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A Study on the Prediction of Bankruptcy in the KOSDAQ Market

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Abstract

Purpose - This study looks into relations between bankruptcy prediction and the quality of accounting income in companies listed on the KOSDAQ.
Design/Methodology/Approach - With the use of a bankruptcy prediction model that has already been developed and applied, and with each company's bankruptcy probability and financial stability score (P, Z-Score, K-Score), this study analyzes the relationship of bankruptcy probability to accounting income quality.
Findings - As a result, the higher a bankruptcy probability, the larger the value of discretionary accruals; the higher the value of the financial stability K-Score , the lower the value of discretionary accruals; the higher a bankruptcy probability, the higher the level of conservatism; the higher the value of financial stability K-Score, the lower the level of conservatism.
Research Implications or Originality - The verification of relations with accounting income quality, the usability of the bankruptcy prediction model was proven. Bankruptcy probability P, and the financial stability scores Z-Score and K-Score were in the model sequentially, and comparative analysis was conducted.

Keywords: Accounting Information, Bankruptcy Probability, Financial Stability Score
JEL Classifications: M14, M42, M48

Ⅰ. Introduction

Insolvent firms inflict damage on not only direct stakeholders (e.g., investors, creditors, employees) but indirectly (e.g., consumers). A firm's insolvency leads to other firms' distress. Such a series of insolvency can cause social and economic loss, and can damage national economy. In the Global Era, bankruptcy-induced damage hits not only relevant firms but many stakeholders in succession, and overall countries and global economy face untold losses (50th Davos World Economic Forum, 2020).

Therefore, this study looks into relations between bankruptcy prediction and the accounting income of companies listed on the KOSDAQ. A financial stability score was applied to an analysis model. A financial stability score means soundness for evaluating overall management factors, including profitability, stability, growth, and efficiency, and for making correct decisions. The financial stability score comes from a variety of research on the prediction of unexpected corporate distress in order for survival.

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Since financial distress inflicts losses on many stakeholders, it is very important to minimize these losses and to predict corporate distress.

Firms that fail to cope with financial costs when business operations are poor are marginal firms. Academically, these are referred to as bankruptcy firms. Altman (1968) first suggested a bankruptcy prediction model to predict these firms. Based on this, a Korean version of the bankruptcy prediction model was developed (Altman, Eom and Kim, 1995). Many domestic studies related to the bankruptcy prediction model were published (Gang Cheol-Seung, 1991; Lee Gye-Won, 1993; Nam Joo-Ha, 1995; Kim Min-Cheol, 2016).

Therefore, with the bankruptcy prediction model already developed and applied, and with each company's bankruptcy probability and financial stability score (P, Z-Score, K-Score), this study analyzes the relationship of bankruptcy probability to accounting income quality.

When a company's bankruptcy probability is measured, a Logit and discriminant model are mainly used. Based on the Logit model used by Lee Gye-Won (1993) and Ohlson (1981) established bankruptcy probability P with KOSDAQ-listed companies. Regarding discriminant model, the Z-Score developed by Altman (1968), the K-Score developed by Altman, Eom and Kim (1995) developed in consideration of Korean conditions, and others have been used. In this study, bankruptcy probability P developed by Lee Gyeo-won (1993), the Z-Score of Altman (1968), and the K-Score of Altman, Eom and Kim (1995) were used. As for the K-Score, the K1-Score for KOSDAQ non-listed companies and K2-Score for KOSDAQ listed companies have already been developed. In this study, a K2-score suitable for the listed companies was used.

The purpose of this study is to find the availability of various indexes for the relationship between bankruptcy probability and the accounting income quality of companies listed on the KOSDAQ. The spatial scope of data for verifying hypotheses was set to companies listed on the Korea Securities Dealers Automated Quotations (KOSDAQ) of the Korea Exchange, and the temporal scope was the period from 2002 to 2019. The number of analyzed samples was 2,660.

In this study, with the use of the bankruptcy prediction model, each company's bankruptcy probability and financial stability score (P, Z-Score, K-Score) were calculated, and hypotheses related to the relationship of bankruptcy probability and financial stability score to accounting income quality were verified in multiple regression analysis.

The discrimination between this study and related work is as follows.

In this study, firstly, companies listed on the KOSDAQ were used. Secondly, a variety of financial stability scores and variables were used in order to analyze the bankruptcy prediction and accounting income quality of the listed companies.

