social Sciences, 6**(3), 11-17.

Zhai, S. S., Choi, J. G., & Kwansa, F. (2015). A financial ratio-based predicting model for hotel business failure. **Global Business & Finance Review (GBFR), 20**(1), 71-86.