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# Does Financial Performance Influence Credit Ratings?: An Analysis of Korean KRX Firms

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## Abstract

Credit rating agencies offer information about default risk. Previous literature suggests that firm's credit ratings are influenced by various metrics, specifically, numerous risk considerations such as size, leverage and growth. However, there is limited evidence to support the relationship between credit ratings and financial performance. Our research is motivated by this caveat. The purpose of this paper is to discover if financial performance measures can be included as an indicator for default risk since the relation between financial performance and default risk/credit rating is a question left unanswered in a South Korean context. In this paper, we empirically test if financial performance measures can provide additional information about credit ratings and credit rating changes. We perform a battery of tests to establish if the following financial performance measures: EPS, CPS, ROA, ROE, and ROS have any explanatory power in explaining credit ratings levels and credit rating changes.

Using a sample from 2002 to 2013, we find that EPS and CPS has a statistically positive relation to credit ratings, suggesting that firms with higher credit ratings have higher levels of EPS and CPS compared to firms with lower credit ratings. Moreover, we find that firms with positive performance measured by EPS and CPS in period t have the potential to experience a credit ratings change in period t+1. However, in South Korea, the majority of firms do not experience a credit ratings change. When we estimate the financial performance of the firms that do not experience a credit ratings change, we find a statistically significant relation between credit rating and financial performance for EPS and CPS. The results suggest that credit ratings for firms with positive financial performance remain stable Finally, we examine the relation between performance in period t and credit ratings increase and decrease in period t+1. The results suggest that the credit ratings of firms with high level of financial performances increase or remain the same. We do not find a relation between financial performance and credit rating decreases; this result may be due to our small sample size. The previous literature has largely ignored the association between credit ratings and performance. Taken together, our results suggests that EPS and CPS can be used as financial performance measures by investors, government agencies and debt issuers as additional information about a firms credit rating levels, and subsequent changes. We contribute to the literature by providing empirical evidence of a relationship between performance metrics and credit ratings, specifically the link between EPS.

*Keywords*: Credit Ratings, Financial Performance, Credit Rating Change, Default Risk

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# 기업의 재무성과가 신용등급에 영향을 미치는가?: 한국 유가증권상장기업 분석

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## 요약

신용등급평가기관들이 제시하는 기업의 신용등급은 채무불이행 위험(defaiult risk)에 관한 유용한 정보를 제공하기 때문에 자본시장 참여자나 채권시장 참여자에게 매우 중요하다 할 수 있다. 선행연구에 따르면 신용등급은 기업의 규모, 부채비율, 성장률 등과 같이 신용평가기관이 신용감시기간(credit watch period) 동안 평가하는 다양한 채무불이행 위험에 의해 결정된다. 한편 기업의 재무성과는 시장참여자들의 투자 의사결정에 매우 중요한 지표이다. 재무성과가 우수한 기업들은 안전한 투자처로 인식될 가능성이 높고 따라서 채무불이행 위험이 낮은 기업으로 인지될 수 있다. 기업의 재무성과가 기업의 채무불이행 위험을 탐지할 수 있는 지표로 사용될 수 있는지 관한 의문은 매우 중요함에도 불구하고 이와 관련된 연구는 실로 매우 부족한 실정이다. 본 연구는 다양한 재무성과 지표들이 기업의 차기 신용등급과 가지는 관련성을 고찰함으로써 이들이 차기 신용등급과 신용등급 변화에 관하여 제공하는 추가적인 정보에 초점을 맞춘다.

본 연구는 2002에서 2013년까지 최근 12개년도의 유가증권상장사 기업표본을 사용하여 기업의 재무성과와 신용등급 및 신용등급 변화의 관련성을 조사함으로써 이들이 채무불이행을 유의적으로 낮추는 지표로 활용될 수 있는지를 고찰하였다. 구체적으로 EPS, CPS, ROA, ROE, ROS를 기업 재무성과의 대용치로 사용하여 각각의 변수가 기업의 차기 신용등급 및 신용등급 변화에 영향을 미치는지를 살펴보았다. 연구결과, 선행연구에서 기업의 재무성과 대용치로 주로 사용된 바 있는 ROA, ROE, ROS는 신용등급 및 신용등급의 변화와 일관적으로 유의적인 관련성을 갖지 않는 것으로 나타났다. 한편 EPS와 CPS는 모든 분석에서 일관적인 결과가 관찰되었다. 우리나라 상장기업의 경우 신용등급이 급격하게 변하지 않고 유지되는 경우가 빈번한데 이는 기업들이 신용등급 관리에 만전을 기하기 때문이라는 해석이 가능하다. 따라서 신용등급이 당기에서 차기로 변화하지 않은 기업들과 변화한 기업들을 비교하는 분석을 수행한 결과 재무성과가 좋은 기업들은 차기 신용등급이 유지되는 경향이 강한 것으로 나타났다. 나아가 추가분석에서는 본 연구 표본을 신용등급이 상향조정된 기업, 하향조정된 기업, 변화하지 않은 기업으로 분류하고 차기 신용등급을 종속변수로 사용한 동일한 분석을 반복해보았다. 연구결과 재무성과가 좋은 기업들은 신용등급이 상향조정되거나 그대로 유지되는 경향이 강한 것으로 나타났다. 한편 신용등급이 하향조정된 기업만을 대상으로 수행된 분석에서는 차기 신용등급과 당기 재무성과의 유의한 관련성을 발견할 수 없었다. 본 연구의 실증분석 결과를 종합적으로 요약하면 EPS와 CPS가 채무불이행 위험에 대해 추가적인 정보를 제공할 수 있는 재무성과 지표로서 활용될 수 있음을 보여주는 결과라 할 수 있다. 본 연구는 자본시장 및 채권시장참여자, 규제기관, 신용평가기관이 기업의 채무불이행 위험을 평가할 때 활용할 수 있는 유용한 지표를 제시했다는 점에서 의미를 찾을 수 있다.

주제어: 기업의 재무성과, 신용등급, 신용등급 변화, 채무불이행 위험

# Ⅰ. Introduction

Credit ratings provide a useful appraisal of a firm's default risk. In South Korea, the credit ratings of the majority of Korean firms are provided by the following credit rating agencies: National Information & Credit Evaluation (NICE), Korea Investor Services (KIS), Korea Ratings (KR) and Seoul Credit Rating & Information (SCI). The calculation of credit ratings levels is complex (Bharath, Sunder, & Sunder, 2008; Kraft, 2014). Different credit rating agencies use different metrics to evaluate a firm's credit ratings (Becker, DeFond, Kiambalvo, & Subramanyam, 1998; Becker & Milbourn, 2011). Therefore, any additional information included in a firm's financial performance is a valuable indicator.

Hovakimian, Kayhan, and Titman (2009) suggests that firm's credit ratings are influenced by various metrics, specifically, numerous risk considerations such as size and growth. However, there is limited evidence to support the relationship between credit ratings and financial performance. Our research is motivated by this caveat. The purpose of this paper is to discover if financial performance measures can be included as an indicator for default risk.

