버스운송업체의 재무변수가
기업부실에 미치는 영향

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Ⅰ. Introduction

Amid rapid changes and fierce competitions, companies today carry a higher risk to go bankruptcy than any other times and, especially, medium- and small-sized companies carry a even higher risk in that regard. The number of bankrupt companies reached a record high of 17,168 in 1997 and 22,828 in 1998 when Korea was under the auspice of the International Monetary Fund. It is reported that some 4,244 companies, most of which were feeble medium- and small sized companies, claimed bankruptcy due to financial bankruptcy in 2002.

Bankruptcy is largely a result of complicated process that contain both external environmental conditions, which are almost impossible to control, and internal environmental conditions of companies, such as failed management and insufficient distribution of human and physical capital within a company. From the perspective of a company, it is possible to decrease a risk of

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bankruptcy should internal environmental conditions rather than external environmental conditions be properly controlled. Also, if it is possible to construct a system that can detect the risk ahead of time, it will make a huge contribution not only to prevent bankruptcy but also to decrease social economic losses.

In Korea, a number of theoretical studies to predict company bankruptcy beforehand were conducted from diverse angles in 1980s. Most of these studies were empirical ones regarding a bankruptcy prediction model that linearly combines many evaluating indicators including a financial ratio through a multivariate discriminant analysis and a Logit analysis. Also, most previous studies were conducted for listed manufacturing companies and big companies.

However, considering that the absolute majority of bankrupt companies are medium-and small-sized companies and the weight of service industry keeps growing bigger due to improvement in industry structure, it is necessary to develop a bankruptcy prediction model for medium- and small-sized companies. Especially, a study on the bankruptcy factors centered on the attributes of transport industry is absolutely necessary because transport industry has a distinct business environment, which is focused on service, from manufacturing industry and has a distinct business structure as well as a distinct way of management.

Therefore, this study intends to examine main factors that influence bankruptcy of a company with a focus on land passenger transporting companies over a certain size that have public and private characters at the same time and also intends to deduce a bankruptcy prediction model for passenger transporting companies.

II. Analysis of current conditions of failed companies

The bus transporting business has undergone a very serious

〈Table 1〉 Bankruptcy status of each year per each business type

(unit: number, %)

Category	Normal company		Normal bus company		Lease bus	
	Bankrupt company	Bankruptcy ratio	Bankrupt company	Bankruptcy ratio	Bankrupt company	Bankrupt ratio
1997	8,226	0.52	14	2.6	20	3.3
1998	10,536	0.52	12	2.3	28	4.3
1999	3,371	0.43	6	1.2	46	6.0
2000	3,840	0.48	13	2.4	57	5.3
2001	3,220	0.41	13	2.4	63	5.4
2002	2,710	0.34	4	0.8	76	6.2
total	31,903		62		290	

Note   : Normal bus company: city bus, regional bus, rural bus
Source : Bank of Korea (2003), Company Management Analysis, 392-398

bankruptcy crisis since 1990s due to a decline in demand and deteriorated management expenses. In case of bus companies that transport passengers, a bankruptcy ratio is almost four times higher than normal companies and, in case of lease bus companies, the ratio ranges from six times to thirteen times higher than other companies.

195 (42.1%) out of total 463 bus companies are under a capital encroachment status. Some 112 companies are under a total encroachment status and 73 companies suffer from partial capital encroachment. Especially, 38 (54.3%) out of 70 regional bus companies are affected by serious capital encroachment and, therefore, suffer from failed management.