The differentiation of this study is: First, in previous studies, KOSPI companies were used, but in this study, KOSDAQ companies were used. Second, the quality of research is improved by utilizing the long period of the study sample from 2002 to 2019. Third, by using various financial stability scores and variables, we examine the quality of the KOSDAQ companies' bankruptcy prediction and accounting profits.

II. Review of Literature and Hypotheses

Generally, 'insolvent firms' and 'financial distress' include such events as bond default or economic failure, insolvency and bankruptcy, and legal bankruptcy (Park Hye-Soo, 2017). In other words, if a company's total revenue is lower than its total costs, or a company's rate of return is lower than its cost of capital, and if a company's return on investment is lower than the average return on investment in the industry, the company suffers economic failure along with profitability degradation. Such economic failure does not mean that a company goes bankrupt. Nevertheless, if the company's earnings fail to

compensate for its expenses continuously, its financial position worsens and comes to a bond default or insolvency. A bond default or insolvency means a condition where a debtor has no ability to repay a debt in the near future, and thereby fails to fulfill its liabilities, either in the period of execution or as already claimed. If a company faces financial distress due to a lack of capital liquidity and thereby cannot maintain corporate actions, it is forced to with from the market according to the bankruptcy proceedings of the court, or to seek rehabilitation (Kim Yong-Sung et al., 2012). If such a situation continues to occur, the company ends up facing 'bankruptcy'.

Accordingly, bankruptcy prediction should be made as an economy is developed. This is because it is a minimal safety device to minimize each economic entity's economic damage (Nam Jae-Woo Lee Hee-Kyung and Kim Dong-Seok, 2000).

When it comes to related work concerning bankruptcy prediction, Altman (1968) developed discriminant modeling based the bankruptcy prediction model to discriminate between sound companies and insolvent companies. Following this, there has been much development. Domestic research on bankruptcy prediction with the use of discriminant analysis began when the Bank of Korea (1982) designed the bankruptcy prediction of domestic companies with the use of discriminant analysis. Altman, Eom and Kim (1995) made a discriminant analysis based bankruptcy prediction model for Korean companies. To overcome the limitations of discriminant analysis, Ohlson (1980) tried bankruptcy prediction by applying Logit analysis, and such a method is widely used. In Korea, many researchers study a Korean version of the Logit model. Logit model based research shows more accuracy than amultivariate discriminant analysis-based model in terms of theories or evaluation.

Defond and Jiambalvo (1994) said that with an increase in a company's financial distress, management tends to increase accounting income. As for the accounting income adjustment, a company is likely to increase the size of discretionary accruals in order to hide corporate distress or other abnormal symptoms. Kim Gyeong-Ho and Park Jong-Il (1999) also argued that insolvent companies made accounting adjustments much to hide financial distress as the fiscal year came to a close the year right before bankruptcy.

According to research by Baek Wohn-Sun and Lee Soo-Roh (2004), and research by Lee Seung-Tae and Choi Jong-Seo (2005), conservative accounting is considered useful as a means of protecting investors and creditors because it helps to solidify financial fundamentals, but it can distort firm value and damage usability from the perspective of the fair presentation of financial statements. In addition, in terms of the characteristics of conservative accounting, companies tend to perceive assets and earnings as little as possible, and debts and costs as much as possible. For this reason, conservative accounting can distort financial information. As shown in many studies, accounting information can be changed or can be influenced depending on different levels of accounting income quality.

Therefore, based on a variety of related work, this research establishes six hypotheses (hypotheses 1 to 6) in order to analyze the relation of corporate bankruptcy probability and financial stability score to accounting income quality.

H1: The higher the value of bankruptcy probability (P), the more discretionary accruals increase.
H2: The lower the value of the financial stability score (Z-Score), the more discretionary accruals increase.
H3: The lower the value of the financial stability score (K-Score), the more discretionary accruals increase.
H4: The higher the value of bankruptcy probability (P), the more the level of conservatism increases.
H5: The lower the value of the financial stability score (Z-Score), the more the level of conservatism increases.
H6: The lower the value of the financial stability score (K-Score), the more the level of conservatism increases.

Ⅲ. Methodology

1. Research Design

The accounting income quality used in this study has been applied for many different scores and methods. In this study, discretionary accruals and level of conservatism are used for accounting income quality.