To test relationship between credit rating and financial performance, we perform numerous empirical tests to establish if earnings per share (EPS), cash flow from operation per share (CPS) return on asset (ROA), return on equity (ROE) and return on sales (ROS) can be included as metrics to explain a firm's credit rating in a Korean context. To establish the relationship between financial performance and credit ratings, we perform four empirical tests. First, we perform multi-variate OLS regression with credit rating as our dependent variable; the five financial performance measures (EPS, CPS, ROA, ROE, and ROS) are our five variables of interest. We include the financial risk variables established by Hovakimian (2009) as controls. We find that of our five performance measures, EPS, CPS and ROS are statistically significantly related with credit ratings. Our results suggest that firms with higher financial performance estimated by EPS, CPS and ROS have higher credit rating levels. The result generally suggests that performance has a positive relation to credit ratings. Therefore, a firm with a higher credit ratings are shown to have higher financial performance than firms with lower credit rating levels. Secondly, we test the relationship between financial performance in period t and a credit ratings change in period t+1. This test is designed to establish if financial performance influences credit rating changes. Our results are statistically significant for EPS and CPS, suggesting that positive financial performance measured by EPS and CPS in period t influence credit rating changes in period t+1.

Thirdly, we test the financial performance of the firms with credit ratings that do not change, firms with a consistent credit rating level. We use a multiple logistic regression approach to estimate which financial performance measures are related to a firm's credit ratings for the majority of firms within our sample, firms with consistent credit ratings. The results suggest that credit ratings of firms with high EPS, CPS and ROA remain

stable, implying that credit ratings tend to not change for firms with high financial performances.

Finally, we perform three additional tests to add robustness to our initial findings. We partition our sample into 3 sub-samples; 1) positive change, 2) negative change and 3) a no-change sample to test if financial performance in period t influences credit ratings in t+1 for each sub-sample. Our regressions estimating credit ratings in t+1 period based on FP are generally significant for the positive change and no-change samples. The results suggest that the credit ratings of firms with high level of financial performance increase or remain the same, consistent with our main results. However, we fail to find a relationship between levels of financial performance and post year credit ratings when using the negative change sample. We infer that our insignificant results may be because of an insufficient sample size.

In summary, Our results suggest that EPS and CPS performance measures have significant explanatory power in explaining credit ratings. In other words, EPS/CPS has a positive relationship with credit ratings; hence, firms with higher EPS/CPS have lower levels of credit risk. There is a positive relationship between a positive EPS/CPS in period t and credit rating changes in period t+1, suggesting that a positive EPS/CPS can influence credit ratings in period t+1. EPS/CPS is positively related to credit ratings for firms that do not experience a credit ratings change. Moreover, a positive levels of EPS/CPS in period t has a positive relationship with credit rating increases in period t+1. Taken together, the results suggest that EPS and CPS can be used additional information when considering credit ratings in a South Korean context. The results suggest ROA, ROE, and ROS have explanatory power in some examples. However, these measures are not consistent for all tests. ROA may have the potential to explain financial performance in period t and credit rating changes in period t+1. However, there is no statistically significant relationship between ROA and credit rating, suggesting that ROA has limitations as a metric to provide additional information about credit ratings. EPS and CPS are the only performance measures that can be used to infer a relationship between financial performance and credit ratings on a consistent basis. Thus, the EPS and CPS performance metrics are superior to ROA, ROE, and ROS with regards to credit ratings estimation in a South Korean context.

A firm's credit rating provides an useful information about a firm's default risk. However, a link between credit ratings and performance is not established in a Korean context. To our knowledge, this is the first paper that directly links performance and credit ratings and credit rating changes using numerous performance metrics in South Korea. We contribute to the literature by providing empirical evidence of a relationship between performance metrics and credit ratings, specifically the link between EPS and CPS credit ratings / credit rating changes. Therefore, performance measures may be used by investors, government agencies and debt issuers as additional information when considering credit ratings.

The remained of this paper proceeds as follows. In section II, we review relevant literature and develop our hypothesis. In Section III, we will

explain the research design and the performance metrics. Section IV will present details of the results and Section V discusses the results of additional analysis. Section VI concludes.

## II. Literature Review and Hypotheses Development

Firms with a similar credit rating are grouped together as firms of similar quality (Kisgen, 2006). Boot, Todd, and Anjolein (2006) argue that credit ratings provide an 'economically meaningful role' by facilitating equilibrium in bond investment. A firm's credit rating provides an independent appraisal to investors regarding the default risk associated with a firm's debt (Kim & Lee, 2007). Credit risk is defined by Standard and Poor's (2012) as the possibility that a bond issuer will default by failing to make principal and interest payments under the bond's terms. Moody's Investor Service (2009) define credit risk as a relatively expected loss rate, which is the product of expected default rates and expected loss-severity rates in the case of default. Credit rating agencies such as Standard & Poor's and Moody's in the U. S. and KIS, KR, NICE and SCI in South Korea evaluate the credit risk levels of their clients using an ordinal scale. As a rule, there are ten categories AAA, AA, A, BBB, BB, B, CCC, CC, C, D; each category from AA to CCC is divided into subcategories with +/-. Credit ratings increases and decreases occur when a firm's credit risk increases or decreases(Kim & Yoon, 2013).

Credit ratings are extensively used by bond investors, debt issuers, and governmental officials as a surrogate measure of a firm's default risk (Jeong & Chung, 2014). However, a firms credit ratings is typically very costly to obtain, since credit ratings agencies must invest large a amount of time and human resources to perform deep and meaningful analysis of a firm's risk status based on various aspects ranging from strategic competitiveness to operational level details (Huang, Chen, Chia-Jung, Chen, & Soushan, 2004). Bharath et al. (2008) suggest that unlike equity, debt contracts have multiple contract terms (interest, maturity, and collateral), and the role of accounting quality in the setting of multiple contract terms is not well understood. Moreover, Kraft (2014) explains that credit rating agencies base credit ratings on 'hard' financial statement data, and soft adjustments based on managerial performance, which raises the possibility of inconsistency.

Fisher (1959) is one of the first scholars to establish a statistical method for estimating bond-rating utilizing ordinary least squares (OLS) in an attempt to explain the variance of a bond's risk premium. Numerous studies have established the relationship between risk and credit ratings using the OLS approach (Pinches & Mingo, 1973; Pogue & Soldofsky, 1969). However, Artificial Intelligence (hereafter AI) techniques reasoning systems and machine learning techniques are now established as measures to estimate credit ratings(Galindo & Tamayo, 2000). Huang, Chen, Chia-Jung, Chen, and Soushan (2004) suggest that structures developed by humans are relatively

simple and easy to interpret, while models obtained in machine learning are usually very complicated and hard to explain, and are often over fitted. In South Korea, AI machine learning is an efficient estimation of credit ratings (Kwon, Han, & Lee, 1997). However, Shin and Han (2001) suggests that although numerous experimental studies report the usefulness of AI determining credit ratings, there is a major drawback in that the user cannot understand the data being processed. Therefore, additional information provided by financial performance with explanatory power in explaining credit ratings is significant information.

