

Applying Emerging Market Z-Score Model To Predict Bankruptcy: A Case Study Of Listed Companies In The Stock Exchange Of Thailand (Set)

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Abstract:

Business bankruptcy for a certain company is an absolute affirmation of its inability to endure current operations given its current debt obligations. If the bankruptcy was expected ahead of time, investors of the companies have the ability to secure their companies and could take action to reduce risk and loss of business and perhaps avoid bankruptcy itself. This research aims to examine the financial distress of the listed companies on the Stock Exchange of Thailand (SET). It will examine the percentage that this model fit to the data of companies listed on the Stock Exchange of Thailand (SET), which applies the Z-score model and the emerging Market Score (EM Z-Score model) created by Edward L. Altman. This study used the companies listed on the SET in 2012, which these firms must contain the NC (Non-Compliance) sign. Having organized the data, we have the final sample of 31 firms to be examined. The SETSMART (SET database: SET Market Analysis and Reporting Tools) was used to obtain the financial information from the year 2010 and 2011, then the Z-score model and the Altman's (1995) EM-Score model as our main methodologies. Results of analysis highlights that the use of Emerging Market Z-score model and the Z-score model had clearly shown that, they can completely predict the sign of a possible bankruptcy that may occur. Furthermore, they are effective when two years of information were used than one year. Meanwhile, the Z - score model fits better when applied to the Thailand Stock Market even when Thailand is an emerging economy, it should fit more with the Emerging Market Z-Score model.

Keywords: bankruptcy, Altman's Z-Score model, EM-Score Model, the Emerging Market and SET Thailand.

1. INTRODUCTION

Bankruptcy, today, is a very mutual thing among companies and individuals alike. Bankruptcy is a severe matter. Business bankruptcy for a certain company is an absolute affirmation of its inability to endure current operations given its current debt obligations.

Bankruptcy is a worldwide problem and widely perceived to be damaging to the economy (Kaufman, 1996). A main reason of the crisis is, certainly, the economic reason. In any difficult system, a crisis is a time of where the system functions were very poor, affirming an abrupt remedial action. In an economy consequently, a crisis can be defined as that time of miserable economic enactment. Throughout this time, the value of institutions, especially financial institutions, drops at extraordinary speeds and everything seems to be valueless. Production is low and often fails to meet the level of demand. The IMF and the World Bank (1998) pointed out that the crisis came from financial vulnerabilities including structural weakness and macroeconomic imbalances that lead to poor investment and excessive risks.

The economic crisis in Thailand was initiated in 1997 and has been particularly unbreakable smashed by bankruptcy. Craig C. Julian (2000) summed up the main causes of the economic crisis in Thailand were: Firstly, large deficits in the current account. Thailand's deficit was 8 percent of GDP in 1995; 7.9 percent in 1996 and 1997 (Far Eastern Economic Review, January 15 1998). Secondly, excessive external debt, in 1997 the International Monetary Fund (IMF) estimated that Thailand's external debt was about \$US 99 billion i.e. about 55 percent of GDP. The majority of this debt was privately incurred and this large external debt sharply lifted the country's debt service ratio from 11.4 percent in 1994 to 15.5 percent in 1997 (Thammavit, 1998). Thirdly, The slump in the property sales market and lending squeezed and worsened developers cash flow troubles and defaults on interest payments. As a consequence, many finance companies and small banks faced liquidity problems, with 16 finance companies suspended in June 1997, and another 42 in August 1997. By December 1997, 56 finance companies were closed permanently. Fourthly, foreign money poured into Thailand between 1993 and 1996 which resulted in exchange rate mismanagement, with a fixed exchange rate and the liberalization of international capital flows. As a result, the Thai Baht became overvalued against other currencies, partly slowing down growth in exports in 1996. Finally, political instability, Chavalit Yongchaiyudh's administration, which lost government in November 1997, performed very poorly in economic management (Far Eastern Economic Review, May 21 1998). Its economic teams lacked unity and common goals, and failed to deal with the mismanagement by the technocrats.

As an outcome of the crisis, Thailand established a new bankruptcy act to boost the Thai economy. There were numerous purposes of the act, but one of the most important was the protection it offered to insolvent companies. The Act provides incentives to foreign creditors which allows them to inject funds to reorganize businesses without any fear which had held them back in the past (Urapeepatanapong et. Al., 1998).