1.1. Altman's Z-Score and the Korean Bankruptcy Prediction Model

Altman (1968) selected thirty-three insolvent firms and thirty-three sound firms among English firms from 1946 to 1965, paired-sampled the firms with equal business types whose asset size ranged from one million to 2.5 million dollars, and conducted discriminant analysis. Among twenty-two financial ratios, one typical financial ratio was selected in each of the five categories: liquidity, profitability, leverage, solvency, and activity. Then, they were involved in the final discriminant model. These financial ratios are as follows.

Z-Score = 1.2(X1) + 1.4(X2) + 3.3(X3) + 0.6(X4) + 1.0(X5)
X1: Working capital/total assets,
X2: Retained profit/total assets,
X3: Operating profit/total assets.
X4: Market value of equity capital/total liabilities,
X5: Sales/total assets
Ⓐ Z <1.81: Determined as an insolvent firm
Ⓑ 1.81 ≤ Z ≤ 2.99: Deferred decision
Ⓒ Z> 2.99: Determined as a sound firm

1.2. Korean Z-Score (Korean Bankruptcy Prediction Model)

Among multiple models for predicting financial distress, the K-Score of Altman, Eom and Kim (1995), which reflected the main accounting information of Korean companies only, was applied and divided into a K1-Score and K2-Score. The K1-Score is an estimate value for companies, including those non-listed. For the score, the year right (t-1) before initial public offering (IPO) was applied. K2-Score is used only for listed companies. For the score, the year (t) of IPO was applied. The higher a company's K-Score, the more its stability and soundness increase. The estimate value and the decision criteria of financial distress are shown below. In this study, only K2-Score was used as the K-Score.

K2-Score = -18.696 + 1.501(X1) + 2.706(X2) + 19.760(X3) + 1.146(X4)
X1: log (total assets), X2: log (sales/total assets), X3: retained earnings/total assets
X4: Market value of equity capital/total liabilities
Ⓐ K2 <-2.30: Determined as an insolvent firm
Ⓑ -2.30 ≤ K2 ≤ 0.75: Deferred decision
Ⓒ K2> 0.75: Determined as a sound firm

1.3. Modified Jones Model (1995) and NDA Model

Discretionary accruals were measured by excluding nondiscretionary values from total measured values. Such a value is by calculating the difference between total accruals (TA) and cash flows from

operations (CFO) and net income (Kim Min-Cheol, 2016). Nondiscretionary accruals (NDA) are measured with the use of a modified Jones model.

$$DA = \beta_0 + \beta_1 BP + \beta_2 ROE + \beta_3 SIZE + \gamma_t$$

$$CON = \beta_0 + \beta_1 BP + \beta_2 ROE + \beta_3 SIZE + \gamma_t$$

DA: discretionary accrual, CON: degree of conservatism,
BP: probability of bankruptcy (P, Z)
ROE: Equity capital ratio,
SIZE: Company size

$$TA_{jt}/A_{jt-1} = a(1 - A_{jt-1}) + b1[(\triangle REV_{jt} - \triangle REC_{jt})/A_{jt-1}] + b2(PPE_{jt}/A_{jt-1}) + \epsilon_{jt}$$

$$DA_0 = TA/A_{-1} - [\hat{a}(1/A_{-1}) + \hat{b1}(\triangle REV - \triangle REC)/A_{-1} + \hat{b2}(PPE/A_{-1}]$$

TA_{it}: Total occurrence of company j in period t,
REV_{it}: Sales of company j in period t,
REC_{it}: Company j's term t accounts receivable,
PPE_{it}: Company j's term t tangible assets,
A_{it}: Total assets of company j

1.4. Measurement of the Level of Conservatism

The research results of Kim Min-Cheol (2016) were applied. Therefore, the measurement is based on the fact that the level of stock price is higher than net assets as a result of conservative accounting by the undercounting of net income and net assets.

$$CONS_t = 1 - (BV_t/MV_t)$$

$CONS_t$: Conservatism amount,
BV_t: Net assets at the end of t,
MV_t: Market value at the end of t

1.5. Bankruptcy Prediction Model of Ohlson (1981) and the Model of Lee Gye-Won (1993)

A Logit model was applied to the bankruptcy prediction model of Ohlson (1981). The model for listed companies, which was designed by Lee Gye-Won (1993), was established. The prediction model one year before bankruptcy is presented below.

$$P_i = [1 + \exp(-(1.69 - 7.88(X301) - 1.99(X302) - 3.92(X303))]^{-1}$$

Pi: Probability of bankruptcy,
X301: Net profit ratio of sales,
X302: Total capital turnover
X303: Equity capital ratio

2. Sample Selection

Table 1 shows the number and selection process of final samples.