Financial performance is an important indicator for market participants' investment decisions. Firms with higher financial performance are more likely to be seen as safer investments in capital and bond markets, hence these firms should have lower default risk. The majority of previous literature use ROA as proxy for financial performance. The ROA performance proxy measures a firm's profitability relative to its total assets, suggesting how efficiently a firm uses its resources to generate income (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999; Mitton, 2001). Other common proxies for financial performance include ROE and ROS. ROE indicates the amount of net income return on a shareholders' investment. ROS indicates how efficiently a firm generates net income from total sales revenue. EPS is also often used as a proxy for financial performance (Adjaoud, Zeghal, & Andaleeb, 2007). EPS indicates the amount of net income generated by a firm per outstanding share. All the above financial performance proxies are calculated from net income. These financial ratios can be considered as proxies with the ability to provide more meaningful financial information than profitability (net income). The literature generally suggests that profitability has a positive relation with credit rating (Ashbaugh-Skaifea, Collins, & LaFond, 2006; Alissa, Bonsall, Koharki, & Penn, 2013). However, there is limited research on the influence of financial performance and credit ratings. In a Korean context, Won and Chun (2013) report that ROA has a negative relation with credit rating. By intuition, financial performance should be positively correlated with credit ratings since positive financial performance should reduce default risk[1]. Therefore, strong financial performance has the potential to reduce risk. Thus, we develop the following hypotheses to establish the relation between financial performance and credit ratings in a korean context:

H1: financial performance influences credit rating and credit rating changes.

[1] Won and Chun (2013)'s study differs from ours. They only consider one proxy for financial performance whilst we use five financial performance measures. Moreover, contrary to expectations, they find a negative association between credit ratings and financial performance whereas we observe positive associations. We also use credit ratings at time t+1 in consideration of one year credit watch period. Furthermore, we perform a series of tests to add robustness to our major findings that provide evidence of a relationship between performance metrics and credit ratings, specifically the link between EPS and CPS credit ratings.

# III. Research Design

## 3.1 Model Specifications and Variables Descriptions

The purpose of this paper is to establish a relationship between credit ratings and financial performance. First, we examine this relationship between credit ratings and financial performance using the following multi-variate OLS regression model.

$$\begin{aligned} CreditRating_{t\,(t+1)} = {} & \alpha_0 + \alpha_1 FP_{t,k=1,2,3,4,5} \\ & + \alpha_2 Size_t + \alpha_3 CFO_t \\ & + \alpha_4 Lev_t + \alpha_5 Grw_t \\ & + \alpha_6 Loss_t + YD + ID \\ & + \epsilon \end{aligned} \quad (1)$$

***Dependent Variable***

$Credit\,rating_t$: The highest bond credit rating score from the 4 major credit rating agencies

$Credit\,rating_{t+1}$: The highest bond credit rating score from the 4 major credit rating agencies

***financial performance Variables***

*EPS* : Earnings per share

*CPS* : Cash flow from operation per share

*ROA* : Return on asset (= Net income / Total assets)

*ROE* : Return on equity (= Net income / Total Owners' Equity)

*ROS* : Return on sales (= Net income / Total sales revenue)

***Control Variables***

*Size* : Natural logarithm of total assets

*CFO* : Cash flow form operation / Total assets

*Lev* : Debt ratio (= Total liabilities / Total owners' equity)

*Grw* : Sales growth ratio (= $(Sales_t - Sales_{t-1})/Sales_{t-1}$)

*Loss* : Dummy variable that is set to 1 if a net income is below 0, 0 otherwise

*YD* : Year fixed effect

*ID* : Industry fixed effect

Credit rating, our dependent variable, takes on an ordinal values from 1 to 17 to represent a firm's credit rating. Our variables of interest are the performance measures labelled FP 1 to 5. The FP variables represent five different regressions for our five performance measures, EPS, CPS, ROA, ROE, and ROS.

There is limited literature on the expected credit rating levels and firms specific characteristics in South Korea; therefore, we borrow from the capital structure and financial leverage literature in the U. S. Hovakimianm, Opler, & Titman, 2001; Hovakimian et al., 2009) to establish control variables. Numerous studies suggest that the following characteristics influence default risk, hence credit ratings.

**Size**: Larger firms tend to be more mature, are able to operate with more leverage, and are therefore able to enjoy access to public debt.

**Risk**: Firms with higher leverage tend to be riskier because any shock to the organ-

ization can have a dramatic effect on a firms future profitability, or even existence. Therefore lower leverage is expected to have a positive relation with credit rating.

**CFO**: Firms with higher cash flow from operations tend to have lower short term risk because creditors and unexpected expenses can be paid without a significant impact on a firms financial operations.

**Grw**: Firms with higher future growth options should have higher expected credit ratings.

**Loss**: Firms that experience financial loss have a higher level of risk because loss firms have less access to private equity; Moreover, the potential for deterioration in business activities may have an adverse effect on creditor relations.

**YD & ID**: In order to control for industry fixed effect and year fixed effect, we include *YD* and *ID*.

Our main variable of interest, CR is the credit rating levels of all the firms in South Korea that borrow equity through public debt over our sample period 2002~2013. Credit ratings are collected on a calendar year basis based on the credit ratings issued by the major credit ratings agencies in Korea: KIS, KR, NICE and SCI.

All four credit rating agencies have different methods of calculating credit ratings. Therefore, we run a battery of tests to analyze the mean-difference of the credit rating levels for the four major credit ratings agencies. We exclude the results for brevity. The results suggest that there is a statistically insignificant mean difference for all the credit ratings agencies amongst firms. Therefore the combination of all the credit ratings for all four credit ratings agencies is a homogenous group. CR is a combination of the highest credit rating level for all four of the largest credit ratings firms in South Korea. The credit ratings levels of all the firms that borrow public debt take an ordinal score from 1 to 17. The value of 17 represents the highest credit ratings levels of KIS, KR, NICE and SCI in a single calendar year AAA. Firms with a credit rating of AA+ are coded with an ordinal score of 16, firms with AA are given an ordinal score of 15, firms with a credit rating of AA- are coded with an ordinal score of 14. CR ordinal score decreases by 1 as credit rating decreases.

B- firms receive an ordinal score coding of 2. All firms including CCC+ and below are given an ordinal score of 1. We base this approach on Alissa et al. (2013). This coding value is illustrated in <Table 1>. Our independent variables

**Table 1**

Credit Rating Scores

| CR scores | CR | CR sores | CR |
|---|---|---|---|
| 17 | AAA | 8 | BBB- |
| 16 | AA+ | 7 | BB+ |
| 15 | AA | 6 | BB |
| 14 | AA- | 5 | BB- |
| 13 | A+ | 4 | B+ |
| 12 | A | 3 | B |
| 11 | A- | 2 | B- |
| 10 | BBB+ | 1 | Below -B |
| 9 | BBB | | |

of interest, financial performance, FP are calculated as follows; EPS, earnings per share; CPS, cash flow from operation per share[2]; ROA, return on asset (Net income/Total Assets); ROE, return on equity (Net income/Total Owners' Equity); ROS, return on sales (Net income / Total sales revenue). Our Control variables are calculated as follows; Size, the natural logarithm of total assets; CFO, cash flow form operation; Lev, debt ratio (total liabilities/total owners' equity); Grw, sales growth ratio (= $(Sales_t - Sales_{t-1})/Sales_{t-1}$); Loss, a dummy variable that is set to 1 if a net income is below 0, 0 otherwise.

