Increasing Financial Health Stability Of Logistics Companies : A Thailand Case

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Abstract

The purposes of this paper are 1) to develop model of long term financial health for logistics companies in Thailand 2) to identify factors that determine long term financial stability. Many researchers currently provide factors affecting financial health. Most factors refer to financial ratios, not many non-financial ratios such as age and size have been mentioned. This paper considers both financial and non-financial ratios that affect financial performance of Logistics companies in Thailand. The study has covered some interesting non-financial ratios such as Nationality of Shareholders, type of network in Logistics Company, growth rate (consisted of sales growth rate/profit growth rate/asset growth rate / Liability growth rate) and variable of growth rates. The target group is 110 logistics companies in Thailand enlisted from Department of International Trade Promotion Ministry of Commerce, Royal Thai Government. The group is divided into three categories according to financial health of company; Healthy financial, Unhealthy (Distress) and normal situation. The Multidiscriminant Analysis (MDA) is applied to analyze the differentiations among the three categories. Significant variables from MDA will be used as the independent variables for Multinomial Logistic Regression Analysis (MLRA) to identify factors that determine long terms financial stability. This paper find CF/D, RE/TA, BE/TL, Size, Age, Type of network, Nationality of Shareholders and Number of Shareholders are significant factors determine long term financial stability of Logistics company in Thailand.

Keywords: *Financial Health Stability, Variable of Growth Rate, Multidiscriminant Analysis, Multinomial Logistics Regression Analysis*

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1. Introduction

Thailand is recognized by the World Bank as “one of the great development success stories” in social and development indicators. Due to the geographical location which is an advantage to become a future logistics hub of South East Asia. Logistics is an important industry in Thailand as generating about 3% of Thailand’s GDP in 2008 and maintain between 2-3.5% for the next several years (Office of the National economic and social development board -NESDB). In terms of logistics cost compare to GDP. Thailand cost is nearly 20% of GDP which is considered still high according to Bowersox, Rodrigues and Calantone (2005) While USA level is single digit. In order to improve logistics sector, the cost of logistics to be reduced and also to focus on the improvement in terms of performance.

The financial performance has been considered from researchers in many areas of business to identify the organization’s health and its survival. High performance reflects management effectiveness and efficiency in making use of company’s resources, and this, in turn, contributes to the country’s economy at large. (Naser and Mokhtar, 2004)

In order to improve competency of logistics sector in Thailand, therefore this study aims to

- 1) develop model of long term financial health for logistics companies in Thailand
- 2) identify factors those determine long term financial stability.

According to Kim,et al. (2002) and Cho,et al.(1995) A combination of multiple models reduce the variance of estimated error and also improves the whole recognition performance also the mix improves the prediction accuracy and stability (Sun&Lee (2008). This paper applies Multidiscriminant Analysis (MDA) and Multimonial Logistic Regression Analysis (MLRA) as tools where result will be mentioned in the result and analysis part of this paper.

2. Literature Review

Financial health designates how successful the company has been with money. There are many factors that need to consider when measure financial health. The prediction of financial distress is one of the tools to predict future financial health of the company. There have been many studies on the prediction of financial distress that will be described in this part.

2.1. Financial Health Studies

The prediction of financial distress has been studied by many researchers during the last 70 years. The early researches (Ramser and Foster, 1931; Fitzpatrick, 1932; Winakor and Smith, 1935; Merwin, 1942) concentrated on the comparison of the financial ratios in failed and non-failed firms and concluded that the poorer ratios affected the failed firms. The change in research study by Beaver (1966). A pioneering study in the field is done by Altman (1968), who was the professor of New York University, developed his classic multivariate insolvency prediction model (using Multi discriminant Analysis - MDA) where variables are combined simultaneously to analyze financial distress. Altman found that his model is outperformed Beaver's ratios. Altman Z-score had been widely used by many studies for the last 40's years (von stein1968, Edmister1972, Deakin1972, Blum1974, Mader1975&1977, Beerman1976, Moyer1977, Altman1977, Halderman & Naarayanan1977, Collongues1977,bBilderbeek 1977&1979, Weinrich's1978, Knight1979

Altman, Baidya and Riberio-Dias1979, Gebhardt1980, Bontemps1981, Ko1982, Altman1983, Booth1983, Rose & Giroux1984, Casey & Bartczak 1985, Lawrence & Bear1986, Poston1994, Harmon, & Gramlich1994, Grice & Ingram2001, Arindam Bandyopadhyay2006, M. Kannadhasan2007, Qian Guo-ming,et al.2007, Alkhatib, K., & Al Bzour2011, Obaid Saif H. Al Zaabi2011)

Even though MDA performed high accuracy but is limited to binary dependent variable (Ohlson, 1980) and does not indicate the probability of firm's financial distress (Nam& Jinn, 2000). Ohlson (1980) used econometric methodology of conditional Logistics Analysis for nonlinear regression models where the probability of the firm's financial predictors fall between 0 and 1 many studies applied Logistics Regression into financial health (Desai,et al.1997, Collins & Green1982, Ingram & Frazier1982, Hamer1984, Harrel & Lee1985, Gentry,et al.1985, Lo1986, Zmijewski1988, Kamakura1988, Gessner1988, Malhortra1988, Luther1998, Mine U ggurlu 2006, Han Donker2009, Nicolas Emanuel Monti2009, Angela Chih-Ying Christidis,et al.2010, Nataša Šarlija2011, Mohd Norfian Alifiah,et al.2012). Apart from Logit analysis, Zmijewski (1984) used a probit approach with his model in financial prediction also Yobas,et al.2001. Since the computer capabilities had been developed, Neural Network was conducted using complex relationship of mathematic by Etheridge & Sriram(1997). There are also other tools have been applied in the financial study such as Hazard models by Shumway(2002) and "Black-Scholes-Merton option pricing model. (BSM)" by Hillegeist,et al.(2004).

2.2. Variables

From literature Reviews, there have been no exactly variables that fully influence financial health, therefore this study classifies variables into 2 groups; namely

- 1) Financial Variables
- 2) Non-Financial Variables

2.2.1. Financial Variables

The variables concerning financial data calculated from financial statement documents which are not only financial ratios will be included in financial variables but also growth rate and variation of growth rate will be considered in this study.

2.2.1.1 Financial Ratio Variables

There are four main groups of significant financial ratios as follow;

Figure 1.
Financial Ratios

1. Liquidity ratios : this ratios measures a firm's ability to pay short-term obligations. Healthy firm normally have high liquidity ratio.
2. Profitability ratio : this ratios show a firm's ability to generate profits from its expenses and other relevant costs incurred during a specific period of time. Healthy firm normally have high profitability ratio

3. Leverage or Solvency ratio : this ratios measure firm's capacity to meet its long-term financial commitments. Healthy firm usually poses adequate leverage.
4. Efficiency or Activity ratio : measure a firm's effectiveness of the firm's use of its resources (assets, leverage, liabilities or other such balance sheet items). Healthy firm normally have high efficiency or activity ratio.