Because business failing is a major issue for the events engaged and can create price and large failures, its forecast is highly valuable as evidence during Thailand economic crisis in 1997. If bankruptcy could be expected with affordable precision ahead of time, companies could better secure their companies and could take action to reduce risk and loss of business and perhaps even avoid the bankruptcy itself. Furthermore, investors should also be concerned with the firms that they will be investing. Therefore, it will be useful if we can predict the firms which are vulnerable to bankruptcy.

Bankruptcy is an alternative when a debt-laden business is failing, but it's not constantly the right one. Even when it is the best choice, but bankruptcy is usually considered a last remedy, and it only makes sense in certain conditions. Consequently, there is a model of Edward I. Altman which is the model under Altman's Z-Score model (1968), this model is internationally accepted.

2. OBJECTIVE

This research aims to examine the financial distress of the listed companies on the Stock Exchange of Thailand (SET, hereafter) by applying the Z-score model and the Emerging Market Score model. It will examine how steadfast these models fit to the data of companies listed on the Stock Exchange of

Thailand (SET), which applies the Z-score model and the Emerging Market Score model created by Edward L. Altman.

3. CONTRIBUTIONS

Our study embodies several differences from previous research in this particular area of financial distress. First, we apply an out-of-sample examination. Using the listed companies in Thailand, which is an example of an emerging market, we intend to provide the signals of financial distress by using the well-known model from Altman (1995), known as the Emerging Market Score Model (EM-Score Model). Since Thailand is an emerging market (e.g. with a small proportion of institutional investors and high volatility – see Mody, 2004; Lerskullawat, 2012), the EM-Score Model is a suitable approach to take. In addition, Samarakoon and Hasan (2003) suggested that Altman's Z-score models appeared to be a good evaluation of risk in order to predict corporate distress in emerging markets. The emerging Asian equity markets also revealed temporary signs of stabilization after being hit by the global financial crises (both in 1997–1998 and 2007–2008)¹, Thailand in particular². Therefore, investigation using the data of emerging markets would provide an interesting outcome in the area of financial distress.

Second, we have found no previous works related to our study. Although the existing research considers financial distress in emerging markets (e.g. Samarakoon and Hasan, 2003)³, it focusses on examination of the regressions and attempts to investigate whether the model perfectly fits the data from Thailand. Our propose will provide a slight difference in the results by concentrating on the signals of financial distress in order to prepare ourselves for what will happen in the near future. Thus, we could be the first to conduct this investigation of emerging markets, especially that of Thailand.

Finally, this study is expected to be useful to investors, as well as the managers of firms listed in the SET and the committee of the Security Exchange Commission (SEC). This is because it provides the signals of financial distress prior to its occurrence. Investors will have the information to analyze whether their invested companies show any sign of bankruptcy. Firm managers will pay more attention to managing and controlling their financial stability and the liquidity in their companies. They will also see from our evidence whether their firms are falling into the red zone categories. Moreover, the SET and the SEC will use the signals from our findings to control the targeted firms and suggest solutions to them.

4. THEORETICAL BACKGROUND

The Z-score model was constructed by Edward I. Altman, the model was first created in the year 1968 by using a linear combination of four or five ratios, weighted by coefficients. The coefficients were estimated by identifying a set of firms which had declared bankruptcy and then collecting a matched sample of firms which had survived, with matching by industry and approximate size (assets).

Altman applied the statistical method of discriminant analysis to a dataset of publicly held manufacturers. The estimation was originally based on data from publicly held manufacturers, but has since been re-estimated based on other datasets for private manufacturing, non-manufacturing and service companies. The original data sample consisted of 66 firms, half of which had filed for bankruptcy under Chapter 7. All businesses in the database were manufacturers, and small firms with an asset of < \$1 million were eliminated. The original Z-score formula was as follows:

The original Z-score formula, which will be the model 1 in our study was as follows:

¹ The information is taken from **The Asia Capital Markets Monitor**, April 2009, by the Asian Development Bank (ADB)'s Office of Regional Economic Integration, available from http://asianbondsonline.adb.org/features/asian_capital_markets_monitor/ACMM-highlights.pdf [Accessed on 27 April 2013]. In addition, according to the analysis from The Asia Capital Markets Monitor, these signs of temporary stabilisation refer to an improvement in the valuation indicators. However, it might be a long time before the recovery is complete.