Table 1. The Number of Final Samples

Category	No. of Samples
KOSDAQ Manufacturing Companies	420
(-) Removal of companies that meet criteria - Companies whose variable data are unable to be extracted - Companies with administration issues	(-) 265
1st selected samples	155
Samples for the entire period (18 years)	2,790
(-) Removal of the outlier 5%	(-) 130
No. of final samples	2,660

Data from 2002 to 2019 on the companies listed on KOSDAQ were collected. For sample homogeneity, only manufacturing companies (420) were selected. According to the criteria, sample companies were selected, and the financial data of KIS-Value were used. In terms of variables to be used in the model, companies whose data for all variables available during the entire period were able to be extracted were selected. In addition, companies which did not have administration issues during the entire period were chosen. As a result, 2,790 samples (155 samples × 18 years = 2,790) that met these criteria were selected. In the 1st descriptive statistics, variables used in had a large outlier difference. Therefore, to generalize an empirical analysis, 5% of outliers were removed. Accordingly, the final data used in empirical analysis numbered 2,660 after the removal of outliers.

Ⅳ. Research Results

1. Descriptive Statistics

For the verification of the hypotheses, the descriptive statistics of the relevant variables were analyzed.

Table 2 shows the results of the descriptive statistics of the variables used in this study. With regard to DA (discretionary accruals), the total mean was 0.069, the median 0.047, standard deviation 0.079, the minimum value 0.000, and the maximum value 1.459. The reason why the DA values were all positive was that absolute value was used in the analysis of discretionary accruals.

Regarding the conservative measurement, CON, the total mean was -0.346, the median -0.162, standard

Table 2. Descriptive Statistics

Variable	N	Average	Median	Standard Deviation	Minimum	Maximum
DA	2,660	0.069	0.047	0.079	0.000	1.459
CON	2,660	-0.346	-0.162	0.886	-6.683	1.154
P	2,660	0.063	0.014	0.173	0.000	1.000
Z	2,660	2.286	1.589	2.474	-1.192	35.321
K	2,660	4.088	2.789	7.011	-17.157	24.859
ROE	2,660	0.580	0.574	0.191	-0.065	0.946
SIZE	2,660	10.978	10.944	0.353	9.899	12.287

Notes: 1. DA: Discretionary Accrual.
2. CON: Conservatism.
3. P: Probability of Bankruptcy.
4. Z: Financial Stability Z-Score.
5. K: Financial Stability K-Score.
6. ROE: Return On Equity.
7. SIZE: Company Size.

deviation 0.886, the minimum value -6.683, and the maximum value 1.154.

The total mean of the bankruptcy probability P values calculated in the Logit model was 0.063, the median 0.014, standard deviation 0.173, the minimum value 0.000, and the maximum 1.000. P represents bankruptcy probability. Therefore, the closer it is to '1', the higher a bankruptcy probability is.

The total mean of the financial stability score Z was 2.286, the median 1.589, standard deviation 2.474, the minimum value -1.192, and the maximum value 35.321. The Z-Score is the opposite of the P value. The lower the Z-Score value, the higher the bankruptcy probability.

The total mean of financial stability score K was 4.088, the median 2.789, standard deviation 7.011, the minimum -17.157, and the maximum 24.859. If the value of the K-Score is larger than 0.75, it means that the probability of insolvency is low; if it is larger than -2.00, but smaller than 0.75, it means that a decision is postponed; if it is smaller than -2.00, it means that the probability of insolvency is high.

The total mean of Return on Equity (ROE) was 0.580, the median 0.574, standard deviation 0.191, the minimum value -0.065, and the maximum value 0.946.

The total mean of SIZE, which represents corporate size, was 10.978, the median 10.944, standard deviation 0.353, the minimum value 9.899, and the maximum value 12.287.

2. Correlation Analysis

In order to verify hypotheses set in the study, this researcher analyzed correlations between the variables available during the entire period.