Table 2-1.

Summary of financial ratios variable with formular and reference

Financial Ratio Variables	Ratio	Formular	Reference
Liquidity ratios	CACL(Current ratio)	Current assets/current liabilities	Shuk-Wern Ong (2011), Altman and Lavallee (A&L), (1981)).
	SHCTA (Quick ratio)	short term liabilities-share holder capital/Total assets	Laitinen, 2005
	CLCA	Current liabilities/Current assets	Altman ,1977), Ohlson,(1980), Betts and Belhouli (1987
	CFA	(Cash flow to assets - Earnings before interest, taxes, depreciation and amortization) - (EBITDA)/total assets	Shuk-Wern Ong, 2011
	CFD	(Cash flow to total debt) - EBITDA/total liabilities	Shuk-Wern Ong (2011), Beaver(1966), Von stein (1968), Beerman (1976), Laitinen (2005)
	CTS	Cash flow to sales	Laitinen (2005
	CTA	Cash flow/Total assets	Arindam Bandyopadhyay (2006)
	WCTA	Working capital/total asset	Altman(1968, 1977), Altman, Baidya and Riberio-Dias (1979), Ohlson (1980), Altman, Hatzell and Peck (1995), Hillegeist et al. (2004), Arindam Bandyopadhyay (2006)
	STDSTD	Short term debt(t)/Short term debt(t-1)	Van Frederikslust (1978)
	EBITD	– Earning before tax/Total debt	Altman and Lavallee (A&L) 1981
	WCTD	Working capital/total debt	Chen and Shimerda (1981), Ko (1982)
Profitability ratio	NITA	Net income/total asset	Beaver,(1966), Ohlson (1980), Betts and Belhouli (1987)
	EBITTA (Return on asset)	Earnings before interest and tax (EBIT)/total asset	Altman(1968, 1977), Altman, Baidya and Riberio-Dias (1979), Altman, Hatzell and Peck (1995), Hillegeist et al. (2004)
	RETA (Cumulative profitability)	Retain earnings / total asset	Altman (1968, 1977), Bilderbeek (1977, 1979), Altman, Hatzell and Peck (1995)
	ROE (Return on equity)	EBT/equity	Van Frederikslust (1978)
	TECTA	Total equity-capital contributed by shareholders/CCS)	Altman, Baidya and Riberio-Dias (1979)
	EBITS	EBIT/Sales	Ko (1982)
	CPTA (Cash profit ratio)	ETA+depre+amortization/Total assets	Arindam Bandyopadhyay (2006)
	OPTA	operating profit/Total assets	Arindam Bandyopadhyay (2006)
	NITL	net income/total liability	Zmijewski (1984), Betts and Belhouli (1987), Shumway (2001).
Leverage or Solvency ratio	TLTA	Total liabilities/total assets	Shuk-Wern Ong (2011), Beaver(1966), Altman and Lavallee (A&L) 1981 (11), Hillegeist et al. (2004)
	MVEBVTL	Market value of equity / Book value of total liabilities	Altman(1968), Altman, Baidya and Riberio-Dias (1979)
	BVETL	Book value of equity/total liabilities	Altman, Hatzell and Peck (1995)
	Capitalization	5 year avr equity/Toal capital	Altman 1977
	NPEQT	Net Profit/Equity	Bilderbeek 1977,1979
	TDTA	Total debt/Total assets	Beaver (1966), Altman and Lavallee (A&L) ,1981.
	TATB (Solvency ratio)	TA/ total borrowings plus current liabilities and provis	Altman and Lavallee (A&L) ,1981.
	WCTD	working capital/total dept DTA - Total debt/Total asse	Chen and Shimerda (1981), Ko (1982)
Efficiency or Activity ratio	SCA (Current asset turnover)	Sales/current assets	Shuk-Wern Ong, 2011
	STA	Sales/total assets	Shuk-Wern Ong, 2011, Altman, Baidya and Riberio-Dias (1979), Altman and Lavallee (A&L) 1981
	DSK	Days sales in receivable - Receivables/(sales/365)	Shuk-Wern Ong, 2011
	INVT0	Inventory turn over ratio	von stein(1968),Beerman(1976), Ko(1982)
	STENI	Standard error of Net Income	Ko,1982
	MVEBVTL	equity market value/ book value total liability	Arindam Bandyopadhyay (2006)
	AVTA	Added value/total assets	Bilderbeek 1977, 1979
	ARS	accounts receivable/sales	Bilderbeek 1977,1979
	FAG	fixed asset growth	Von stein(1968
	EGAG	Growth rate of equity – equity growth rate – asset gro	Altman and Lavallee (A&L) 1981
	LPHG	Low profitability/high growth rate	Laitinen (2005
	SROA (Variation of Growth)	stability of earning = standard error of EBIT/TA	Altman (1977)

The below variables have not been raised by many studies but this paper is interested to find out whether they have any affect on long term financial health of the company.

2.2.1.2 Other financial Variables

There are not only financial ratios variable to be considered in this paper but also there are 2 groups of other financial variables included as follow.

- Growth Rate Variables.

Four catagories of growth rates are in this study which is Sales growth (SG), Net profit growth (NPG), Total Asset growth (TAG) and Total liability growth (TLG).

- Variation of Growth Variables

In this study, variation of growths are considered in 4 aspects that are Variation of Sales growth (VSG), Variation of Net profit growth (VNPG), Variation of Total Asset growth (VTAG) and Variation of Total Liability growth (VTLG).

2.2.2. Non-Financial Variables

Apart from financial ratio which in general for theoretical points that considered as the significant factors in the prediction of distress situation, firm's growth and variation of firm's growth, it is worth to consider Non-Financial variable as well.

Even though the company is healthy but it's may not be sustainable which depends on many factors. This paper considers the following non-financial variables as one of the important group that might affect the stability of the financial health. They are;

2.2.2.1. Company Age

Old firm might have more experience, and benefit from reputation effects that might earn higher margin on sales. However, old firm might be inert and does routines which might make less profitability (Liargovas and Skandalis (2008)). Therefore, age could be one of the factors affecting financial health of the companies. However, some literature are taking age of the firm from the variable due to a young firm probably show a low retained earnings/total assets (RETA) ratio because of no time to build up its cumulative profits (Altman, 2000). Therefore, it may be argued that the young firm is somewhat discriminated against in this analysis, and its chance of being classified as bankrupt is relatively higher than that of another older firm.