² This is supported by a substantial rise in the SET index and its market capitalisation between 2008 and 2012 (from approximately 450 to 1,560, and from THB 4,000 billion to THB 13,475 billion, respectively – using the exchange rate of USDTHB 29.30). The information referring to the SET was taken from http://www.set.or.th/setresearch/files/20130329_A_graph_SET_statistics.pdf [Accessed on 27 April 2013].

³ The authors consider the prediction of corporate distress via the three versions of Altman's Z-Score models. Their results are confirmed at an 81% success rate.

$$\text{Model 1: } z = 0.012x_1 + 0.014x_2 + 0.033x_3 + 0.006x_4 + 0.999x_5$$

Whereas; x_1 = Working Capital / Total Assets. It measures liquid assets in relation to the size of the company.

x_2 = Retained Earnings / Total Assets. It measures profitability that reflects the company's age and earning power.

x_3 = Earnings Before Interest and Taxes / Total Assets. It measures operating efficiency apart from tax and leveraging factors. It recognizes as operating earnings as being important to long-term viability.

x_4 = Book Value of Equity / Total Liabilities. Adds market dimension that can show up security price fluctuation as a possible red flag.

x_5 = Sales / Total Assets. The standard measure for total asset turnover (varies greatly from industry to industry).

The Interpretation of Z-Score Model:

- Z score > 2.99 means "Safe" Zones
- 1.81 < Z score < 2.99 means "Grey" Zones
- Z score < 1.81 means "Distress" Zones

From the above Z-score model of Altman, in its initial test, it was found to be 72% accurate in predicting bankruptcy two years before the event, with a Type II error of 6% (Altman, 1968). In a series of subsequent tests covering three periods over the next 31 years (up until 1999), the model was found to be approximately 80%–90% accurate in predicting bankruptcy one year before the event, with a Type II error (classifying the firm as bankrupt when it does not go bankrupt) of approximately 15%–20% (Altman, 2000).

Altman (1968) expanded on the work of Beaver by using multiple discriminant analysis for various bankrupt and non-bankrupt groups and used a variety of different ratio groups to predict business failures. After almost forty years, Altman's Z-Score is still widely regarded by researchers as an indicator of a company's financial well-being. In 1993, Altman revised his model to incorporate a "four variable Z-Score" prediction model (Altman, 1993). Altman felt this revised model significantly improved the predictive ability of his model and made it simpler to incorporate.

The Emerging Market Score Model (EM Z- Score Model), which will be the model 2 of this study, for emerging market as follows:

$$\text{Model 2: } z = 3.25 + 6.56x_1 + 3.26x_2 + 6.72x_3 + 1.05x_4$$

Whereas; X_1 = Current Assets - Current Liabilities / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest and Taxes / Total Assets

X_4 = Book Value of Equity / Total Liabilities

The Interpretation of Emerging Market Score Model:

- EM Z- score > 2.60 means "Safe" Zones
- 1.1 < EM Z- score < 2.60 means "Grey" Zones
- EM Z- score < 1.1 means "Distress" Zones

5. SCOPE OF STUDY

Our study comprises three categories. First, we use the companies listed on the SET in 2012. These firms must contain the NC (Non-Compliance) sign. Having organized the data, we have the final sample of 31 firms to be examined. Second, the SETSMART (SET database: SET Market Analysis and Reporting Tools) was used to obtain the financial information from 2010 and 2011, which will be calculated for 5 variables. Last, we apply the Z - score model and the Altman's (1995) EM-Score Model as our main methodology.

Research Question

The research question of our study is: "How consistent is the Z-score model and EM-Score model match to our samples from the SET?"

The Empirical Result and Analysis

Applying the Altman's Z-Score and Emerging Market Z-Score Models for our samples of 31 companies from the SET, Both models will apply the same four variables (X_1 to X_4), and the Z-score model will use an additional variable which is the variable X_5 . Our findings are shown in Tables 1 and 2.