Table 3 shows the results of the correlations between the variables. As a correlation analysis, the Pearson Correlation Coefficient was applied. The coefficients of correlations between discretionary accruals (DA) and other variables were analyzed. All variables but Z, which were CON, P, K, ROE, and SIZE, had significant correlations with DA at a significance level of 0.1%. The correlation coefficient of each was 0.101, 0.240, -0.195, -0.156, and -0.094, respectively. Regarding a correlation with DA, bankruptcy probability (P) had the most correlation. Conservatism (CON) and P had positive correlations with DA. The financial stability score (K) and Return on Equity (ROE) had negative correlations with

Table 3. Correlations between Variables

	Dependent Variable	Independent Variable					
	DA	CON	P	Z	K	ROE	SIZE
DA	1						
CON	0.101 ***	1					
P	0.240 ***	0.113 ***	1				
Z	-0.035	0.299 ***	-0.005	1			
K	-0.195 ***	-0.100 ***	-0.303 ***	0.566 ***			
ROE	-0.156 ***	-0.074 ***	-0.006	0.608 ***	0.716 ***	1	
SIZE	-0.094 ***	0.025	-0.037	0.007	0.131 ***	-0.094 ***	1

Notes: 1. *p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

corporate size (SIZE).

CON had significant correlations with P, Z, K, and ROE at a significance level of 0.1%. The correlation coefficient of each was 0.113, 0.299, -0.100, and -0.074, respectively. The Z-Score (Z) had the most correlation with CON. CON had positive correlations with P and Z. K had a negative correlation with ROE.

P had a significant correlation with K at a significance level of 0.1%, and its correlation coefficient was -0.303. Therefore, they had a negative correlation.

Z had significant correlations with K and ROE at a significance level of 0.1%, and the correlation coefficient of each was 0.566 and 0.608, respectively. Therefore, Z had positive correlations with these two variables.

K had significant correlations with Return on Equity and SIZE at a significance level of 0.1%, and the correlation coefficient of each was 0.716 and 0.131, respectively. Therefore, K had positive correlations with these two variables.

The correlation coefficient of ROE and SIZE was -0.094. Therefore, the two variables had a negative correlation at a significance level of 0.1%.

3. Hypothesis Verification in Multiple Regression Analysis

In this section, hypotheses were verified via multiple regression analysis. The purpose of the analysis of Hypothesis 1 to Hypothesis 6 was to verify the usability of the multiple scores used to evaluate accounting income quality in order to predict the bankruptcy of all the KOSDAQ-listed companies.

1.1 Analysis of Hypothesis 1

Table 4 presents the verification results of the relationship between discretionary accruals (DA) and bankruptcy probability (P). According to the regression analysis, the coefficient (β) of P was 0.236 (a positive value) and was significant at a significance probability of 0.1%. In other words, with an increase in P, DA became larger, and thus the quality of accounting income was lowered. Aside from this, the correlation coefficient of Return on Equality (ROE) and discretionary accruals (DA) was negative, and was significant at a significance probability of 0.1%. The lower Return on Equity (ROE) was, the higher discretionary accruals (DA) was.

The correlation coefficient of corporate size (SIZE) and discretionary accruals (DA) was also negative

Table 4. Results of the Relationship between DA and P

Independent Variable	Dependent Variable: DA		
	Coefficient (B)	Coefficient (β)	t-stat.
Intercept	0.350		7.549***
P	0.108	0.236	12.733***
ROE	-0.068	-0.165	-8.854***
SIZE	-0.023	-0.101	-5.435***
F-value		89.545***	
Adj. R^2		0.091	
Samples (N)		2,660	

Notes:: 1.* p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

value significant at a significance probability of 0.1%. Therefore, the smaller the corporate size (SIZE), the larger discretionary accruals (DA) was.

The modified R2, which represents the explanatory power of the regression model of Hypothesis 1, was 0.091, and the F-value was 89.545. The values were significant at a significance probability of 0.1%.

1.2. Analysis of Hypothesis 2

Table 5 shows the results from the multiple regression analysis of Hypothesis 2. It presents the verification results of the relationship between discretionary accruals (DA) and the financial stability score (Z-Score) in a modified Jones model. According to the regression analysis, the coefficient (β) of the Z-Score was 0.107 (a positive value), and it was significant at a significance probability of 0.1%. In other words, with an increase in the Z-Score, DA became larger, and thus the quality of accounting income was lowered.