## 3.2 Sample Selection

All credit rating data is collected from TS2000. Financial data is collected from Dataguide and Kisvalue. We select a sample period from 2002 to 2013. This sample period has been selected because financial performance of firms' reporting is considered more robust after the 1997 Asian Financial Crisis. Our sample overlaps the recent Financial Crisis in the west. However, although Korea suffered a reduction in growth, the country did not enter

into a recession unlike most western economies. All financial data is collected as per calendar year[3]. A total of firm 7,344 observations were downloaded for KRX firms from 2002~2013, 5,263 firm observations were deleted for three reasons, 1) they did not issue 2) financial data was not available; 3) financial firms were deleted consistent with previous studies, leaving a total sample of 2,045. Our data is winsorized at the 1% level, consistent with previous studies.

**Table 2**

Sample Distribution by Industry

| IND | Freq. | % | Cum% |
|---|---|---|---|
| Metal working | 132 | 6.45 | 6.45 |
| Plastic | 30 | 1.47 | 7.92 |
| Other machinery | 88 | 4.3 | 12.22 |
| Whole sale | 178 | 8.7 | 20.93 |
| Non-metallic minerals | 86 | 4.21 | 25.13 |
| Textiles | 21 | 1.03 | 26.16 |
| Retail | 29 | 1.42 | 27.58 |
| Food and beverage | 107 | 5.23 | 32.81 |
| Transport and storage | 128 | 6.26 | 39.07 |
| Medicine and medical | 74 | 3.62 | 42.69 |
| Clothing | 27 | 1.32 | 44.01 |
| Automobiles | 74 | 3.62 | 47.63 |
| Electricity and gas | 71 | 3.47 | 51.1 |
| Electrical equipment | 45 | 2.2 | 53.3 |
| Service | 224 | 10.95 | 64.25 |
| Electronic components | 134 | 6.55 | 70.81 |
| Construction | 215 | 10.51 | 81.32 |
| Pulp and paper | 22 | 1.08 | 82.4 |
| Chemistry | 178 | 8.7 | 91.1 |
| Computer programming | 89 | 4.35 | 95.45 |
| Others | 93 | 4.55 | 100 |
| Total | 2,045 | 100 | |

<Table 2> shows the distribution of firm that borrow equity in the form of public debt by industry. 21 KRX industries acquire public

[2] In order to minimize the effect of heteroscedasticity, we scale eps and cps by 1,000 converting these to $US value.

[3] Our sample period is from 2002 to 2013. However, South Korea adopted IFRS since 2009 on a voluntary basis and it became mandatory for all listed firms since 2011. In order to avoid any potential bias from inconsistent financial data between periods, we only use K-GAAP financial data available on the database systems.

bonds in South Korea. The two largest industries are Service and Construction with 10.95% and 10.51% respectively, followed by wholesale and chemistry with 8.7%. The 17 remaining industries hold 61.14% of the bonds suggesting that a variety of different industries borrow public debt; moreover, there is no distinct pattern in the firms that acquire equity in the form of public bonds.

# Ⅳ. Empirical Results

## 4.1 Descriptive Statistics and Pearson Correlation

<Table 3> describes the sample's descriptive statistics. The means and medians of all the variables in our descriptive statistics merge, suggesting a normally distributed sample; thus, outliers would have a minimal influence on our regressions. The credit rating level is an ordinal scale that takes a value of 17 for AAA firms and a value of 1 is a firm is CCC+ or below. All of the performance measures, EPS, CPS, ROA, ROE, and ROS are positive. All of the performance measures are dispersed with a large enough level to perform our analysis. The results suggest that all firms are positively leveraged. Our sample firms are growing and have positive cash flow on average. 17% of the firms in our sample are financial loss firms. In <Table 4>, we show Pearson Correlations. Our variables of interest are shown in column 1.

Our performance measures are all positively correlated with credit ratings at the 1% level (EPS 0.24, CPS 0.27, ROA 0.17, ROE 0.11 and ROS 0.18). Size is positively correlated with credit rating suggesting that larger firms have higher credit ratings consistent with previous literature. CFO has a positive correlation (0.09) and leverage has a negative relation with credit ratings suggesting that firms with less risk have higher credit ratings. Grw is positively related to credit ratings and loss firms have a negative relation to credit ratings, consistent with previous literature.

In the person correlation, we can see that our variables are show statistically significantly high levels of correlation. Since correlations coefficients for all our variables are not particularly large, we assume multicollinearity is not an issue for this study. Furthermore, we perform a VIF test for every regression analysis to check whether multicolliernity has the potential to influence our regression. We find the average score of the VIF test is 1.36, and the highest score for the most highly correlated variables are 3.99, suggesting that multicollinearity does not influence our results.

## 4.2 Multivariate Analysis Results

<Table 5> illustrates our multivariate analysis results.[4] Our results suggest that EPS, CPS and ROS show a statistically significant positive relation with credit ratings at the 1% level. The positive

[4] We run both OLS regression and ordinal probit regression for every specified model, and find that the results are qualitatively the same. For brevity, we only show the results of OLS regression analysis.

**Table 3**

Descriptive Statistics

| Variables | Obs | Mean(Median) | Max(Min) | S.D |
|---|---|---|---|---|
| CR | 2,045 | 7.86(8) | 17(1) | 5.05 |
| EPS | 2,045 | 3.36(1.2) | 57.1(-13.97) | 8.58 |
| CPS | 2,045 | 2.45(1.87) | 79.59(-11.76) | 13.63 |
| ROA | 2,045 | 0.02(0.03) | 0.18(-0.39) | 0.09 |
| ROE | 2,045 | 0.04(0.06) | 0.61(-0.99) | 0.22 |
| ROS | 2,045 | 0.04(0.03) | 0.91(-0.84) | 0.19 |
| Size | 2,045 | 20.68(20.56) | 24.50(17.56) | 1.62 |
| CFO | 2,045 | 0.05(0.05) | 0.30(-0.17) | 0.08 |
| Lev | 2,045 | 0.52(0.53) | 0.94(0.07) | 0.19 |
| Grw | 2,045 | 0.08(0.06) | 1.03(-0.72) | 0.41 |
| Loss | 2,045 | 0.17(0) | 1(0) | 0.38 |