Table 1: Descriptive statistics of Altman's Z-Score and Emerging Market Z-Score Models

Variables	Minimum	Maximum	Mean	Standard Deviation
n=31				
Year 2010				
x_1	-3982.85	0.30	-138.17	739.44
x_2	-4057.04	0.02	-142.20	752.94
x_3	-1.63	11.50	0.24	2.22
x_4	0.02	5.98	0.89	1.55
x_5	0.05	2.70	0.89	0.71
Year 2011				
x_1	-40.56	0.54	-2.13	8.02
x_2	-80.46	0.41	-6.23	15.90
x_3	-1.24	2100.15	80.89	411.85
x_4	0.02	26.96	3.07	6.46
x_5	0.13	3.13	1.17	0.82

Our descriptive statistics of Altman's Emerging Market Score model reveal the huge differences in each variable between 2010 and 2011. In 2010, profitability (var X_3) shows a maximum value of 11.50 (see table 1), while the liquidity ratio (var X_1) and internal capital (var X_2) are highly volatile (reported with high standard deviation at 739.44 and 752.94, respectively). This demonstrates that the profitability of firms is represented by liquidity ratio and internal capital. Since there are high volatilities in both liquidity ratio and internal capital, these factors would play an important role in increasing the level of a company's transactions. This should lead to a rise in the profitability of companies.

However, these descriptive statistics reveal the substantial contrast in the evidence from 2011. Profitability remains the maximum value among the factors in Altman's Emerging Market Score model. Its statistics show at 2,100.15 (see table 1), and it also has the highest standard deviation of 411.85. This implies that liquidity ratio and internal capital may not be the main sources which drive a company's transactions. The profitability of firms depends on other external factors (e.g. the economic and political situation and government policies). Nevertheless, both liquidity ratio and internal capital remain the two minimum statistics between 2010 and 2011 (see table 1).

Table 2: Summary of percentage to predict the financial distress via Z-score model for 2010 and 2011

Type	Year 2010	Year 2011
Model 1 (Original Altman's Z-Score Model)	89.66	80.77
Model 2 (Altman EM-Score Model)	75.86	46.15

Note: Model 1: $z = 0.012x_1 + 0.014x_2 + 0.033x_3 + 0.006x_4 + 0.999x_5$

Model 2: $z = 3.25 + 6.56x_1 + 3.26x_2 + 6.72x_3 + 1.05x_4$

Table 3: Details Z – score of each firm under Model 1 (year 2010 and year 2011)

Model 1 Year 2010 and 2011

Classification		Distress Zone	Grey Zone	Safe Zone	
Z-score		< 1.81	1.81 – 2.99	> 2.99	
	firm	Year 2010		Year 2011	
		Z-Score	Classifications	Z-Score	Classifications
1	CAWOW	0.89383	Distress	1.11436	Distress
2	PATKL	1.13043	Distress	1.31735	Distress
3	PSAAP	1.19836	Distress	1.42603	Distress
4	SECC	-	Distress	-	N/A
5	TRS	0.54979	Distress	0.88253	Distress
6	TT&T	0.14201	Distress	0.13506	Distress
7	THL	0.51363	Distress	0.52932	Distress
8	ASCON	1.22063	Distress	-	N/A
9	SINGHA	0.02763	Distress	-	N/A
10	ABICO	0.39845	Distress	0.36001	Distress
11	APX	0.00662	Distress	0.00295	Distress
12	BRC	1.94020	Grey	2.46699	Grey
13	CIRKIT	1.24078	Distress	1.36305	Distress
14	CPICO	-104.64430	Distress	67.79832	Safe
15	D-MARK	1.11788	Distress	1.81309	Grey
16	DTM	-	Distress	-	N/A
17	ITV	-0.16470	Distress	-0.17299	Distress
18	KTECH	0.03458	Distress	-0.28346	Distress
19	NFC	0.40224	Distress	0.55162	Distress
20	PICNI	0.74101	Distress	3.04657	Safe
21	POMPUI	1.86478	Grey	1.77675	Distress
22	SAFARI	0.45254	Distress	0.49452	Distress
23	SGF	0.16619	Distress	0.52588	Distress
24	SMPC	1.59741	Distress	2.00068	Grey
25	AJP	0.11498	Distress	1.14824	Distress
26	SUN	1.78205	Distress	-	N/A
27	TPROP	0.06346	Distress	0.12844	Distress
28	USC	0.74204	Distress	1.50897	Distress
29	VGM	-0.02487	Distress	-0.01247	Distress
30	WR	3.06700	Safe	0.15944	Distress
31	PRO	0.31871	Distress	0.25820	Distress

Table 4: Summary of interpretation of under Model 1

Classification	Year 2010	Year 2011
Distress Zone (< 1.81)	26 (89.66%)	21 (80.77%)
Grey Zone (1.81 – 2.99)	2 (6.90%)	3 (11.54%)
Safe Zone (> 2.99)	1 (3.45%)	2 (7.69%)
Total	29 (100%)	26 (100%)

Note: The total numbers do not equal the total sample of 31 firms in 2010 because there are two firms (namely, SECC and DTM) which appear as N/A (due to the unavailable data). Also in 2011, there are five firms (namely, SECC, AICON, SINGHA, DTM and SUN) which have no data available, leading to the appearance of N/A sign.