The correlation coefficient of Return on Equity (ROE) and discretionary accruals (DA) was negative and significant at a significance probability of 0.1%. The lower Return on Equity (ROE) was, the higher discretionary accruals (DA) was. The correlation coefficient of corporate size (SIZE) and discretionary accruals (DA) was also negative and significant at a significance probability of 0.1%. Therefore, the smaller the corporate size (SIZE), the larger discretionary accruals (DA) was.

The modified R^2, which represents the explanatory power of the regression model of Hypothesis 2, was 0.042, and the F-value was 40.311. The values were significant at a significance probability of 0.1%.

Table 5, Results of the Relationship between DA and Z

Independent Variable	Dependent Variable: DA		
	Coefficient (B)	Coefficient (β)	t-stat.
Intercept	0.405		8.452***
Z	0.003	0.107	4.450***
ROE	-0.096	-0.232	-9.640***
SIZE	-0.026	-0.117	-6.116***
F-value		40.311***	
Adj. R^2		0.042	
Samples (N)		2,660	

Notes: 1. *p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

1.3. Analysis of Hypothesis 3

Table 6 presents the results from the multiple regression analysis of Hypothesis 3. Hypothesis 3 was set to verify the relationship between discretionary accruals (DA) and the financial stability score (K-Score) in a modified Jones model. According to the regression analysis, the coefficient (β) of K-Score was -0.136 (a negative value), and was significant at a significance probability of 0.1%. In other words, the higher the financial stability score (K-Score), the lower discretionary accruals (DA) was.

The correlation coefficient of Return on Equity (ROE) and discretionary accruals (DA) was negative and significant at a significance probability of 0.1%. The lower Return on Equity (ROE) was, the higher discretionary accruals (DA) was. The correlation coefficient of corporate size (SIZE) and discre-

Table 6. Results of the Relationship between DA and K

Independent Variable	Dependent Variable: DA		
	Coefficient (B)	Coefficient (β)	t-stat.
Intercept	0.295		5.811***
K	-0.002	-0.136	-4.805***
ROE	-0.028	-0.067	-2.362**
SIZE	-0.19	-0.083	-4.160***
F-value		41.445***	
Adj. R^2		0.044	
Samples (N)		2,660	

Notes: 1. *p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

tionary accruals (DA) was also negative and significant at a significance probability of 0.1%. Therefore, the smaller the corporate size (SIZE), the larger discretionary accruals (DA) was.

The modified R^2, which represents the explanatory power of the regression model of Hypothesis 3, was 0.044, and the F-value was 41.445. The values were significant at a significance probability of 0.1%.

1.4. Analysis of Hypothesis 4

Table 7 shows the analysis results of Hypothesis 4. Hypothesis 4 was set to verify the relationship between bankruptcy probability (P) and the level of conservatism (CON). According to the regression analysis, the coefficient (β) of P was 0.113 (a positive value), and was significant at a significance probability of 0.1%. In short, the higher bankruptcy probability (P)was, the higher the level of conservatism.

The correlation coefficient of Return on Equity (ROE) and the level of conservatism (CON) was negative and significant at a significance probability of 0.1%. The higher Return on Equity (ROE) was, the lower the level of conservatism (CON). The correlation coefficient of corporate size (SIZE) and the level of conservatism was positive, but corporate size (SIZE) failed to influence the level of conservatism, a dependent variable.

The modified R2, which represents the explanatory power of the regression model of Hypothesis 4, was 0.018, and the F-value was 16.839. The values were significant at a significance probability of 0.1%.

Table 7. Results of the Relationship between CON and P

Independent Variable	Dependent Variable: CON		
	Coefficient (B)	Coefficient (β)	t-stat.
Intercept	-0.822		-1.523
P	0.581	0.113	5.898***
ROE	-0.330	-0.071	-3.683***
SIZE	0.058	0.023	1.187
F-value		16.839***	
Adj. R^2		0.018	
Samples (N)		2,660	

Notes: 1. *p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

1.5. Analysis of Hypothesis 5

Table 8 shows the analysis results of Hypothesis 5. Hypothesis 5 was set to verify the relationship between financial stability score (Z-Score) and the level of conservatism. According to the regression analysis, the coefficient (β) of the Z-Score was 0.548 (a positive value), and was significant at a significance probability of 0.1%. In short, the higher the financial stability score (Z-Score) was, the higher the level of conservatism.