**Table 4**

Pearson Correlations

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. CR | 1 | | | | | | | | | |
| 2. EPS | 0.24*** | 1 | | | | | | | | |
| 3. CPS | 0.27*** | 0.72*** | 1 | | | | | | | |
| 4. ROA | 0.17*** | 0.33*** | 0.20*** | 1 | | | | | | |
| 5. ROE | 0.11*** | 0.28*** | 0.17*** | 0.63*** | 1 | | | | | |
| 6. ROS | 0.18*** | 0.27*** | 0.11*** | 0.68*** | 0.46*** | 1 | | | | |
| 7. Size | 0.57*** | 0.24*** | 0.29*** | 0.17*** | 0.13*** | 0.15*** | 1 | | | |
| 8. CFO | 0.09*** | 0.22*** | 0.44*** | 0.32*** | 0.30*** | 0.14*** | 0.16*** | 1 | | |
| 9. Lev | -0.14*** | -0.28*** | -0.22*** | -0.43*** | -0.18*** | -0.47*** | 0.02 | -0.20*** | 1 | |
| 10. Grw | 0.02 | 0.04* | 0.01 | 0.16*** | 0.13*** | 0.12*** | 0.04* | 0.07*** | -0.02 | 1 |
| 11. Loss | -0.14*** | -0.29*** | -0.17*** | -0.61*** | -0.58*** | -0.47*** | -0.09*** | -0.26*** | 0.35*** | -0.15*** |

*Note.* 1. Variable Definition

CR : The highest bond credit rating from the 4 major credit rating agencies
EPS : Earnings per share
CPS : Cash flow from operation per share
ROA: Return on asset (= Net income/Total Assets)
ROE : Return on equity (= Net income/Owners' Equity)
ROS : Return on sales (= Net income/sales revenue)
Size : Natural logarithm of total assets
CFO : Cash flow form operation
Lev : Debt ratio (= Total liabilities / Owners' equity)
Grw : $(Sales_t - Sales_{t-1})/Sales_{t-1}$
Loss : Dummy variable that is set to 1 if a net income is below 0, 0 otherwise

2. *, **, and *** indicate significance at the 1% 5%, and 10% levels, respectively.

**Table 5**

Multi-Variate OLS Regression Analysis (DV: Credit Rating)

Model: $Credit\ Rating_t = \alpha_0 + \alpha_1 FP_{t,k=1,2,3,4,5} + \alpha_2 Size_t + \alpha_3 CFO_t + \alpha_4 Lev_t + \alpha_5 Grw_t + \alpha_6 Loss_t + YD + ID + \epsilon$

| | Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|---|
| *Intercept* | ? | -25.50(-19.45)*** | -24.85(-18.84)*** | -26.03(-19.91)*** | -26.09(-19.96)*** | -25.92(-19.91)*** |
| *EPS* | + | 0.04(3.23)*** | | | | |
| *CPS* | + | | 0.04(4.86)*** | | | |
| *ROA* | + | | | 0.14(0.12) | | |
| *ROE* | + | | | | -0.31(-0.63) | |
| *ROS* | + | | | | | 1.65(2.82)*** |
| *Size* | + | 1.76(28.86)*** | 1.73(28.17)*** | 1.81(29.73)*** | 1.81(30.10)*** | 1.78(29.58)*** |
| *CFO* | + | 1.94(2.51)** | 0.67(0.81) | 2.28(2.90)*** | 1.96(2.48)*** | 2.06(2.66)*** |
| *Lev* | - | -2.74(-2.05)*** | -2.65(-4.94)*** | -3.09(-5.58)*** | -3.08(-5.79)*** | -2.62(-4.71)*** |
| *Grw* | ? | -0.03(-0.16) | -0.01(-0.06) | -0.04(-0.17) | -0.03(-0.14) | -0.08(-0.39) |
| *Loss* | - | -0.37(-1.43) | -0.51(-1.96)* | -0.48(-1.63) | -0.60(-1.98)** | -0.22(-1.80)* |
| *YD* | | *Included* | *Included* | *Included* | *Included* | *Included* |
| *ID* | | *Included* | *Included* | *Included* | *Included* | *Included* |
| *F value* | | 42.48*** | 43.15*** | 41.94*** | 41.96*** | 42.35*** |
| *Adj* $R^2$ | | 0.4011 | 0.4050 | 0.3980 | 0.3981 | 0.4003 |
| *Obs* | | 2,045 | 2,045 | 2,045 | 2,045 | 2,045 |

*Note.* 1. Variable Definition
Refer to variable definition in <Table 1>.
2. *, **, and *** indicate significance at the 1% 5%, and 10% levels, respectively.

relationship between EPS, CPS and ROS with credit ratings suggest that firms with higher credit ratings levels are expected to have higher levels of financial performance firms compared to firms with lower credit ratings levels. Our results are only statistically significant for three of our five financial performance measures. We do not find a statistically significant relationship between credit ratings and our two additional performance measures, ROA and ROE.

The first control measure, Lev is negative consistent with previous literature. The second control measure CFO shows the expected results for all our financial performance models, except for the cps model, suggesting that firms with higher CFO are more likely to be seen as safer investments in capital and bond markets, hence these firms should have lower default risk. The results for growth are not statistically significant. Loss is negatively related to the highest credit rating levels consistent with previous literature for three out of our five performance models.

Next, we examine the relationship between credit ratings in period t+1, and financial performance in period t. The purpose of this regression is to explain if financial performance can influence the level of a firm's credit rating change in the next period (period t+1). To establish if financial

performance in period t can influence credit ratings in t+1, we are required to delete a further 710 firms, leaving a total of 1335 firm observations. <Table 6> illustrates the results for our 5 individual financial performance regressions. Our variable of interest is FP, our five financial performance measures. Our results suggest that the variables with the highest explanatory power explaining a credit ratings change are EPS and CPS, which are statistically significant at the 5% and 1% levels respectively. The other performance measures, ROA, ROE, and ROS are not statistically significant. Size is positively significant at the 1% level for all our models; leverage and loss are negatively statistically significant at the 1% level for all five models. Growth shows a negative relation with credit ratings change. However, if we consider that larger firms tend not to grow, the results can be contextualized.

Our second proxy for risk CFO is positively statistically significant related to credit ratings change in period t+1, taken together with <Table

**Table 6**

Multivariate OLS Regression Analysis (DV: Post_Credit Rating)