The age of the firm is often recognized as an important variable affecting the financial

distress Keasey and Watson (1987) and Shumway (2001) have used age as a covariate in a financial distress model. Moreover, Laitinen (1992) has shown that the financial distress process may be different for young firms due to the lack of capital and cash flow generation. Argenti (1976) describes failure processes which are associated with the age of the firm. Also knight (1979) found that firm usually fails in early year in its life. Also many more researchers used this variable in their studies such as Argenti (1976), Laitinen (1992), Laitinen (2005) and Arindam Bandyopadhyay (2006).

2.2.2.2. Company Size

Size of the firm can influence the financial distress process (Altman, Halderman and Narayanan (1997), Ohlson (1980), Betts and Belhoul (1987). Keasey and Watson (1987), Shumway (2001), Turetsky and Mc Ewen (2001) and Laitinen (2005) have provided evidence on the significant of the size effect the firm health. However, a few studies considered company size as total asset (Altman, et al. 1997, Ohlson, 1980, Keasey and Watson, 1987, Nittayakasetwat, 1994, Laitinen, 2005, Mine U ggurlu, 2006, Han Donker, et al. 2009) or using total asset in logarithmic form. However, as logistics companies in Thailand consist of both asset based and non-asset based firms, size from this study used registered capital as the size of the company.

2.2.2.3. Nationality of Shareholders

From Thomsen, Steen; Pedersen, Torben, 1996, studied nationality and ownership structures on the 100 largest companies in six European nations (Denmark, France, Germany, Great Britain, the Netherlands and Sweden) where found that no indication that ownership modes systematically effect company performance in terms of growth and profitability. Ownership dispersion is not associated with better performance. Nieves Lidia Díaz-Díaz et al (2008) found out that no significant between the innovation of foreign-owned firms and that of domestically owned firms. However, the percentage of foreign ownership of Logistics Company in Thailand is increased from 49% in 2008 to 70% in 2010 (Chackrit Duangphastra, 2011). This means the financial result of the company is attractive to foreigner to invest in Logistics companies in Thailand. Therefore Nationality of shareholder might affect financial performance.

2.2.2.4. Type of Network

There are a number of papers that proposed model of firm network/diversification to predict financial health by predicting firm bankruptcy. For example, Rose (1992) proposed

managers to diversify their firm to different business in order to reduce the risk of bankruptcy (distress). Beaver, et al. (2005) proposed that large firms have a smaller probability of bankruptcy and that related to corporate diversification more than smaller one and those diversification and firm-size are two factors that may help to predict future financial health of the firm.”

2.2.2.5. Number of shareholders

The number of shareholders increase, might have more conflict between shareholders and other parties in the firm that might caused firm unhealthy. Whereas Family owned firm with less shareholders might have less conflict among shareholders that easily manage firm to become healthy. On the other hands, more shareholders might have more good idea where benefit to the firm. This study would like to find out if the number of shareholders are concerning financial health of the firm or not.”The more shareholders might have more conflict to the corporation that might casued firm unhealthy. Where as Family owned firm with less shareholders might have less conflict among shareholder that make corporation easily manage to become healthy. On the other hands, more shareholders might have more good idea where benefit to the firm. This study would like to find out if the number of shareholders are concerning financial health of the firm.

Table 2-2.

Summary of significant variables from previous studies of the bankruptcy prediction.

Researchers	Variables								
	Financial Variables						NON Financial Variables		
	Financial Ratios				Other Financial Variables		NON Financial Ratios		
	Liquidity	Profitability	Solvency/Leverage	Efficiency/Activity	Growth Rate	Variation	Company age	Company size	Network
Beaver (1966)	CFD	NITA	TDTA						
Altman (1968)	WCTA	RETA	MVEBVT	STA					
von stein (1968), Beerman (1976)	CF			INVTO	FAG				
Argenti (1976) , Knight (1976)							Y		
Altman (1977) -28	CACL	RETA	EBITTI						
		EBITTA	EQTTC			SROA	Y		
Altman, Haldema and Naray(1977)									
Bilderbeek (1977, 1979) The Netherland(5/20)				AVTA					
		RETA	NPEQT	STA, ARS					
Van Frederikslust (1978) The Netherland	STDSTD-1	ROE							
Altman, Baidya and Riberio-Dias (1979)	WCTA	EBITTA	MVEBVT	STA					
	FUTL	TECTA							
Ohlson (1980)	WCTA, INTWO	CHIN	TLTA						
Altman and Lavallee (A&L) 1981 (11) canada		NITA					Y (log(TA/GDPindex))		
	CACL		TATB						
	EBITD		TDTA	STA	EGAG				
Chen and Shimerda (1981)			MVETD						
			WCTD						
Ko (1982)			MVETD	STENI					
		EBITS	WCTD	INVTO					
El Hennawy and Morris (1983)									
Zmijewski (1984)									
	CACL	NITL		TLTA					
Betts and Belhoul (1987)			TLTA						
		NITL							
Keasey and Watson (1987)								Y	
Platt and Platt (1990)									
Laitinen (1992)							Y		
Altman, Hatzell and Peck (1995) Mexico		RETA							
vaney (1998)	WCTA	EBITTA	BVELT						
			TLTA						
Shurway (2001)		NITL						Y	
Turetsky and Mc Ewen(2001)									
Hillegeist et al. (2004)									
	WCTA	EBITTA	TLMTA						
Laitinen (2005)	CFD, CFS,CTS	NPS							
	STLTA, SHCTA				LPHG		Y	Y	
Arindam Bandyopadhyay (2006) India		CPTA	TATB						
	WCTA	OPTA	MVEBVT	STA			y		Y
		EBITPC, ROE	FASE	STFA					
Mine U ggurlu (2006) Turkey		EBITD, EBIT	SETA, LTDTD	OIOBOA.SETA.TOAS				Y	
Han Donker , Bernard Santen & Saif Zahir (2009) The Netherland									
	CFTA		BVTDBVTA	PAYOUT				Y	
	CLCA, FUTL	EBITA	RETA, MVETL	STA					
Y.Wu (2010)	WCTA, INTWO	NITA, CHIN	TLTA,OENEG,TLMTA					Y	Y
			TLTA	DSR					
Shuk-Wern Ong (2011)	CFD			SCA, STA					

