THE DETERMINANTS OF FINANCIAL HEALTH IN THAILAND: A FACTOR ANALYSIS APPROACH

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Abstract: *This aim of this research was to examine the factor structureof the finance ratio to describe the ratios in Small and Medium Entrepreneurs (SMEs). With an initial set of 18 financial ratios, eight ratios with the highest factor loadings were selected. The results of this study show that it may not be necessary to use many ratios to assess financial performances. Based on the factor analysis results, eight groups of the financial ratios were found, including invest asset group (current ratio, quick ratio, gross profit margin, invest/ sale), asset turnover group (fixed asset turnover, total asset turnover, debt-to-total assets), equity group (return on equity (ROE), debt/ equity ratio), profit group (net profit margin, CL/Sales, EBIT/CL), working asset group (working capital/total asset, return on assets (ROA)), remain turnover group (receivable turnover, inventory turnover), ICR group (interest coverage ratio), and ROI group (return on investment).*

Keywords: *Factor analysis, financial ratio, financial health*

JEL Classification*: C53 G17 M21*

1. INTRODUCTION

Companies need to use financial ratios to analyze theirfinancial healthin order to monitor their financial position and financial performance. There are a large number of financial ratios, which share some similar characteristics. Therefore, the number of financial ratios must be reduced and regrouped into new different categories. Grouping ratios can helpentrepreneurs, investors, or lenders make easydecision. A popular technique that can help reduce the number of ratios is a factor analysis technique. This technique has been used successfully in many different research studies and countries.

There is a large amount of research resorting to small new composite dimensions of financial ratios that are determined and described by factor analysis (Taffler and Tisshaw, 1977; Chen and Shimerda, 1981; Ugurlu and Aksoy, 2006; Chen, 2011). Factor analysis is used as a statistical tool to analyze the correlation between a large numberof

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variables. Moreover, this technique can explain variables with a minimum loss of information (Hair *et al.*, 2009). The same factor considered by variables must be highly positively or negatively correlated.

This paper adopted a factor analysis to analyze financial ratios of 30,463 Small and Medium Entrepreneurs (SMEs) in Thailand for 2012. The purposes of the study are to define a set of factors that can explain the ratios in a smaller number of concepts and to examine linear relations of financial ratios to a smaller number of factors. This paper is comprised of five sections: introduction, literature reviews, research methodology, findings, and conclusion.

2. LITERATURE REVIEWS

Based on theliterature reviews, Factor Analysis was first applied to financial ratios by Pinches, Mingo and Caruthers (1973) to modify empirically based categorization of financial ratios. The results show that there are reasonably stability in the composition of a financial ratios set. In another study, it was found that the ratios of Indian firms for each factor can account for most of the information available in the original larger set (De, Bandyopadhyay and Chakraborty, 2011). Also, there is a difference between the empirical and theoretical classification of financial ratios for international commercial airlines (Ali and Charbaji, 1994). Some studies resort to factor analysis to determine factors that can explain financial ratios in small new composite dimensions, and some use factor analysis to classify ratios variables for corporate financial distress in several countries such as USA, UK, Taiwan, and Turkey (Libby, 1975; Taffler and Tisshaw, 1977; Chen and Shimerda, 1981; Chen, 2011; Erdogan, 2013).

This study proposes to reduce variables to predict financial health of SMEs by using factor analysis. Previous studies adopted a study design of prediction model to examine financial ratios which are related to financial health of corporate (Libby, 1975; Taffler and Tisshaw, 1977; Darayseh, Waples and Tsoukalas, 2003). These studies generally applied such methods as logistic regression (Ohlson, 1980; Darayseh *et al.*, 2003), discriminant analysis(Altman, 1968; Deakin, 1972), probit (Zmijewski, 1984) and artificial neural network (Rekba Pai, Annapoorani and Pai, 2004) to use financial ratios to predict corporate financial distress. To reduce the problem of selecting the variables that are very close to each other and are highly correlated, this study was designed to group and reduce variables to predict performances by using financial ratios.

3. RESEARCH METHODOLOGY

3.1. Variables and data

A factor analysis technique can reduce the number of variables into fewer dimensions. These dimensions are called factors (Hair *et al.*, 2009). This study usedthe audited financial statements of SMEs in Thailand for 2012. 30,463 samples of the financial

statements were selected and analyzed by Factor Analysis. Initially, 18 variables (financial ratios) were obtained (see Table 1).