Model: $Post\_Credit\ Rating_{t+1} = \alpha_0 + \alpha_1 FP_{t,k=1,2,3,4,5} + \alpha_2 Size_t + \alpha_3 CFO_t + \alpha_4 Lev_t + \alpha_5 Grw_t + \alpha_6 Loss_t + YD + ID + \epsilon$

| | Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|---|
| *Intercept* | ? | -15.91(-22.16)**** | -15.75(-21.99)*** | -16.04(-22.20)*** | -15.84(-21.93)*** | -15.95(-22.16)*** |
| *EPS* | + | 0.01(2.49)** | | | | |
| *CPS* | + | | 0.02(4.29)*** | | | |
| *ROA* | + | | | -0.92(-1.43) | | |
| *ROE* | + | | | | 0.39(1.55) | |
| *ROS* | + | | | | | -0.15(-0.49) |
| *Size* | + | 1.48(45.59)*** | 1.48(45.25)*** | 1.50(45.46)*** | 1.49(45.46)*** | 1.49(45.60)*** |
| *CFO* | + | 1.68(2.89)*** | 0.75(1.89)* | 1.88(3.19)*** | 1.61(2.71)*** | 1.76(3.01)*** |
| *Lev* | - | -5.78(-19.07)*** | -5.68(-18.88)*** | -6.03(-19.75)*** | -5.96(-20.00)*** | -5.98(-18.94)*** |
| *Grw* | ? | -0.21(-2.14)*** | -0.21(-2.13)** | -0.19(-1.97)* | -0.22(-2.21)** | -0.21(-2.08)*** |
| *Loss* | - | -0.56(-4.04)*** | -0.62(-4.47)*** | -0.72(-4.45)*** | -0.47(-2.90)*** | -0.63(-4.22)*** |
| *YD* | | Included | Included | Included | Included | Included |
| *ID* | | Included | Included | Included | Included | Included |
| *F value* | | 135.85*** | 137.49*** | 135.30*** | 135.34*** | 135.05*** |
| *Adj* $R^2$ | | 0.7694 | 0.7715 | 0.7686 | 0.7687 | 0.7683 |
| *Obs* | | 1335 | 1335 | 1335 | 1335 | 1335 |

*Note.* 1. Variable Definition
Post_CR : The highest bond credit rating from the 4 major credit rating agencies in t+1 period.
For other variables, refer to variable definition in <Table 1>.
2. *, **, and *** indicate significance at the 1% 5%, and 10% levels, respectively.

**Table 7**

Logistic Regression Analysis (DV: DNo_Change)

| Model | $DNo\_Change = \alpha_0 + \alpha_1 FP_{t,k=1,2,3,4,5} + \alpha_2 Size_t + \alpha_3 CFO_t + \alpha_4 Lev_t + \alpha_5 Grw_t + \alpha_6 Loss_t + YD + ID + \epsilon$ | | | | | |
|---|---|---|---|---|---|---|
| | Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| *Intercept* | ? | 6.48(5.27)*** | 6.65(5.39)*** | 6.66(5.36)*** | 6.62(5.33)*** | 6.50(5.27)*** |
| *EPS* | + | 0.02(1.93)* | | | | |
| *CPS* | + | | 0.02(1.89)* | | | |
| *ROA* | + | | | 1.71(1.78)* | | |
| *ROE* | + | | | | 0.49(1.22) | |
| *ROS* | + | | | | | 0.94(1.55) |
| *Size* | ? | -0.14(-2.69)*** | -0.15(-2.80)*** | -0.15(-2.77)*** | -0.14(-2.64)*** | -0.14(-2.68)*** |
| *CFO* | ? | -3.12(-3.21)*** | -3.92(-3.61)*** | -3.21(-3.24)*** | -3.19(-3.23)*** | -3.06(-3.13)*** |
| *Lev* | - | -1.56(-2.96)*** | -1.59(-3.04)*** | -1.58(-3.01)*** | -1.86(-3.57)*** | -1.56(-2.91)*** |
| *Grw* | ? | 0.53(1.65)* | 0.59(1.85)* | 0.49(1.53) | 0.55(1.71)* | 0.58(1.74)* |
| *Loss* | - | 0.15(0.63) | 0.07(0.29) | 0.31(1.13) | 0.26(0.93) | 0.24(0.93) |
| *YD* | | Included | Included | Included | Included | Included |
| *ID* | | Included | Included | Included | Included | Included |
| $Chi^2$ | | 97.55*** | 96.20*** | 94.93*** | 93.41*** | 94.35*** |
| *Pseudo* $R^2$ | | 0.0765 | 0.0754 | 0.0744 | 0.0732 | 0.0740 |
| *Obs* | | 1335 | 1335 | 1335 | 1335 | 1335 |

*Note.* 1. Variable Definition
DNo_Change: Dummy variable that is set to 1 if a credit rating score remained the same, 0 otherwise
For other variables, refer to variable definition in <Table 1>.
2. *, **, and *** indicate significance at the 1% 5%, and 10% levels, respectively.

5>, the results suggest negative cash flow from does not have affect a firm's credit rating; however, a statistically positive cash flow in period t will influence credit ratings in period t+1. Next, we test whether financial performance is statistically related to credit rating changes. Credit ratings generally do not change in a korean context since the majority of firms care deeply about their credit rating, and attempt to keep default risk at minimum. Thus, we run a logistic regression to establish the relationship between credit ratings and firms with stable credit rating firms. DNo_Change is a dummy variable that takes the value of one if credit ratings do not change, 0 otherwise.

<Table 7> shows that the performance of firms that do not experience a credit rating change has a positive relation between EPS, CPS, and ROA at 1% significance level. The results generally suggest that credit ratings for firms with positive financial performance remain stable. The ROE and ROS performance metrics are not statistically significant suggesting that EPS, CPS and ROA

are more robust measures to explaining credit ratings. The negative relation at a 1% level between size and credit ratings change suggests that larger mature do not experience a credit rating change. This conjecture is supported by the positive relation between growth and credit ratings at the 10% level for four out of five of our performance models.

## Ⅴ. Additional Analysis

In <Table 8>, we compare credit rating changes with no changes since majority of korean firms credit rating do not experience a credit rating change. However, Credit rating in t+1 period can increase or decrease. Despite a limited samples for credit rating increases and decreases, we divide our sample into 3 sub-samples: 1) Positive change, 2) Negative change, and 3) No change. In order to add additional robustness to our previous findings that financial performance influences credit rating in the following period, we repeat the $Post\_Credit\ Rating_{t+1}$ regression using 3 sub-samples. In our sample period 2003~2013, there have been 192 observations of credit rating's increases and 54 decreases. However, in South Korea, credit ratings generally do not change. There are 1,281 observations of no credit rating changes in our sample.

<Table 8> illustrates the results. Four out of five of our financial performance (FP) measurers are statistically signigicant in explaining performance in period t and a credit rating increase in period t+1. ROA is statistically significant at the 1% level. EPS, CPS and ROE are statistically significant at 5%. ROS is not statistically significant. Our results suggest that firms with positive financial performance in period t, have the potential to experience a credit rating increase in period t+1. Our FP variables are not statistically associated with post credit ratings decreases for our credit decrease sample. A possible explanation for this result may be because of insufficient sample size. For our no change sub-sample, our FP variables generally have a significant positive association with post credit ratings, suggesting that the credit ratings for firms with high financial performance keep the same level of credit ratings. EPS and CPS are statistically significant at the 1% level, ROE is statistically significant at the 5% level. The results suggest that credit ratings for firms with high financial performance remain stable consistent, do not experience credit rating changes, consistent with our findings in <Table 6>. The results suggest that the credit ratings of firms with high level of financial performances increase or remain the same, consistent with our previous findings.