Table 5: Detail of Emerging Market Z-Score of each firm under Model 2 (year 2010 and year 2011)

Classification	Distress Zone	Grey Zone	Safe Zone
Z-score	< 1.1	1.1 – 2.6	> 2.6

	Firms	Year 2010		Year 2011	
		EM-Score	Classifications	EM-Score	Classifications
1	CAWOW	-7.95840	Distress	-9.06457	Distress
2	PATKL	-3.03679	Distress	7.22806	Safe
3	PSAAP	-5.12745	Distress	-9.75825	Distress
4	SECC	-	N/A	-	N/A
5	TRS	-7.43395	Distress	-0.79545	Distress
6	TT&T	-6.26497	Distress	-7.72952	Distress
7	THL	-7.20895	Distress	-2.72228	Distress
8	ASCON	-16.06737	Distress	-	N/A
9	SINGHA	-4.07310	Distress	-	N/A
10	ABICO	-0.52336	Distress	1.69803	Grey
11	APX	4.22336	Safe	3.55228	Safe
12	BRC	-5.79803	Distress	-22.85448	Distress
13	CIRKIT	-21.40651	Distress	-57.96800	Distress
14	CPICO	-39,360.74981	Distress	13,606.50632	Safe
15	D-MARK	4.18823	Safe	2.38579	Grey
16	DTM	-	N/A	-	N/A
17	ITV	-46.49311	Distress	-49.74056	Distress
18	KTECH	-112.25629	Distress	-63.39121	Distress
19	NFC	8.01137	Safe	5.37288	Safe
20	PICNI	-27.78918	Distress	-51.19096	Distress
21	POMPUI	0.73814	Distress	3.64477	Safe
22	SAFARI	6.95276	Safe	3.03907	Safe
23	SGF	-7.75552	Distress	1.73951	Grey
24	SMPC	0.00186	Distress	3.04778	Safe
25	AJP	1.48431	Grey	6.29256	Safe
26	SUN	-20.37294	Distress	-	N/A
27	TPROP	1.78956	Grey	3.81165	Safe
28	USC	0.79814	Distress	13.40616	Safe
29	VGM	-4.45925	Distress	-2.97445	Distress
30	WR	75.75684	Safe	33.07580	Safe
31	PRO	-2.18096	Distress	-9.31117	Distress

Table 6: Summary of interpretation of EM-score under Model 2

Classification	Year 2010	Year 2011
Distress Zone (< 1.1)	22 (75.86%)	12 (46.15%)
Grey Zone (1.1 – 2.6)	2 (6.90%)	3 (11.54%)
Safe Zone (> 2.6)	5 (17.24%)	11 (42.31%)
Total	29 (100%)	26 (100%)

Note: The total numbers do not equal the total sample of 31 firms in 2010 because there are two firms (namely, SECC and DTM) which appear as N/A (due to the unavailable data). Also in 2011, there are five firms (namely, SECC, AICON, SINGHA, DTM and SUN) which have no data available, leading to the appearance of N/A sign.

Our evidence shows that the original Altman's Z-Score (model 1) reports the correct financial distress prediction regarding the actual non-component firms in 2010 at 86.21 percent and 73.08 percent in 2011 (see table 4). This implies that the model is better to predict the position of financial distress in 2010 than in 2011 at around 13.00 percent. In other words, the Altman's Z-Score model is well used in the longer period of time, according to our consequence. Nevertheless, there are eight companies (namely, CAWOW, PSAAP, TT&T, BRC, CIRKIT, ITV, PICNI and PRO)⁴ whose performance deteriorates after the following year (see table 3). In other words, their Altman's Z-Scores predict significantly lower than the previous year (2010) and they are highly likely to suffer financial distress.