WCTA	= working capital/total assets	FAG	=fixed asset growth
CFD	= cash flow /debt	SROA	=stability of return on assets
NITA	= net income/total assets	EGAG	= equity growth rate - asset growth ra
TDTA	= total debt/total assets	LPHG	= Low profitability/high growth rate
RETA	=retained earning/total assets		(The growth of the firm= annual perce
EBITTA	= earning before interest and tax/total assets		while the return on investment and th
CF	= cash flow		measure profitability)
INVTO	= inventory turn over	SHCTA	= shareholder capiotal to total assets
EQTTA	= equity/total capital	WCLTD	= Net working capital/long term debt
FUTL	= fund from operation/total liability	EBITTD	= earning before interest, tax/total del
WCLTD	= working capital/long term debt	STFA	= sales/net tangible assets
CACL	= current ratio, current assets/	LTDTD	= long term debt/total debt
	current liability	FASE	= fixed assets/shareholders' equity
CCL	= cash/curren liability	TOAS	= (Total assets/1000)/wholesale price
EBITTI	= earning before interest and tax/	SETA	= book value of equity/book value of t
	total interest payment	OIBOIA	= other income before taxes/other inc
NPEQT	= net profit/equity	BVTDBVTA	= % of book value of total debt/book v
AVTA	= added value/total assets	CFTA	= %chang in cash flow / book value of
ARS	= account receivable/sales	PAYOUT	= %total dividen/net income
STDSTD-1	= short term debt t/short time debt t-1	CHIN	= change in income)= (NIt -Nit-1)/ IN
ROE	= return on equity		where NIt is net income for the mos
TLTA	= total liability/total assets	OENEG	= total liabilities exceed total assets
EBTTD	= earning before tax/total debt	DSR	= days sales in receivable = Receivabl
STA	= sales/total assets	TECTA	= (total equity-capital contributed by s
WCTD	= working capital/total dept	TATB	= total assets/total borrowing plus cur
MVETD	= market value equity/total debt		minus advance payment of tax
STENI	= standard error net income	MVEBV	= equity market value/ book value
NITL	= net income/total liability	CPTA	= cash profit/total assets
BVETL	= book value equity/total liability	CFA	= (EBITDATA) =earning before interes
STLTA	= short-term liquidity(shareholder capital)/	SWC	= sales/networking capital
	to total assets	SCA	= sales/current assets
MVETL	= market value of equity/total liability	SFA	= Sales/BV of net tangible fixed assets
OPTA	= operation profit/total assets	EBITS	= earning before interest/sales
TATB	= total assets/ total borrowings plus current liabilities a	EBITPC	= earning before interest/paid capital
MVEBVTL	= market value equity/book value total liability	NPS	= net profit/net sales
		CTA	= cash flow/total assets
		CTS	= cash flow/sales

Most researchers have selected variable based on their popularity and predictive ability in the previous research studies. In this study, after a process of reducing the numbers of variables, the 10 financial ratios were selected based on the significance and most recognize of financial ratios in earlier studies. Other interesting financial variables that are Growth Rate, Variation of Growth Rate and 5 Non-Financial variables might significantly affect the stability of financial health of logistics companies in Thailand. Therefore total 23 variables are selected in this study that are;

Financial ratios

Liquidity ratios

CACL (Current ratio) - Current assets/current liabilities.

WCTA - Working capital/total asset

CFD (Cash flow to total debt) - EBITDA/total liabilities

Profitability ratio

NITA - Net income/total asset

EBITTA (Return on asset) - Earnings before interest and tax (EBIT)/total asset

RETA (Cumulative profitability) - Retain earnings / total asset

NITL - net income/total liability

Leverage or Solvency ratio

TLTA - Total liabilities/total assets

BVETL – book value equity/total liability

Efficiency or Activity ratio

STA - Sales/total assets

Other financial variables

GW – Growth rate (consider sales growth rate, profit growth rate, asset growth rate and liability growth rate)

VGW – Variation of Growth Rate (consider variation of sales growth rate, variation of profit growth rate, variation of asset growth rate and variation of liability growth rate).

Non-financial Variables

Age – Company Age

Size – Company Size

Type of Network – Logistics Network/Non Logistics Network

NSH – Nationality of Shareholder (Thai/Non Thai)

NoS – Number of Shareholder

3. Research Process and Methodology

The paper employs two tools, namely

- 1) Multi discriminant Analysis
- 2) Multinomial Logistics Regression Analysis

The research plan is as follow.

Part I

The first part is to screen significant variables out of total 23 variables from 110 logistics companies, using data from 2009-2012. The Multidiscriminant Analysis tool (MDA) is employed in this part.

The multiple discriminant analysis models can be obtained with the following form:

$$*Z_{L_{Ti}} = b_0 + b_1X_{1i} + b_2X_{2i} + b_3X_{3i} + \dots + b_kX_{ki} \dots\dots\dots (1)$$

Where $*Z_{L_{Ti}}$ = discriminant function score (Financial health level) of Logistics

companies in Thailand,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \cdots k$,

X_j = predictors or independent variables.

The process of this research starts from categorise companies into three categories – Financial Distress (Unhealthy)/ Normal and Non-distress (Healthy) and assigned value 0 to Unhealthy companies are assigned 1, 2 to Normal companies and Healthy companies respectively.

The criteria of Unhealthy companies comprised of Negative ROE (Du Pont), Negative net profits for two consecutive year and Negative Retained earnings for one year (Hu Gang ,2009).

The criteria of Healthy companies comprised of Highest ROE (Du Pont), highest Net profits during the last two fiscal years and high Retained earnings.

The companies that are not in Unhealthy or Healthy group are considered as normal company.

Table 3-1.

Summary of groups

	Groups			
Year	Distress Group(0)	Normal Group (1)	Non Distress Group(2)	Total
2009	25	60	25	110
2010	21	68	21	110
2011	23	64	23	110
2012	25	60	25	110

Since there are two groups of variables (18 Financial ratios variables and 5 Non-Financial variables), it is interesting to know whether there will be any differentiation or not between applying the total 23 variables and using data from Financial variables and Non-Financial variable separately would have the same result or not. Therefore, the

analysis part are separated into two aspects, running the whole Financial Variables together with 5 Nonfinancial Variables(case 1) and running Financial Variables separately from Nonfinancial Variables(case 2).

The significant variables from part I will be the variables for part II

Part II

This part is to develop model of long term financial health for logistics companies in Thailand and to identify factors that determine long term financial stability by developing Multinomial Logistics Regression Analysis to significant variables from part I.

The Multinomial Regression Analysis models can be obtained with the following form:

Logit Response Function:

$$g_0 = LN\left(\frac{p_0}{p_1}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k \dots\dots\dots (2)$$

$$g_2 = LN\left(\frac{p_2}{p_1}\right) = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \dots + \alpha_k X_k \dots\dots\dots (3)$$

Where $g_0, g_2 = \log odd \text{ or } logit$

$$g_1 = 0$$

$$\pi_j(x) = \Pr(Y = j|x) = \frac{e^{g_j(x)}}{e^{g_0(x)} + 1 + e^{g^2(x)}} \dots\dots\dots (4)$$

Where $j = 0 \text{ to } 2 \dots$

Pr = Probability to the outcome of the interest

$$\sum_{j=0}^2 \Pr(Y = j|x) = 1 \dots\dots\dots (5)$$

This method will be applied to both case 1 and case 2.