In robustness tests, we perform a series of additional tests to add robustness to our main findings. First, our sample is a combination of cross-sectional and time series data; thus, may be considered unbalanced panel data. We repeat the analysis using the unbalanced panel data model (random effect model). Untabulated results suggest that EPS and CPS are positively correlated to credit ratings at time t+1 whereas other financial performance variables show insignificant results, consistent with our main findings. Second, we repeat

**Table 8**

Multivariate OLS Regression Analysis by 3 Sub-Samples (DV: Post_Credit Rating)

Model: $Post\_CreditRating_{t+1} = \alpha_0 + \alpha_1 FP_{t,k=1,2,3,4,5} + \alpha_2 Size_t + \alpha_3 CFO_t + \alpha_4 Lev_t + \alpha_5 Grw_t + \alpha_6 Loss_t + YD + ID + \epsilon$

| | Positive Change | | | | | | Negative Change | | | | | | No change | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| *Intercept* | ? | -8.29*** | -8.01*** | -8.58*** | -8.32*** | -8.67*** | ? | -6.18 | -4.09 | -6.27 | -6.22 | -6.08 | | -15.43*** | -15.31*** | -0.35* | -15.30*** | -15.44*** |
| | | (-3.52) | (-3.40) | (-3.67) | (-3.53) | (3.64) | | (-0.86) | (-0.58) | (-0.87) | (-0.87) | (-0.84) | | (-22.11) | (-21.97) | (-1.81) | (-21.75) | (-22.03) |
| *EPS* | + | 0.03** | | | | | - | -0.01 | | | | | + | 0.01*** | | | | |
| | | (2.09) | | | | | | (-0.57) | | | | | | (3.31) | | | | |
| *CPS* | + | | 0.03** | | | | - | | 0.20 | | | | + | | 0.01*** | | | |
| | | | (2.37) | | | | | | (1.34) | | | | | | (4.10) | | | |
| *ROA* | + | | | 7.06*** | | | - | | | -2.57 | | | + | | | 0.26 | | |
| | | | | (2.47) | | | | | | (-0.58) | | | | | | (0.59) | | |
| *ROE* | + | | | | 2.29** | | - | | | | 0.89 | | + | | | | 0.49* | |
| | | | | | (2.16) | | | | | | (0.64) | | | | | | (1.84) | |
| *ROS* | + | | | | | 0.67 | - | | | | | 0.15 | + | | | | | 0.19 |
| | | | | | | (0.61) | | | | | | (0.05) | | | | | | (0.65) |
| *Size* | | 1.18** | 1.18*** | 1.19*** | 1.21*** | 1.22*** | | 0.60* | 0.51 | 0.63* | 0.62* | 0.59* | | 1.49*** | 1.48*** | 1.07*** | 1.49*** | 1.51*** |
| | | (10.58)* | (10.67) | (10.82) | (10.88) | (10.81) | | (1.80) | (1.53) | (1.85) | (1.85) | (1.76) | | (48.19) | (47.90) | (34.06) | (47.94) | (48.19) |
| *CFO* | | 1.88 | 0.63 | 0.61 | 0.71 | 1.81 | | 8.16 | 4.55 | 8.98 | 8.32 | 8.44 | | 1.79*** | 0.99* | 1.41*** | 0.72*** | 1.91*** |
| | | (1.16) | (0.37) | (0.36) | (0.42) | (1.10) | | (1.06) | (0.51) | (1.17) | (1.09) | (1.06) | | (3.26) | (1.68) | (3.63) | (3.08) | (3.44) |
| *Lev* | | -3.54*** | -3.82*** | -3.58*** | -4.25*** | -3.92*** | | -2.44 | -2.62 | -3.26 | -2.81 | -2.27 | | -5.58*** | -5.54*** | -4.11*** | -5.78*** | -5.83*** |
| | | (-4.00) | (-4.55) | (-4.16) | (-5.12) | (-4.21) | | (-0.83) | (-0.92) | (-0.96) | (-0.92) | (-0.76) | | (-19.05) | (-19.03) | (-18.51) | (-20.09) | (-19.04) |
| *Grw* | | -0.09 | -0.09 | -0.23 | -0.26 | 0.05 | | -3.88* | -4.27 | -3.44 | -4.97** | -4.32* | | -0.21** | -0.21** | -0.15** | -0.22** | -0.21** |
| | | (-0.15) | (-0.16) | (-0.35) | (-0.40) | (0.08) | | (-1.72) | (-2.09)** | (-1.33) | (-2.07) | (-1.87) | | (-2.31) | (-2.36) | (-2.43) | (-2.43) | (-2.30) |
| *Loss* | | -0.83 | -1.05* | -0.10 | -0.03 | -0.88 | | 0.31 | 0.05 | 0.06 | 0.69 | 0.27 | | -0.45*** | -0.51*** | -0.35*** | -0.34** | -0.52*** |
| | | (-1.43) | (-1.86) | (-0.15) | (-0.04) | (-1.42) | | (0.26) | (0.04) | (0.05) | (0.50) | (0.22) | | (-3.32) | (-3.77) | (-3.32) | (-2.13) | (-3.67) |
| *YD* | | *Included* | *Included* | *Included* | *Included* | *Included* | | *Included* | *Included* | *Included* | *Included* | *Included* | | *Included* | *Included* | *Included* | *Included* | *Included* |
| *ID* | | *Included* | *Included* | *Included* | *Included* | *Included* | | *Included* | *Included* | *Included* | *Included* | *Included* | | *Included* | *Included* | *Included* | *Included* | *Included* |
| *F value* | | 13.65*** | 14.27*** | 13.85*** | 13.68*** | 13.20*** | | 2.65** | 1.83* | 3.65*** | 2.65** | 2.61** | | 138.00** | 138.80*** | 136.53*** | 136.96*** | 136.55*** |
| *Adj* $R^2$ | | 0.6986 | 0.7026 | 0.7018 | 0.6992 | 0.6909 | | 0.2609 | 0.3110 | 0.2612 | 0.2633 | 0.2508 | | 0.7939 | 0.7949 | 0.7922 | 0.7927 | 0.7922 |
| *Obs* | | 192 | 192 | 192 | 192 | 192 | | 54 | 54 | 54 | 54 | 54 | | 1281 | 1281 | 1281 | 1281 | 1281 |

*Note*. 1. Variable Definition

Refer to variable definition in <Table 1>.

2. *, **, and *** indicate significance at the 1% 5%, and 10% levels, respectively.

the analysis after partitioning our sample into investment grade firms and non-investment grade firms based on Kisgen (2006). For brevity, we only explain our results. We find that the relation between EPS/CPS and credit ratings at time t+1 is stronger for investment grade firms, suggesting that investment grade firms (lower default risk firms) with better financial performance can be seen as firms with lower level of credit risk, compared to non-investment grade firms with weaker financial performance.

Third, our dependent variables are credit ratings at time t/t+1, with an ordinal value from 1-17; hence we additionally consider a non-linear relationship by running an ordered probit regression analysis. Our untabulated results are qualitatively consistent with the main findings.