Subsidies are planned in the general account and have an unstable characteristic that stable supply is hard to be secured. Also, they tend to be temporary support, such as the hinterland support program (agricultural special tax) and oil price support (driving tax). Therefore, unification of dispersed supporting system that can generate systematic and efficient supporting programs for achieving policy ends and preventing bankruptcy should be

⟨Table 2⟩ Current status of capital encroachment companies

(unit: million won)

Category	Number of analyzed companies	Encroached companies	Total capital encroachment					Partial capital encroachment				
			no. of companies	composition ratio	surplus	deficit	capital stock	no of companies	composition ratio	surplus	deficit	capital stock
City bus	307	128 (41.7%)	75	24.4	4,947	-141,400	-136,453	53	17.3	20,014	-14,304	5,710
Rural bus	86	29 (33.7%)	18	20.7	15,802	-49,698	-38,896	11	12.8	5,721	-2,916	2,805
Regional bus	70	38 (54.3%)	29	41.4	3,713	-16,630	-12,917	9	12.9	1,499	-1,033	466
Total	463	195 (42.1%)	122	26.3	24,462	-207,729	-188,267	73	15.8	27,234	-18,253	8,982

Note : Capital stock = surplus - deficit
Source : The Korea Transport Institute (2003), A Study for Transporting Business System Revision, 19-20.

studied and examined so as to deal with important issues, such as securing continuous and stable supporting funds, restructuring bus system, operating public bus and high-tech information facility, improving bus business management, securing additional support fund for establishing infra, expanding bus infra, and supporting companies.

Ⅲ. Design for Empirical Study

1. Extent of analysis

For the sake of developing an bankruptcy prediction model, we divide the land transporting companies (category code I 6020, according to the Korea Standard Industry Category) that is centered on transportation into a group of bankrupt companies and a group of healthy companies between 1997 and 2002 and set up the extent of analysis to the finance information of these companies and the characteristic finance information of the

transporting business.

The characteristic finance information of the transporting business is that the business has a public character differently from other normal companies although a private businessman operates the business. For instance, oil price subsidy for a desired line, employment insurance, empty vehicle subsidy, transfer discount, student discount, loss compensation for isolated places, and loss compensation for non-profitable lines are the government subsidies that are designed to enhance social services and control an increase of fare.

2. Data collection and Analysis Method

This study has a different purpose from existing studies in that it intends to develop a bankrupt company prediction model. Thus, we examine if the variables in the existing studies are applicable in this study and try to develop a model by selecting the variables that reflect inherent characteristics of Korean transporting companies. Korean transporting companies are by and large non-listed companies and service companies and, therefore, this study selects a sample business that is 100% non-listed land passenger transporting companies. Also, extracting a sample of a group of bankrupt companies is done by setting up a 5 year period from 1997 to 2002 and selecting 22 companies, from which finance data were available in this period.

The finance information of these sample companies is based on the data from Korea Credit Guarantee Fund and Maeil Business News and goes through several comparison stages by a mail survey and a visit confirmation in order to secure not only identifiability and homeostasis but also objectivity and credibility. Especially, it overcomes a limit of data collection regarding non-listed companies, which is unique fiscal data management of

non-listed companies or intense security, and enhances accuracy of the data.

Sampling a group of healthy companies is based on a paired sample method selecting 22 healthy companies with a similar size in the same industry. These 22 healthy companies should exist as of the end of 2002 and be in the same industry and an active company in the same fiscal year with a similar size (the number of registered vehicle, sales size)

This study selects the variables that affect company bankruptcy prediction out of finance information and subsidy related information in the very previous year of bankruptcy for 22 failed companies and 22 healthy companies. Bankruptcy prediction model is derived and verified through a Logit analysis using Limdep statistical package.

3. Variable Definitions

In this study, we define an independent variable and a dependent variable as follows for an empirical analysis.

① Independent variable: Independent variables in this study uses the 29 finance variables that prove to be the most fundamental variables in the previous company bankruptcy studies and the 3 subsidy variables that displays attributes of transporting companies.

② Dependent variable: the used code of the model is as follows. A bankrupt company is 0 and a healthy company is 1.

For the bankruptcy variables that have been introduced by the previous studies, this study selects the variables that are going to be used for developing a model in accordance with the following criteria.

① After reviewing the existing domestic and foreign literature, a ratio that clearly demonstrates a difference between a failed company and a healthy company and a ratio that has been significantly regarded in the previous studies and is available for data collection and normally used.