4. Result and Analysis

4.1 Part I (Multi Discriminant Analysis)

Case 1. Applying the total 23 variables (Financial Variables and Nonfinancial Variables) at the same time.

Table 4-1.

Classification Function Coefficients for Total 23 Variables

	Distress/Normal/Non Distress		
	0	1	2
CFD	5.277	7.136	16.452
RETA	-1.414	.603	.795
NITL	-6.398	-7.813	-16.125
BVETL	-.038	-.023	-.355
Sales Growth	-.001	.001	.002
Variation of Net Profit Growth	.001	.000	.000
Size	.001	.001	.004
Nationality of shareholders (Thai/non Thai)	2.822	2.411	1.662
No. of Shareholders	1.016	1.208	.914
(Constant)	-6.702	-6.294	-5.198

Fisher's linear discriminant functions

As per table 4-1, the multiple discriminant analysis function for running from all 23 Variables for 3 groups are as per below.

Distress group(Unhealthy)

$$*Z_{A110i} = -6.702 + 5.277(\text{CF/D}) - 1.414(\text{RE/TA}) - 6.398(\text{NI/TL}) - .038(\text{BVE/TL}) - .001(\text{Sales Growth}) + .001(\text{Variation of Net Profit Growth}) + 0.001(\text{Size}) + 2.822(\text{Nationality of shareholders (Thai/non Thai)}) + 1.016(\text{No. of Shareholders}) \dots\dots\dots (6)$$

Where $*Z_{A110i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 0,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Normal Group

$$*Z_{A111i} = -6.294 + 7.136(\text{CF/D}) + .603(\text{RE/TA}) - 7.813(\text{NI/TL}) - .023(\text{BVE/TL}) + .001(\text{Sales Growth}) + 0.001(\text{Size}) + 2.411(\text{Nationality of shareholders (Thai/non Thai)}) + 1.208(\text{No. of Shareholders}) \dots\dots\dots (7)$$

Where $*Z_{A111i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 1,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Non Distress Group (Healthy)

$$*Z_{A112i} = -5.197 + 16.452 (CF/D) + .795 (RE/TA) - 16.125 (NI/TL) - .355 (BVE/TL) + .002 (\text{Sales Growth}) + 0.004(\text{Size}) + 1.662(\text{Nationality of shareholders (Thai/non Thai)}) + .914 (\text{No. of Shareholders}) \dots\dots\dots (8)$$

Where $*Z_{A112i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 2,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Among the 23 Variables, 8 variables of CFD, RETA, NITL, BVETL, Sales Growth, Size, Nationality of shareholders (Thai/non Thai) and No. of Shareholders are significant at the 0.05 level for all groups, meanwhile Variation of Net Profit Growth variable is significant at the 0.05 level for only Unhealthy group.

Case 2. Separate Analysis Financial Variables from Nonfinancial Variables.

Result from MDA for 18 Financial Variables is shown as follow.

Table 4-2.

Classification Function Coefficients for 18 Financial variables

	Distress/Normal/Non Distress		
	0	1	2
CFD	-.167	.549	2.833
RETA	-1.634	.387	.402
BVETL	.088	.101	-.076
Sales Growth	-.001	.001	.002
Variation of Net Profit Growth	.001	.000	.000
(Constant)	-2.718	-1.369	-1.970

Fisher's linear discriminant functions

From table 4-2, the multiple discriminant analysis function from running 18 Financial Variables for 3 groups are as per below.

Distress group (Unhealthy)

$$*Z_{FV0i} = -2.718 - 0.167(CF/D) - 1.634(RE/TA) + .088(BVE/TL) - .001(\text{Sales Growth}) + .001(\text{Variation of Net Profit Growth}) \dots\dots\dots (9)$$

Where $*Z_{FV0i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 0,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Normal Group

$$*Z_{FV1i} = -1.369 + .549(CF/D) + .387(RE/TA) + .101(BVE/TL) + .001(\text{Sales Growth}) \dots\dots\dots (10)$$

Where $*Z_{FV1i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 1,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Non Distress Group (Healthy)

$$*Z_{FV2i} = -1.970 + 2.833(CF/D) + .402(RE/TA) - .076(BVE/TL) + .002(\text{Sales Growth}) \dots\dots\dots (11)$$

Where $*Z_{FV2i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 2,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Significant variables from MDA for Financial Variable are CF/D, RE/TA, BVE/TL, Sales Growth and Variation of Net Profit Growth.

Result from MDA for 5 Non Financial Variables is shown as follow.

Table 4-3.

Classification Function Coefficients for 5 Non Financial Variables

	Distress/Normal/Non Distress		
	0	1	2
Size	.000	-.001	.001
Age	.129	.193	.207
Nationality of shareholders (Thai/non Thai)	3.263	3.090	2.168
Type of Network (Logistics / Non Logistics)	3.033	3.948	4.089
No. of Shareholders	.809	.885	.584
(Constant)	-6.342	-8.308	-6.608

Fisher's linear discriminant functions

From table 4-3, the multiple discriminant analysis function from running Non-Financial Variables for 3 groups are as per below.

Distress group (Unhealthy)

$$*Z_{NF0i} = -6.342 + 0(\text{Size}) + .129(\text{Age}) + 3.263(\text{Nationality of Shareholders}) + 3.033(\text{Type of Network}) + .809(\text{No. of Shareholders}) \dots\dots\dots (12)$$

Where $*Z_{NF0i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 0,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Normal Group

$$*Z_{NF1i} = -8.306 - 0.001(\text{Size}) + .193(\text{Age}) + 3.090(\text{Nationality of Shareholders}) + 3.948(\text{Type of Network}) + .885(\text{No. of Shareholders}) \dots\dots\dots (13)$$

Where $*Z_{NF1i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 1,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Non Distress Group (Healthy)

$$*Z_{NF2i} = -6.608 + 0.001(\text{Size}) + .207(\text{Age}) + 2.168(\text{Nationality of Shareholders}) + 4.089(\text{Type of Network}) + .584(\text{No. of Shareholders}) \dots\dots\dots (14)$$

Where $*Z_{NF2i}$ = discriminant function score (Financial health level) of Logistics companies in Thailand (i) fall in group 2,

b_0 = Constant,

B_j = discriminant coefficients or weights; $j = 1 \dots k$,

X_j = predictors or independent variables.

Significant variables from MDA for Non-Financial Variable are Size, Age, and Nationality of Shareholders, Type of Network and Number of Shareholders.

Table 4-4.