Finally, we control for additional variables that may affect credit ratings at time t+1. More precisely, we additionally include DA, discretionary accruals calculated using the adjusted performance model (Kothari, Leone, & Wasleyl, 2005), FOR, foreign investor share ownership, and BIG4, a dummy variable that is 1 if a firm's external auditor is one of those big4 auditors, 0 otherwise. The untabulated results suggest that EPS/CPS are significantly positively associated with credit ratings at time t+1, consistent with the main results. Discretionary accruals show negative sign but insignificant for all models. FOR is strongly associated with credit ratings at time t+1, suggesting that higher foreign investor share ownership is considered to influence corporate governance; therefore, lowers default risk. Big4 audit firms are also found to have positive relation with credit ratings at time t+1, implying that credit rating agencies may consider firms with audited by Big4 auditors as firms with lower default risk.

## Ⅵ. Conclusions

In this paper we examine if performance measures can be used as metrics with additional explanatory power to explain credit ratings levels and credit rating changes. Our results, the first examining the relation between numerous financial performance measures and credit rating suggest that financial performance can be used as additional metrics when calculating credit ratings and credit rating changes in a Korean context. The results suggest that whilst ROA, ROE, and ROS show some statistically significant results, these performance measures are not consistent in explaining credit ratings levels and credit rating changes. For example, ROA has some explanatory power in explaining financial performance in period t and credit rating changes in period t+1. However, there is no statistically significant relationship between ROA and credit rating, suggesting that ROA has limitations as a metric to provide additional information about credit ratings. On the other hand, EPS and CPS are consistent in explaining the relationship between financial performance, credit ratings and credit rating changes.

We find that EPS and CPS has a statistically positive relation to credit ratings, suggesting that firms with higher credit ratings have higher levels of EPS and CPS compared to firms with lower credit ratings. Moreover, we find that firms with

positive performance measured by EPS and CPS in period t have the potential to experience a credit ratings change in period t+1. However, in South Korea, the majority of firms do not experience a credit ratings change. When we estimate the financial performance of the firms that do not experience a credit ratings change, we find a statistically significant relation between credit rating and financial performance for EPS and CPS. The results suggest that credit ratings for firms with positive financial performance remain stable Finally, we examine the relation between performance in period t and credit ratings increase and decrease in period t+1. The results suggest that the credit ratings of firms with high level of financial performances increase or remain the same. We do not find a relation between financial performance and credit rating decreases; this result may be due to our small sample size. The previous literature has largely ignored the association between credit ratings and performance. Our results suggests that EPS and CPS can be used as financial performance measures by investors, government agencies and debt issuers as additional information about a firms credit rating levels, and subsequent changes. A weakness of our paper is that our results based on a Korean context may not be applicable other countries because the financial, legal and legislative systems may be different. Possible future research may examine the relationship between financial performance and credit ratings in an international context.

## References


Adjaoud, F., Zeghal, D., & Andaleeb, S. (2007). The effect of board's quality on performance: A study of canadian firms. Corporate Governance: *An International Review, 15*(4), 623-635.

Alissa, W., Bonsall, S. B., Koharki, K., & Penn, M. W. (2013). Firms' use of accounting discretion to influence the credit ratings. *Journal of Accounting and Economics, 55*(1), 129-147.

Ashbaugh-Skaife, H., Collins, D., & LaFond, R. (2006). The effects of corporate governance on firms' credit ratings. *Journal of Accounting and Economics, 42,* 203-243.

Becker, B., & Milbourn, T. (2011). How did increased competition affect credit ratings? *Journal of Financial Economics, 101*(3), 493-514.

Becker, C., DeFond, M., Jiambalvo, J., & Subramanyam, K. (1998). The effect of audit quality on earnings management. *Contemporary Accounting Research, 15*(1), 1-24.

Bharath, S., Sunder, J., & Sunder, J. (2008). Accounting quality and debt contracting. *The Accounting Review, 83*(1), 1-28.

Boot, A. W. A., Todd, T. M., & Anjolein, S. (2006). Credit ratings as coordination mechanisms. *Review of Financial Studies, 19*(1), 81-118.

Fisher, L. (1959). Determinants of risk premiums on corporate bonds. *Journal of Political Economy, 47,* 217-237.

Galindo, J., & Tamayo, P. (2000). Credit risk assessment using statistical and machine learning: basic methodology and risk modelling applications. *Computational Economics, 15*(1-2), 107-143.

Hovakimian, A., Opler, T., & Titman, S. (2001). The debt-equity choice. *Journal of Financial and Quantitative Analysis*, *36*(1), 1-24.

Hovakimian, A., Kayhan, A., & Titman, S. (2009). *Credit rating targets*. Working Paper.

Huang, Z., Chen, H., Chia-Jung, H., Chen, W. H., & Soushan, W. (2004). Credit rating analysis with support vector machines and neural networks: a market comparative study. *Decision Support Systems, 37,* 543-558.

Jeong, Y. W., & Chung, H. C. (2014). The impact of bond ratings by domestic and foreign credit rating agencies on stock prices. *Korean Journal of Business Administration, 27*(3), 371-391.

Kim, S. S., & Yoon, J. I. (2013). Effect of the credit ratings on the capital structure. *Korean Journal of Business Administration, 26*(8), 2003-2019.

Kim, S. T., & Lee, P. S. (2007). Effects of credit ratings and earnings management on capital structure decisions. Korean *Journal of Business Administration, 20*(5), 2207-2227.

Kisgen, D. (2006). Credit ratings and capital structure. *Journal of Finance, 61*(3), 1035-1072.

Kisgen, D. (2009). Do firms target credit ratings or leverage levels? *Journal of Financial and Quantitative Analysis, 44*(6), 1323-1344.

Kothari, S., Leone, A., & Wasley, C. (2005). Performance matched discretionary accruals measures. *Journal of Accounting and Economics, 39,* 163-197.

Kraft, P. (2014). Do rating agencies cater? Evidence from rating-based contracts. *Journal of Accounting and Economics, 59*(2-3), 264-283.

Kwon, Y. S., Han, I. G., & Lee, K. C. (1997). Ordinal Pairwise Partitioning (OPP) approach to neural networks training in bond rating. *Intelligent Systems in Accounting, Finance and Management, 6*(1), 23-40.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (1999). Legal determinants of external finance. *Journal of Finance, 54,* 1131-1150.

Mitton, T. (2001). *A cross-section analysis of the impact of corporate governance on the east asian crisis*. Marriat School, Brigham University, USA.

Moody's Investor service (2009). *Moody's rating symbols and definitions*.

Pinches, G. E., & Mingo, K. A. (1973). A multivariate analysis of industrial bond ratings. *Journal of Finance, 28*(1), 1-18.

Pogue, T. F., & Soldofsky, R. M. (1969), What's in a bond rating? *Journal of Financial and Quantitative Analysis, 4*(2), 201-228.

Shin, K. S., & Han, I. (2001). A case-based approach using inductive indexing for corporate bond rating. *Decision Support Systems, 32,* 41-52.

Standard and Poor's (2012). *Standard and poor's ratings definitions*.

Won, S. H., & Chun, B. G. (2013). Analysis of the relationship between credit ratings and firm's performance. *Financial Information Review, 2*(1), 2234-7739.

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