The correlation coefficient of Return on Equity (ROE) and the level of conservatism was negative and significant at a significance probability of 0.1%. The higher Return on Equity (ROE) was, the lower the level of conservatism. The correlation coefficient of corporate size (SIZE) and the level of conservatism was negative, but corporate size (SIZE) failed to influence the level of conservatism, a dependent variable.

The modified R2, which represents the explanatory power of the regression model of Hypothesis 5, was 0.193, and the F-value was 21.359. The values were significant at a significance probability of 0.1%.

Table 8. Results of the Relationship between CON and Z

Independent Variable	Dependent Variable: CON		
	Coefficient(B)	Coefficient(β)	t-stat.
Intercept	0.780		1.586
Z	0.196	0.548	24.900***
ROE	-1.901	-0.409	-18.497***
SIZE	-0.043	-0.017	-0.977
F-value		21.359***	
Adj. R^2		0.193	
Samples (N)		2,660	

Notes: 1. *p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

1.6. Analysis of Hypothesis 6

Table 9 shows the analysis results of Hypothesis 6. Hypothesis 6 was set to verify the relationship between the financial stability score (K-Score) and the level of conservatism. According to the regression analysis, the coefficient (β) of the K-Score was -0.114 (a negative value), and was significant at a

Table 9. Results of the Relationship between CON and K

Independent Variable	Dependent Variable: CON		
	Coefficient (B)	Coefficient (β)	t-stat.
Intercept	-1.458		-2.527**
K	-0.014	-0.114	-3.948***
ROE	0.053	0.011	0.399
SIZE	0.104	0.041	2.050*
F-value		10.404***	
Adj. R^2		0.101	
Samples (N)		2,660	

Notes: 1. *p<0.05, **p<0.01, ***p<0.001.
2. See defining variables in Table 2.

significance probability of 0.1%. In short, the higher the financial stability score (K-Score) was, the lower the level of conservatism.

The correlation coefficient of Return on Equity (ROE) and the level of conservatism was positive, but ROE failed to influence the level of conservatism, a dependent variable. The correlation coefficient of corporate size (SIZE) and the level of conservatism was positive and significant at a significance probability of 0.1%. The larger the corporate size (SIZE) was, the higher the level of conservatism.

The modified R^2, which represents the explanatory power of the regression model of Hypothesis 6, was 0.101, and the F-value was 10.404. The values were significant at a significance probability of 0.1%.

4. Discussion

This study analyzed relationships between bankruptcy prediction and the accounting income quality of KOSDAQ-listed companies. A financial stability score was used in an analysis model. A company's financial stability score means the soundness for evaluating its overall management factors, including profitability, stability, growth, and efficiency, and for making correct decisions. The financial stability score came from varied research on the prediction of unexpected corporate distress in order for survival. Financial distress inflicts losses on many stakeholders; it is very important to minimize these losses and predict corporate distress.

Firms that fail to cope with financial costs due to poor operations are marginal firms. Academically, they are referred to as bankruptcy firms. Altman (1968) first suggested a bankruptcy prediction model to predict these firms. Based on the Altman's bankruptcy prediction model, a Korean version of the bankruptcy prediction model was developed (Altman, Eom and Kim, 1995). Many domestic studies related to the bankruptcy prediction model were published (Gang Cheol-Seung, 1991; Kim Min-Cheol, 2016; Lee Gye-Won, 1993; Nam Joo-Ha, 1995). In the more diversified and uncertain business environment of the 21st century, it is more urgent to predict financial distress and bankruptcy more than ever before. Therefore, with the use of a bankruptcy prediction analysis model based on financial ratios, this research conducted verification in diverse ways.

Based on a series of verifications, it is necessary to design a plan for actively establishing a bankruptcy prediction system to minimize the potential risks of management, overcome difficulties, and come up with a plan for recovery and growth in changing economic situations.

With the use of the model set in this study, research hypotheses were verified. The results are presented as follows.