② A ratio that clearly shows a characteristic of the transporting business

③ A ratio that is thought to be specially necessary among the differences between ① and ② or a rate of change

Finance ratio is normally divided into a profitability ratio, flexibility ratio, security ratio, growth ratio, and activity ratio. Profitability ratiois for specifying the management record of a company during a fixed period and an index that can evaluate efficiency of the use of asset and an ability to create profit through sales activities. Flexibility ratio means a potential that can be cashed in a short term and is an index that can measure and evaluate an ability to pay for a short term liability. Security ratio is designed to see the soundness of finance structure and a fund raising power, growth ratio is a ratio for analyzing profit of a company and growth of an asset, and activity ratio is a turnover ratio of asset/liability/capital and to see how actively a capital that is invested in a company for a period is operated.

Dividing the selected variables in accordance with the above finance ratio category gives us, a total of 29 variables consisting of 10 profit ratios, 5 flexibility ratios, 4 security ratios, 5 activity ratios, and 5 growth ratios. The addition ofthe 3 subsidy variables that can display a character of a transporting company makes a total of 32 variables independent variables as shown the below table.

A primary correlation of independent variables is verified and it is referred to selecting the most appropriate independent variables.

〈Table 3〉 definitions of independent variables

Category	Variables	Sign
Profitability	net profit to sales	X1
	net profit to total assets	X2
	net profit to stockholder's equity	X3
	ordinary income to sales	X4
	ordinary income to total assets	X5
	operating income to sales	X6
	interest compensation ratio	X7
	total profit to sales	X8
	paid interest to sales	X9
	ordinary income to stockholder's equity	X10
Flexibility	current assets to total assets	X11
	net working capital to total assets	X12
	current assets to current liabilities	X13
	quick assets to current liabilities	X14
	current assets to inventory assets	X15
Security	stockholder's equity to total assets	X16
	stockholder's equity to current liabilities	X17
	total assets to loan	X18
	fixed assets to stockholder's equity and long-term liabilities	X19
Activity	sale to total capital	X20
	sales to inventory assets	X21
	sales to fixed assets	X22
	working capital to sales	X23
	sales to stockholder's equity	X24
Growth	growth rate of inventory assets	X25
	growth rate of fixed assets	X26
	growth rate of total assets	X27
	growth rate of sales	X28
	growth rate of ordinary income	X29
Variables that are inherent in the transporting business	subsidy to sales	X30
	subsidy to operating income	X31
	subsidy to current term net profit	X32

Ⅳ. The Results of the Study

A Logit analysis shows that 4 variables - net profit to sales, paid interest to sales, net working capital to total assets, and

subsidy to sales - are estimated by the data in the year prior to bankruptcy, 5 variables - paid interest to sales, stockholder's equity to total assets, stockholder's equity to current liabilities, total assets to loan, and subsidy to sales - are estimated by the data two years prior to bankruptcy, and 4 variables - net working capital to total assets, stockholder's equity to current liabilities, sales to inventory assets, and subsidy to operating income - are estimated as significant ones by the data three years prior to bankruptcy. This study intends to explain with a focus on a prediction model a year prior to bankruptcy.

The statistics that verifies the appropriateness of the Logit model with a focus on a prediction model of a year prior to bankruptcy reveals that the value of chi-square is very high up to 44.94 and the p-value and the t-value are at a very significant level. The detailed estimated results are in the following 〈Table 4〉.

〈Table 4〉 Result of estimating a bankruptcy prediction model

Variables	Variables	Results of estimation		
		Coefficient	t-value	p-value
net profit to sales	x1	96.12	2.09	0.037
paid interest to sales	x9	−183.69	−1.84	0.066
net working capital to total assets	x12	−5.12	−1.86	0.063
subsidy to sales	x30	44.23	1.71	0.087
constant	C	−1.88	−0.114	0.091
converged value of logliklihood	L(C)	−8.03		
initial value of loglikelihood	L(O)	−30.50		
Chi-square	X2	44.94		

Due to page limit, the bankruptcy prediction models of one, two and three year prior to bankruptcy were not reported respectively.