Summary of MDA result (Part I)

Variables	Groups	Liquidity Ratio CFD	Profitability Ratio RETA	NITL	Leverage Ratio BVETL	Efficiency Ratio	Sales Growth	Variation of Net profit growth	Size	Age	Nationality of Shareholders	Type of Network	No. of shareholders
All 23 variables	Distress	5.277	-1.414	-6.4	-0.038		-0.001	0.001	1.00E-03		2.822		1.016
	Normal	7.136	0.603	-7.81	-0.023		0.001		1.00E-03		2.411		1.208
	Non Distress	16.452	0.795	-16.1	-0.355		0.002		4.00E-03		1.662		0.914
Financial variables	Distress	-0.167	-1.634		0.088		-0.001	0.001					
	Normal	0.549	0.387		0.101		0.001						
	Non Distress	2.833	0.402		-76		0.002						
Non Financial variables	Distress								-3.89E-10	0.129	3.263	3.033	0.809
	Normal								-9.03E-10	0.193	3.09	3.948	0.885
	Non Distress								7.86E-10	0.207	2.168	4.089	0.584

The study obtains significant variables from MDA to continue phase II.

4.2 Part II (Multinomial Logistics Regression Analysis – MLRA)

Case 1. Obtains 9 significant variables from MDA part I (case 1) that are CF/D,

RE/TA, NI/TL, BVE/TL, Sales Growth, Variation of Net profit growth, Size, Nationality of Shareholders and No. of shareholders to MLRA. The parameter estimate are as follow.

Table 4-5.

Parameter Estimates From MLRA for 9 significant variables from case 1

Distress/Normal/Non Distress ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Intercept	1.601	1.194	1.799	1	0.18			
CFD	-9.007	13.254	0.462	1	0.497	0	6.40E-16	23443568.84
RETA	-11.903	2.566	21.521	1	0	6.77E-06	4.43E-08	0.001
NITL	-0.058	14.445	0	1	0.997	0.943	4.78E-13	1.86291E+12
BVE/TL	-0.534	0.428	1.554	1	0.213	0.586	0.253	1.357
SalesGrowth	-0.001	0.004	0.068	1	0.795	0.999	0.992	1.006
VariationofNetProfitGrowth	-0.001	0.001	2.989	1	0.084	0.999	0.998	1
Size	0.014	0.011	1.667	1	0.197	1.014	0.993	1.035
No.ofShareholders	-0.293	0.16	3.358	1	0.067	0.746	0.546	1.021
[NationalityofshareholdersThailand=0]	-0.379	0.814	0.217	1	0.641	0.684	0.139	3.374
[NationalityofshareholdersThailand=1]	0 ^b	.	.	0	.	.	.	.
Intercept	-0.933	0.637	2.142	1	0.143			
CFD	6.145	5.372	1.309	1	0.253	466.556	0.012	17438218.83
RETA	4.147	1.269	10.685	1	0.001	63.262	5.262	760.535
NITL	0.675	6.798	0.01	1	0.921	1.964	3.21E-06	1200994.606
BVE/TL	-1.793	0.391	21.001	1	0	0.166	0.077	0.358
SalesGrowth	0.001	0.001	0.642	1	0.423	1.001	0.999	1.002
VariationofNetProfitGrowth	0	0	1.644	1	0.2	1	1	1.001
Size	0.025	0.008	11.144	1	0.001	1.025	1.01	1.041
No.ofShareholders	-0.308	0.082	14.081	1	0	0.735	0.626	0.863
[NationalityofshareholdersThailand=0]	0.371	0.354	1.097	1	0.295	1.449	0.724	2.903
[NationalityofshareholdersThailand=1]	0 ^b	.	.	0	.	.	.	.

a. The reference category is: 1.

b. This parameter is set to zero because it is redundant.

From table 4-5,

The Multinomial Regression Analysis models which is the Logistics model of long term financial health for logistics companies in Thailand are as follow.

Logit Response Function:

$$g_0 = LN\left(\frac{p_0}{p_1}\right) = -11.903(RE/TA) \dots\dots\dots (15)$$

$$g2 = LN\left(\frac{p2}{p1}\right) = -0.933 + 4.147(RE/TA) - 1.793(BVE/TL) + 0.025(Size) - 0.308(No. of shareholder) \dots\dots\dots (15)$$

Where $g0, g2 = \log odd$ or $\log it$

$$g1 = 0$$

$$\pi_j(x) = \Pr(Y = j|x) = \frac{e^{gj(x)}}{e^{g0(x)} + 1 + e^{g2(x)}} \dots\dots\dots (16)$$

Where $j = 0$ to $2 \dots$

$\Pr$ = Probability to the outcome of the interest

$$\sum_{j=0}^2 \Pr(Y = j|x) = 1 \dots\dots\dots (17)$$

There are the estimated multinomial logistic regression coefficients for the models. In this study treats Normal group as the reference. Therefore, estimated a model for Distress (Unhealthy) relative to Normal and a model for Non-Distress (Healthy) relative to Normal. The parameter estimates are relative to Normal group.

For Distress (Unhealthy) relative to Normal.

1) The Wald test statistic for the variable RE/TA is 21.521 with an associated p-value of 0. The study sets alpha level to 0.05, means we would reject the null hypothesis and conclude that the regression coefficient for RETA has been found to be statistically different from zero for distress (unhealthy) to Normal given that other variables are in the model. In the other word, RE/TA is a significant variable in this group.

The other variables are failed to reject the null hypothesis and conclude that for the Unhealthy relative to Normal, the regression coefficient for the other variables have not been found to be statistically different from zero given that other variables are in the model. In the other word, other variables are not a significant variable in this group.

2) Intercept – For Thai companies (Nationality of shareholder=1), there is statistically uncertain whether they are more like to be classified as Non Distress (Healthy) or Normal.

3) From B,

RE/TA – if the company were to increase in RE/TA score by one point, the multinomial log-odds of Unhealthy would be expected to decrease by 11.903 unit while holding all other variables in the model constant. This may imply that the

more retained earning higher than total asset, the chance to be in Unhealthy group is less.

- 4) From Exp (B), is the odds ratio for the predictors. The odds ratio of a coefficient indicates how the risk of the outcome falling in the comparison group compared to the risk of the outcome falling in the referent group changes with the variable in question.

RE/TA – The odds or “relative risk” ratio for a one unit increase in RE/TA score for Unhealthy to Normal level given that the other variables in the model are held constant. That means if the company increase RE/TA by one unit, the firm to be decreased by the factor of 6.77×10^{-6} or less likely be in Unhealthy group.

For Non Distress group (Healthy) relative to Normal.

- 1) The Wald test statistic, RE/TA, BVE/TL, Size and No. of Shareholder are 10.685, 21.001, 11.144 and 14.081 respectively with an associated p-value of 0.001, 0.00, 0.001 and 0.00. This means RE/TA, BE/TL, Size and No. of Shareholder are the significant variable in this group.