As a result, Hypothesis 1, 3, 4, and 6 were accepted, whereas Hypothesis 2 and 5 were rejected. Just as the results emphasized by Kim Gyeong-Ho and Park Jong-Il (1999), the results of this study explain well that the closer a company comes to the year right before bankruptcy, the more accounting adjustment is performed to hide its financial distress. As verified in Hypothesis 1, the higher a bankruptcy probability, the larger the discretionary accruals. The result is consistent with the results of related work.

In this study, bankruptcy probability (P) and the financial stability score (K-Score) had significant correlations with the level of conservatism (CON). According to Kim Min-Cheol (2016), conservatism (CON) had a significant correlation with the financial stability score (Z-Score), whereas CON had no significant correlation with bankruptcy probability (P). It is judged that the difference in results between this study and the research by Kim Min-Cheol (2016) is attributable to issues such as the selection of comparative subjects. This indicates that it will be necessary to research the cause of the difference, in either the characteristics of the conservative accounting process or in other factors of conservatism.

Ⅴ. Conclusion

1. Summary of Results

This study analyzed correlations between bankruptcy prediction and the accounting income quality of companies listed on the KOSDAQ. For the analysis, this researcher applied the previously developed bankruptcy prediction model, and made use of corporate bankruptcy probability and financial stability scores (P, Z-Score, K-Score) so as to find correlations with accounting income quality. In particular, with the use of the bankruptcy prediction model, how the usability of accounting information was changed before and after the introduction of K-IFRS was analyzed. In this study, six hypotheses were designed.

As sample companies to be analyzed, 420 manufacturing companies were selected, and the temporal scope for the analysis was the period from 2002 to 2019. After selection criteria were applied, 2,660 samples, except for outliers, were selected as analysis samples. As a result, the higher a bankruptcy probability was, the larger the value of discretionary accruals; the higher the value of the financial stability K-Score was, the lower the value of discretionary accruals; the higher a bankruptcy probability was, the higher the level of conservatism; and the higher the value of the financial stability K-Score was, the lower the level of conservatism. The results proved that corporate bankruptcy probability and the financial stability score had significant relationships with conservatism

2. Research Implications and Limitations

Firstly, the bankruptcy prediction model already developed was used to calculate bankruptcy probability. Through the verification of relationships with accounting income quality, the usability of the bankruptcy prediction model was proven. Bankruptcy probability P, and the financial stability scores of the Z-Score and K-Score, were used in the model sequentially, and a comparative analysis was conducted. Therefore, the results are expected to be helpful for practical evaluation. Secondly, it is possible to use multiple dependent variables that were already analyzed in this study. For example, in Hypothesis 1, 2, and 3, a correlation between corporate size (SIZE) and discretionary accruals (DA) was analyzed. As a result, the smaller corporate size (SIZE) was, the larger discretionary accruals (DA). There are problems, such as maximization of management's personal use, lack of internal accounting control procedures in business, a lack of external audit efficiency, failure of supervision, failure of business management, and problems in accounting customs. If companies have a small size, they face deficiencies legally, and the problem of accounting audit costs, and thereby the management control function, is limited. In such a case, management is able to intervene directly in financial information and modify accounting information. Thirdly, the longer a listing period, the less uncertainty of accounting information and the more firm value is related to accounting information. Since this study made use of data that had been accumulated from 2002 to 2019, the accounting information of each is more useful to the analysis on accounting income quality than that in a relatively short research period.

This study also has limitations.

Firstly, there are multiple models for evaluating the quality of accounting income. Therefore, it is possible to find more diverse methods than the one used in this study. In particular, given that this study had some differences from related work in terms of the measurements of the level of conservatism, bankruptcy probability, and financial soundness, there might be a problem with these measurements. This indicates that there are multiple influential factors for conservative accounting on accounting income quality. Secondly, there are many different models for measuring the values of bankruptcy probability and financial stability scores. Both this study and related work applied universally used models and a relatively long model. It will be necessary to develop and analyze a new model. Thirdly, a variety

of variables, as well as bankruptcy probability and financial stability scores, were applied in this study. Nevertheless, only financial ratios in past financial statements were used. For this reason, there is low applicability at the moment when it is necessary to respond to actual bankruptcy risks of companies at present. Fourthly, it is necessary to develop and apply new financial variables to analyze relationships between a variety of accounting income qualities and financial stability scores.

In order to analyze in detail the influential factors on relationships between bankruptcy prediction and the accounting income quality of KOSDAQ-listed companies, it will be necessary to research the aforementioned limitations.

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