Table 1
Variables contributing to highest opportunity to financial failure

No	Codes	Ratio	Formula
1	CA/CL	Current Ratio	Current Assets/Current Liabilities
2	QA/CL	Quick Ratio	Quick Assets/Current Liabilities
3	S/AR	Receivable Turnover	Sales/ Average Accounts Receivable
4	CGS/AI	Inventory Turnover	Cost Of Goods Sold/ Average Inventories
5	WC/TA	Working Capital/Total Asset	Current Assets - Current Liabilities/ Total Asset
6	NI/FA	Fixed Asset Turnover	Net Income/ Fixed Asset
7	S/TA	Total Asset Turnover	Sales/ Average Total Assets
8	GP/NI	Gross Profit Margin	Gross Profit/Net Income
9	ROE	Return on Equity (ROE)	Net Income/ Average Stockholders' Equity
10	ROI	Return on Investment (ROI)	Income - Cost/ Cost
11	ROA	Return on Assets (ROA)	Net Income/ Average Total Assets
12	NI/S	Net Profit Margin	Net Income/ Sales
13	TL/TSE	Debt-to-Total Assets	Total Liabilities/ Total Stockholders' Equity
14	IBITE/IE	Interest Coverage Ratio	Income Before Interest And Tax Expenses/ Interest Expense
15	In/S	Inventory /Sale	Inventory/Sale
16	D/E	Debt/ Equity Ratio	Debt/ Equity Ratio
17	CL/S	CL/Sales	Current Liabilities /Sales
18	EBIT/CL	Average Total Assets	Earnings Before Interest And Tax / Current Liabilities

Table 1 shows the financial variables used in this study. The financial data are the ratios found to have contributed to the highest opportunity to financial failures in previous research (Lin *et al.*, 2010). These financial data were used in calculating the variables of SMEs in Thailand in this study.

3.2. Factor Analysis

Factor analysis is a technique used to describe variability among observed, correlated variables into fewer dimensions that are called factors (Hair *et al*, 2009). This study adopts a principal component analysis since it is most appropriately fit the objective of this study which is to obtain the minimum number of factors to explain a maximum proportion of the variance found in the original variables. Only factors with an eigenvalue of more than 1 were considered as significant factors and were extracted. The value of 1 is the SPSS default setting following Kaiser's stopping criterion to decide how many factors to extract. A more conservative stopping criterion can be set by using a higher eigenvalue—(consider deleting this sentence since it does not give additional information about the use of factor analysis in this study). A varimax rotation to examine loadings of a factor was adopted;it is an orthogonal rotation which is based on squared loadings of a factor to examine maximize variance. Finally, the Kaiser Meyer Olkin (KMO) statistic was used to measure sampling adequacy

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Table 2
Correlations among variables

	CA/CL	QA/CL	S/AR	CGS/AI	WC/TA	NI/FA	S/TA	GP/NI	ROE	ROI	ROA	NI/S	TL/TSE	IBITE/IE	In/S	D/E	CL/S	EBIT/CL
CA/CL	1	**.998**	-.007	-.005	.007	.005	-.002	**-.992**	-.004	-.009	-.002	.004	.000	-.003	**.998**	-.005	-.007	.043
QA/CL		1	-.008	-.005	.012	.010	-.002	**-.988**	-.005	-.009	-.002	.004	.000	-.003	**.994**	-.005	-.008	.090
S/AR			1	.169	.022	-.100	-.014	.007	**.221**	-.012	-.005	.009	-.001	-.005	-.008	.076	.051	-.011
CGS/AI				1	.029	-.005	-.068	.004	.036	-.011	-.001	.005	-.002	-.003	-.005	.020	-.009	-.009
WC/TA					1	-.048	-.246	-.006	.044	.005	**.444**	.055	-.119	-.150	.005	.000	-.011	.090
NI/FA						1	**-.360**	-.003	-.014	.007	-.186	-.004	-.158	.006	.004	-.039	.011	.043
S/TA							1	.002	.007	-.006	**.239**	.004	**.359**	.002	-.002	.017	-.002	.018
GP/NI								1	.004	.010	.002	-.004	.000	.003	**-.993**	.005	.007	-.025
ROE									1	.015	.201	**.144**	-.002	.027	-.005	**.569**	-.028	.018
ROI										1	-.003	.005	-.002	-.005	-.008	-.004	-.005	-.002
ROA											1	**.124**	-.021	.008	-.002	-.007	-.013	.044
NI/S												1	-.006	.016	.002	-.018	**-.321**	**.394**
TL/TSE													1	-.001	.000	.100	-.003	.000
IBITE/IE														1	-.003	-.004	.003	-.004
In/S															1	-.005	-.006	.024
D/E																1	.135	-.009
CL/S																	1	-.018
EBIT/CL																		1