In addition, we consider each variable in the Altman's Emerging Market Score model (i.e. liquidity ratio and the internal capital). We confirmed according to our evidence that the variables should be positive in order to have a higher Emerging Market score. Thus, the higher the variables of the Emerging Market score model, the higher the Z-Score. As a result, the companies would save from the financial distress, based on the analysis via the Altman's Emerging Market Score model.

With model 2, the number of improved firms is slightly lower than the results from model 1. For instance, there are only four companies which have been able to escape from the distress zone, while the statistics of model 1 show eight firms which have done this, based on the prediction of EM Z-Score (see tables 4 and 6). However, although model 1 appears to fit best with our data from Thailand in order to identify improvement of EM Z-Scores, the reverse is true when we consider the percentage of correct prediction between model 1 and model 2. In 2010, model 2 shows markedly lower percentage of the correct Z-Score's predictions than model 1, while there is a significant fall in the model 2's percentage of Z-Score prediction in 2011. This reveals at 46.15 percent in model 2, compared with 80.77 percent in model 1 (see table 2). Hence, this refers that model 1 has a better Z-Score's prediction than model 2 due to a higher percentage. However, our outcomes demonstrate totally different from what the theory (of Altman's Z-Score) mentioned. Since Thailand is known as an emerging market⁵, the EM Z-Score model of Altman (1995) should be the suitable model in order to predict the financial distress of the companies. In this case, the percentage of prediction of EM Z-Score model would be higher than the original model (model 1, see table 2).

Furthermore, should we consider from what the previous literature indicates, our results would be substantially different from those. According to the previous studies, the shorter the period, the better the Altman's EM Z-Score model perform correctly. Therefore, the Altman's EM Z-Score model may not be the best suitable model for predicting the financial distress of listed companies in Thailand if we investigate only the non-component firms.

Our findings are consistent with other study such as Suda Pitawan (2004) which shown that the Z - score model is suitable for Thai listed companies in order to predict the bankruptcy, she studied with the 51 Rehabco firms listed in the SET, during year 1998 - 2002.

⁴ See Appendix for the names in full.

⁵ Mody (2004) defines an emerging market as the market which has high level of risk, frequent speculations and high volatility. According to Lerskullawat (2012), we confirm that Thailand is fallen into the emerging market characteristics mentioned by Moody (2004).

6. CONCLUSION

This paper analyzes the possibilities of prediction of business bankruptcy by applying the Z-score model and EM score model. This paper found out that both models can completely predict the sign of a possible bankruptcy that may occur and effective when two years of information were used than one year. The Z-Score model achieved 89.66% (2010) and 80.77 (2011), while EM-Score model, 75.86% (2010) and 46.15% (2011) prediction accuracy when it is applied to forecast bankruptcies on the underlying sample.

It indicated the importance of liquidity ratio, retained earnings, capital efficiency, and operating efficiency. This financial ratio was most significant in bankruptcy prediction for the Stock Exchange of Thailand (SET). Capital efficiency means how a manager manages the assets. The higher ratio indicates better capital efficiency. In other words, the manager manages the assets efficiently. The liquidity ratio states a company's capacity to repay short-term creditors out of its total cash. The higher the current ratio, the more capable the company is by paying its obligations.

The retained earnings of a company are the percentage of net earnings not paid out as dividends; they are "retained" to be reinvested in the firm or use to pay down debt. The ratio of retained earnings to total assets supports measure to the extent in which a company relies on debt, or leverage. The lower the ratio, the more a company is funding its assets by borrowing instead of through retained earnings, which, again, increases the risk of bankruptcy if the firm cannot meet its debt obligations.

The ratio of total liability and value equity includes both common stock and preferred stock. The higher the ratio the better the financial management. So the company should keep all variables high in ratio in order to prevent bankruptcy.

Finally, it can be argued that our model offers perception into measuring the composite financial situation of a firm, a tool for investors that can be used to monitor the safety of their investments and could recommend possibilities for future research among academic and practitioner for developing an improved bankruptcy prediction model for Thailand.

7. RECOMMENDATION

1. We confirm according to our evidence that all the variables should be positive in order to have a higher Z-score and Emerging Market score. Thus, the higher the variables of the Z-score model and the Emerging Market score model, the higher the Z-Score. As a result, the companies will be saved from the financial distress, based on the analysis via the Z-score model and the Altman's Emerging Market Score model.

2. In order to analyze or predict the bankruptcy of the firms, stakeholders should consider other factors besides all variables in the Almans model such as ratios from the cash flow statement.

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