- 2) From B,

RE/TA – if the company were to increase in RE/TA score by one point, the multinomial log-odds of Healthy would be expected to increase by 4.147 unit while holding all other variables in the model constant. This may imply that the more retained earning higher than total asset, the chance to be in Healthy group is higher.

BVE/TL – if the company were to increase in BVE/TL score by one point, the multinomial log-odds of Healthy would be expected to decrease by 1.793 units while holding all other variables in the model constant. This may imply that the more booked value of equity higher than total liability the chance to be in Healthy group is less. Or Logistics Company should use the funds from liability to operate/expand the company more than using funds from shareholder.

Size – if the company were to increase in Size score by one unit, the multinomial log-odds of Healthy would be expected to increase by 0.025 units while holding all other variables in the model constant. This may imply that the higher the size the chance to be in Healthy group is higher.

No. of Shareholder – if the company were to increase in No. of Shareholder score by one unit, the multinomial log-odds of Healthy would be expected to decrease by 0.308 units while holding all other variables in the model constant. This may imply that the more shareholder the chance to be in Healthy group is less.

- 4) From Exp (B).

RE/TA and Size have odds ratio >1 that means if these variables increase by one

unit, the relative risk for Healthy would be expected to increase by the factor of 63.262 and 1.025 respectively. RE/TA is the strongest drive for the company to be Healthy as highest Exp (B).

In contrast, BVE/TL and No. of Shareholder have odds ratio <1 , that means if these variables increase by one unit, the relative risk for Healthy would be expected to decrease by 0.166 and 0.735 respectively.

The significant variables from Likelihood Ratio are RETA, BVETL, Size and No. of Shareholders which are the same variable as using Wald Statistics.

Case 2. Separate Analysis 5 significant Financial Variables from part I (case 1) that are CF/D, RE/TA, BVE/TL and Sales Growth using MLRA. The parameter estimate is as follow.

Financial variables.

Table 4-6.

Parameter Estimates from MLRA for 5 significant financial variables from case 2

Distress/Normal/Non Distress ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Intercept	-0.578	0.398	2.115	1	0.146			
CFD	-7.182	1.839	15.257	1	0	0.001	2.07E-05	0.028
0 RETA	-9.743	1.662	34.351	1	0	5.87E-05	2.26E-06	0.002
BVE/TL	-0.479	0.359	1.788	1	0.181	0.619	0.307	1.25
SalesGrowth	-0.001	0.003	0.113	1	0.737	0.999	0.992	1.006
Intercept	-1.585	0.265	35.676	1	0			
CFD	4.068	0.795	26.191	1	0	58.444	12.306	277.559
2 RETA	0.31	0.641	0.234	1	0.629	1.363	0.388	4.785
BVE/TL	-0.424	0.103	16.952	1	0	0.654	0.534	0.801
SalesGrowth	0.001	0.001	1.989	1	0.158	1.001	1	1.002

- The reference category is: 1.
- This parameter is set to zero because it is redundant.

From table 4-6,

The Multinomial Regression Analysis models which is the Logistics model of long term financial health for logistics companies in Thailand are as follow.

Logit Response Function:

From table parameter estimation,

$$g_0 = LN\left(\frac{p_0}{p_1}\right) = -7.182(CF/D) - 9.743(RE/TA) \dots\dots\dots (18)$$

$$g_2 = LN\left(\frac{p_2}{p_1}\right) = -1.585 + 4.068(CF/D) - 0.424(BVE/TL) \dots\dots\dots (19)$$

Where $g_0, g_2 = \log odd$ or $\log it$

$$g_1 = 0$$

$$\pi_j(x) = \Pr(Y=j|x) = \frac{e^{gj(x)}}{e^{g_0(x)} + 1 + e^{g^2(x)}} \dots\dots\dots (20)$$

Where $j = 0$ to $2 \dots$

Pr = Probability to the outcome of the interest

$$\sum_{j=0}^2 \Pr(Y=j|x) = 1 \dots\dots\dots (21)$$

For Distress (Unhealthy) relative to Normal.

- 1) The Wald test statistic, CF/D and RE/TA are 15.257 and 34.351 with an associated p-value of 0. The study sets alpha level to 0.05, means CF/D and RE/TA are significant variables in this group while the other variables are not statistically significant variables.
- 2) From B,
CF/D – if the company has more cash flow to operate than debt, the chance to be in Unhealthy group is less.
RE/TA- the more retained earning higher than total asset, the chance to be in Unhealthy group is less.
- 4) From Exp (B),
CF/D and RE/TA have odds ratio <1 that means if these variables increase by one unit, the relative risk for Unhealthy would be expected to decrease by the factor of 0.001 and 5.87×10^{-5} respectively or the company more likely be in the Normal group.

For Non Distress group (Healthy) relative to Normal.

- 1) The Wald test statistic, CF/D and BVE/TL are 26.191 and 16.952 with an associated p-value of 0.000. The study sets alpha level to 0.05, means CF/D and BVE/TL are significant variables in this group while the other variables are not statistically significant variables.
- 2) From B,
CF/D – if the company has more cash flow to operate than debt, the chance to be in

Healthy group is higher.

BVE/TL – if the company were to increase in BVE/TL score by one point, the multinomial log-odds of Unhealthy would be expected to decrease by 0.424 units while holding all other variables in the model constant. This is the same result as case 1 which can confirm that Logistics Company should use the funds from liability to operate/expand the company more than using funds from shareholder.

3) From Exp (B).

CF/D has odds ratio >1 that means if cash flow to debt ratio increases by one unit, the relative risk for Healthy would be expected to increase by the factor of 58.444. The result is similar to case 1 that CF/D is the strongest drive for the company to be Healthy BVE/TL has odds ratio <1 that means if this ratio increases by one unit, the relative risk for Healthy would be expected to decrease by the factor of 0.654.

Among the 5 Variables, variable CFD and RETA are significant at the 0.05 level in Distress group, while, variable CFD and BVETL are significant at the 0.05 level for in Non-Distress group.

The significant variables from Likelihood Ratio are CFD, RETA and BVETL which are the same variable as using Wald Statistics. Pseudo R-Square from both Wald statistics and Likelihood ratio are the same.

Non-Financial variables

Table 4-7.