Note: Bolded values show correlations significant at the 0.01 significance

4. FINDINGS

The variables are examinedusing correlation matrix with a visual evaluation of the correlations. Initially, the relationships of variables were examined by using the data illustrated in Table 2. It was found that there were multiple variables that show highly related ratios (In/S, CA/CL, QA/CL, GP/NI). It is, therefore, necessary to group the similar relationships into the same group. Other variables not correlated with other variables, especially variables ROI and IBITE/IE, are found not to be correlated with any other variables (See Table 2).

Table 3
Factors solution

Factors	% of Variance	Variables that significantly load on the factor	Variables name	Factor Loading
1. Invest Asset	21.022	CA/CL	Current Ratio	.998
		QA/CL	Quick ratio	.996
		GP/NI	Gross Profit Margin	-.994
		In/S	Invest/sale	.997
2. Asset Turnover	9.616	NI/FA	Fixed Asset Turnover	-.644
		S/TA	Total Asset Turnover	.849
		In/S	Debt-to-Total Assets	.654
3. Equity	8.798	ROE	Return on Equity (ROE)	.854
		D/E	Debt/ Equity Ratio	.878
4. Profit	8.246	NI/S	Net Profit Margin	.856
		CL/S	CL/Sales	-.554
		EBIT/CL	EBIT/CL	.680
5.Working Asset	7.232	WC/TA	working capital/total asset	.801
		ROA	Return on assets (ROA)	.840
6. Remain Turnover	5.965	S/AR	Receivable Turnover	.725
		CGS/AI	Inventory Turnover	.761
7.ICR	5.344	IBITE/IE	Interest Coverage Ratio	.889
8. ROI	5.296	ROI	Return on Investment (ROI)	.842
Bartlett's Test (Significance)			0.000	
Kaiser Meyer Olkin			.620	
Measure N			30,463	

To check the capability analysis using factor analysis, it was found that the KMO measure of sampling is 0.620, the Bartlett's test is 0.000. As such, it is the appropriate to use factor analysis (See Table 3). The sample consists of 30,463 SMEs in 2012. Eight variables were selected, and the variable for each of the factor with the highest factor loadings are highlighted in bold. The eight variables are Variable 1 including CA/CL, QA/CL, GP/NI, In/S (current ratio, quick ratio, gross profit margin, invest/sale), Variable 2 including NI/FA, S/TA, In/S (fixed asset turnover, total asset turnover, debt-to-total assets), Variable 3 including ROE, D/E (return on equity, debt/ equity ratio), Variable 4 including NI/S, CL/S, EBIT/CL (net profit margin, CL/sales, EBIT/ CL), Variable 5 including WC/TA, ROA (working capital/total asset, return on assets),

Variable 6 including S/AR, CGS/AI (receivable turnover, inventory turnover), Variable 7 including IBITE/IE (interest coverage ratio), and Variable 8 including (return on investment).

5. CONCLUSION

Many financial ratios computed from the financial data were found in aset of financial statements. Different researchers in different studies would have used different ratios and they would naturally have found varying usefulness in the specific ratios they have selected.The definition of this study is one group of factors which can explain the ratios in a smaller number of concepts. An initial set of 18 ratios contributes the highest opportunity to financial failures from 30,463 SMEs in Thailand for 2012. However, as seen from the result of the Factor analysis whichis useful to analyze the structure of correlation ratios, only 8 major variables were found from the financial ratios of SMEs in Thailand.

This study showed that, for the present data of SMEs in Thailand, the number of ratios should be reduced because the reduction of the variable number can also help reduce multiple correlation problems. Moreover, the variables can be understood more clearly and accurately. Based on the literatures and the findings of this study, it can be seen that factors canobviously explain variables in their groups. As seen, this study has successfully showed that factor analysis can be useful in reducing the number of financial ratios to a smaller number set of financial ratios. This study was to identify base on classifies on the financial ratios to confirm and adjust the conventional classifications of financial ratios. Finally, this paper will contribute to the very limited research studies in Thailand on selecting and finding all of the financial ratios of SMEs. Due to the financial limitations of the data are incomplete.

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