According to the result of model estimation, all the four variables are statistically significant at the 10% significance level and hold a high explaining power. An analysis based on the sample for

analysis (44 companies) shows that a degree of precision regarding total categorization is 90.9%. As it is able to categorize 20 out 22 bankrupt companies, a sensitivity to tell a bankrupt company as a bankrupt company is 90.0%. That is, according to the estimated results of model, all of net profit to sales, paid interest to sales, net working capital to total assets, and subsidy to sales is statistically significantand has a high predictive power.

As we review several significant meanings of the above estimation model, a strategic management interpretation that independent variables affect dependent variables in the estimated model differs by a sign (positive or negative) of coefficient and the statistical significance value (t-value). Influences on dependent variables could be reversely interpreted as the value of coefficient is positive or negative. At first, a greater value of applied variable has more influences on becoming a healthy company as the value of coefficient is positive. Also, the greater the statistical significance of t-value becomes, the greater the credibility of influences becomes.

To the contrary, in case of a positive coefficient, a greater value of applied variable has more influences on becoming a bankrupt company. Likewise, the greater the statistical significance of a coefficient becomes, the greater the statistical credibility becomes.

It is estimated, in this study, that the values of coefficients of net profit to sales and subsidy to sales are positive and the paid interest to sales and net working capital to total assets are negative.

Firstly, as we see the influences of a positive coefficient on dependent variables, the greater values of net profit to sales and subsidy to sales have a positive influence on promoting the soundness of a company. Reversely, since the values of coefficients of paid interest to sales and net working capital to total capital are estimated to be negative, the greater value of applied variable

increases the tendency to be a bankrupt company.

Therefore, a management strategy to decrease paid interest to sales and net working capital to total capital can prevent bankruptcy. With regard to statistical significance, net profit to sales is 2.09, which is the highest value, and, thus, it is the most credible variable among four variables.

Ⅴ. Conclusion

While the studies for predicting company bankruptcy ahead of time have been continuously conducted since 1960s, the majority of them were on big companies focusing on the listed companies and the manufacturing industry. The reason was probably because it is relatively easy to collect data from them and the growth policy has been focused on the manufacturing industry. However, considering that the absolute majority of bankrupt companies are medium- and small-sized companies and the weight of the service industry keeps increasing due to improvement in industry structure, it is desperately necessary to develop a bankruptcy prediction model for the transporting business.

Therefore, this study derived a bankruptcy prediction model with an emphasis on inherent bankruptcy factors of the land passenger transporting business that has both a characteristic of public service and a private characteristic at the same time.

The results of this study highlight that accurate diagnosis and prediction of bankrupt companies are very important in stability of company and, further, society and this study suggests which quantitative variables lead a company to bankruptcy.

It will bring about epochal changes and development to revision of management environment of the transporting business

in that it can predict the bankruptcy possibility in advance by inputting the finance data of a company into the suggested model. Also, it will provide the criteria for what needs to be done by a company or related authorities to prevent bankruptcy.

Additionally, it implies that a company needs to adopt an innovative management mind such as real time finance analysis and establishment of efficient management system with a basis upon finance conditions of a company so as to prevent bankruptcy.

Meanwhile, as a couple of distinctive characteristics from existing studies, four variables, firstly, such as net profit sales, paid interest to sales, net working capital to total assets, and subsidy to sales were commonly selected in the one year prior to bankruptcy model. It implies that these variables are important in the passenger transporting business regardless of size, scale, region, and time of the variables suggested in the previous studies.

Secondly, the previous studies were limited to the model estimation with an emphasis on the listed companies and the manufacturing industry and, therefore, there was a problem that the attributes of the transporting business were not uncovered due to the absence of a case study. This study is a rare study for the non-listed companies and on the transporting business that takes subsidies from the government. Also, looking at the result of analysis lets us realize that model estimation and interpretation limited to the character variables of the transporting business.

References

1. The Korea Transport Institute (2003), "A Study on the Transporting Business System Revision".
2. Bank of Korea (2003), Company Management Analysis.