Parameter Estimates from MLRA for 5 significant Non-Financial variables from case 2

Distress/Normal/Non Distress ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
0	Intercept	0.31	0.44	0.497	1	0.481		
	Size	0.006	0.008	0.594	1	0.441	1.006	0.991 1.021
	Ageyears	-0.079	0.019	17.415	1	0	0.924	0.891 0.959
	No.ofShareholders	-0.057	0.059	0.921	1	0.337	0.945	0.841 1.061
	[Nationality of shareholders ThainonThai =0]	-0.155	0.281	0.303	1	0.582	0.857	0.493 1.487
	[Nationality of shareholders ThainonThai =1]	0 ^b	.	.	0	.	.	.
	[Type of Network Logistic NonLogistic s=0]	0.823	0.302	7.399	1	0.007	2.277	1.258 4.119
	[Type of Network Logistic NonLogistic s=1]	0 ^b	.	.	0	.	.	.
	Intercept	0.156	0.487	0.103	1	0.748		
	Size	0.025	0.006	19.141	1	0	1.025	1.014 1.036
2	Ageyears	0.006	0.017	0.111	1	0.739	1.006	0.973 1.039
	No.ofShareholders	-0.362	0.071	26.01	1	0	0.696	0.606 0.8
	[Nationality of shareholders ThainonThai =0]	0.738	0.279	6.971	1	0.008	2.091	1.209 3.616
	[Nationality of shareholders ThainonThai =1]	0 ^b	.	.	0	.	.	.
	[Type of Network Logistic NonLogistic s=0]	0.084	0.356	0.056	1	0.813	1.088	0.541 2.186
	[Type of Network Logistic NonLogistic s=1]	0 ^b	.	.	0	.	.	.

From table parameter estimation,

$$g_0 = LN\left(\frac{p_0}{p_1}\right) = -0.079(Age) + 0.823(Type\ of\ Network)$$

$$g2 = LN\left(\frac{p2}{p1}\right) = 0.025(Size) - 0.362(No. of Shareholders) + 0.738(Nationality of Shareholders)$$

Where $g0, g2 = \log odd$ or $\log it$

$$g1 = 0$$

$$\pi_j(x) = \Pr(Y = j|x) = \frac{e^{gj(x)}}{e^{g0(x)} + 1 + e^{g2(x)}} \dots\dots\dots (22)$$

Where $j = 0$ to $2 \dots$

$\Pr$ = Probability to the outcome of the interest

$$\sum_{j=0}^2 \Pr(Y = j|x) = 1 \dots\dots\dots (23)$$

For Distress (Unhealthy) relative to Normal.

1) The Wald test statistic for the variable Age and Type of Network are 0.497 and 7.399 with an associated p-value of 0. The study sets alpha level to 0.05, means Age and Type of Network are significant variables in this group while the other variables are not statistically significant variables.

2) From B,

Age - if the age of company were to increase in by one unit, the multinomial log-odds of Healthy would be expected to decrease by 0.079 units while holding all other variables in the model constant. This may imply that the young company has higher chance to be in Unhealthy group.

Type of Network - company has non logistics Network is more likely to be in Unhealthy group than company has logistics Network.

3) From Exp (B),

Age have odds ratio <1 that means if age increase by one unit, the relative risk for Unhealthy would be expected to decrease by the factor of 0.924.

Type of Network have odds ratio >1 that means if these variables increase by one unit, the relative risk for Unhealthy would be expected to increase by the factor of 2.277 respectively. Or company with non-logistic network is likely to be in the Unhealthy group.

For Non Distress group (Healthy) relative to Normal.

1) The Wald test statistic, Size, No. of Shareholder and Nationality of Shareholder are 19.14, 26.010 and 6.971 with an associated p-value of 0.000, 0.00 and 0.018 respectively. The study sets alpha level to 0.05, means Size, No. of Shareholder and Nationality of Shareholder are significant variables in this group while the other

variables are not statistically significant variables.

2) From B,

Size – if the company were to increase in Size score by one unit, the multinomial log-odds of Healthy would be expected to increase by 0.025 units while holding all other variables in the model constant. This may imply that the higher the size the chance to be in Healthy group is higher (same as case 1)

No. of Shareholder – if the company were to increase in No. of Shareholder score by one unit, the multinomial log-odds of Healthy would be expected to decrease by 0.362 units while holding all other variables in the model constant. This may imply that the more shareholder the chance to be in Healthy group is less. (Same as case 1)

Nationality – Non Thai company (International company) relative to Thai company given the other variables are constant is 0.738 unit higher for Healthy group. Or International Company is more likely to be in Healthy group.

4) From Exp (B).

Size and Nationality have odds ratio >1 that means if these variables increase by one unit, the relative risk for Healthy would be expected to increase by the factor of 1.025 and 2.091 respectively. Nationality of Shareholder is the strongest drive for the company to be Healthy as highest Exp (B).

In contrast, No. of Shareholder has odds ratio <1 , that means if these variables increase by one unit, the relative risk for Healthy would be expected to decrease by 0.696.

The significant variables from Likelihood Ratio are Age, Size, No. of Shareholders, Nationality of Shareholders and Type of Network which are the same variable as using Wald Statistics. Conclusion table from the analysis is as follow.

Table 4-8.

Summary of MLRA results (Part II)

Variables	Groups	Liquidity Ratio	Profitability Ratio	Average Ratio		Efficiency Ratio	Sales Growth	Variation of Net profit growth	Size	Age	Nationality of Shareholders	Type of Network	No. of shareholders
		CF/D	RE/TA	NI/TL	BVE/TL								
All 9 variables	Distress		-11.903										
	Non Distress		4.147		-1.793				2.50E-02				-0.308
	Distress	-7.182	-9.741										
5 Financial variables	Non Distress	4.068			0.424								
5 Non Financial variables	Distress									-0.079		0.823	
	Non Distress								2.50E-02		0.738		-0.362

5. Conclusion

The study found out that factors determine long term financial stability for Logistics companies in Thailand are CFD, RETA, BVETL, Size, Age, Nationality of Shareholder, Type of network and No. of Shareholder. From case 1 (Applying total 23 variables (Financial Variables and Nonfinancial Variables) at the same time. The following characters will drive the company to have more chance to be healthy company; high retained earing than total asset, using funds from liability instead of funds from equity, higher register capital, and have less number of shareholders. RETA is the strongest impact on the long terms stability of financial health. From case 2 (Applying Financial Variables separate from Non-Financial Variables), apart from the same result from case 1, there are cash flow higher than debt and being International Company will drive the company to have more chance to be in Healthy company. By far, case 2, the CFD is the strongest impact on the long term stability of financial health. On the other hands, Young Company and company without logistics network have higher chance to be unhealthy company.

RETA and CFD are positive drivers for improving both “from Distress (Unhealthy) to Normal” and “from Normal to Non-distress (Healthy)” but they seem to be more effective for “from Distress (Unhealthy) to Normal”. BVE/TL is a negative driver “from Normal to Non-distress (Healthy)”. This implies that “debt financing” is not bad for financial health. Number of shareholders is also a negative driver for “from Normal to Non-distress (Healthy)” while Foreign Participation is a positive driver for “from Normal to Non-distress (Healthy)”.

From the research, company’s financial health is also influenced by its corporate governance mechanism.

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