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The Effect of Credit Rating and Industrial Competitiveness of the Company on its Capital Adjustment Speed

Jinhwa Song[1] , Sooeun Kim[2]
Corresponding author: Sooeun Kim
Adjunct Professor, Department of Culture and Art Management, Sangmyung University, Korea
Associate Professor, Department of Global Finance and Management, Sangmyung University, Korea

ABSTRACT: *This study empirically analyzed the effect of credit rating and industrial competitiveness on the capital adjustment speed of companies with credit ratings among those listed on the Korea Exchange from January 1, 2005, to December 31, 2020. First, it was found that all corporate characteristic variables had a significant effect on leverage, and when the actual leverage ratio deviated from the target leverage ratio, the gap was partially adjusted every year. Second, among companies with credit ratings in the top 25% in sales adjusted their leverage more slowly than those in the bottom 25% in sales. Companies in the bottom 25% in sales have faster capital adjustments because they preemptively reduce their leverage to prevent a decrease in their target credit ratings or a decrease in profits in the next year. In contrast, companies in the top 25% in sales did not need to increase their leverage since they can maintain the target credit rating and sales in the next year. Third, companies in the bottom 25% in sales have higher Herfindahl-Hirschmann Index ("HHI") and have significantly lower cash holdings than those in the top 25% in sales, and more quickly adjust their debts when their actual leverage ratio deviates from the target leverage ratio. In other words, it was found that companies that did not achieve their target sales due to intense competition in the industry face greater uncertainty about the future due to reduced profits, and the management chooses to reduce costs such as capital costs through debt adjustment rather than job creation through investment expansion.*

KEYWORD*: Credit rating, Industrial competitiveness, Capital adjustment speed, Herfindahl-Hirschman Index*

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I. INTRODUCTION AND LITERATURE REVIEW

Companies are classified into those with and without credit ratings. They strive to obtain high credit ratings from credit rating agencies to raise capital at low interest rates in the capital-raising market. Credit rating is useful information to see a company's creditworthiness, has an important influence on stock prices and bond prices, and ultimately indicates a company's competitiveness in the capital raising market. Most of the early credit rating studies analyzed credit ratings' effects on stock prices and bond prices. Hand et al. (1992) analyzed the effect of a credit rating downgrade on stock prices and bond prices and announced the results of a study that found that companies with lower credit ratings had a negative (-) effect on both stock prices and bond prices. Ederington et al. (1987) analyzed the relationship between credit rating and bond yield by announcing the study result that credit rating has a greater effect on bond yield than other publicly available variables in the market. Financial institutions' investments in bonds are subject to various government regulations depending on their credit rating. Partnoy (1999) stated that when commercial banks invest in speculative-grade bonds below investment grade (BBB), investors are subject to various restrictions along with internal audits. Boot et al. (2003) also stated that pension funds are subject to various restrictions when investing in investment-graded and/or speculative-graded government bonds or corporate bonds. Ederington and Goh (1998) stated that companies with lower credit ratings have a negative (-) effect on stock returns and analysts' earnings forecasts. In addition, credit rating not only affects the surface interest of bonds, bond repurchase, bond offering, bond contracts, asset-backed securities issuance, CP issuance and also have an overall effect on the long-term supply agreement, labor-management relations, and customer relations.

Credit ratings also significantly affect studies on capital structure and capital structure adjustment speed. Currently, studies are underway to argue that corporate characteristic variables such as growth opportunity, asset type, profitability, corporate size, depreciation, and sales growth rate are important variables that determine the capital structure and affect the speed of capital adjustment. Miguel and Pindado (2001) studied the adjustment speed related to a company's capital structure policy, saying that if the capital structure deviates from the target capital structure, the company partially adjusts the capital structure toward the target

capital structure. In addition, as capital adjustment costs occur in capital structure adjustment, and as capital adjustment costs increase, the management feels burdened, and the adjustment speed decreases. Kisgen (2009), in a follow-up study to Kisgen (2006), analyzed the effect of credit rating changes on changes in capital structure. This study stated that a credit rating downgrade has a negative (-) effect on the change in the capital structure in the following year. However, an increase in the credit rating does not significantly affect the change in the capital structure in the following year. In other words, it is said that the downgrade and rise of the credit rating asymmetrically affect the change in the capital structure in the following year. Lang and Stultz (1992) stated that the lower the industrial competitiveness, the greater the effect of the bankruptcy disclosure of a highly competitive firm on the competitive firm in the industry. It can be said that changes in industrial competitiveness and credit rating are also related to a company's industrial competitive position. In other words, the higher the industrial competitive position of a company with a changed credit rating in an industry with low competitiveness, the stronger the influence of the credit rating change will be.

The presence or absence of a company's credit rating and rating adjustment directly affect the company's investment return and capital raising costs and also affect the capital structure policies of competing companies in the same industry. The capital structure policies of these companies are of significant interest to corporate stakeholders such as investors, management, and government officials. However, there are few studies in the domestic academic community on the effect of credit ratings and rating adjustments on corporate capital structure policies in a competitive environment. In domestic studies, there are not many companies with credit ratings, and the analysis period is short, so the empirical results on credit ratings and capital structure are weak. Therefore, this study analyzes the effect of credit rating and industry competitiveness on capital structure and adjustment speed. Through these attempts, this study intends to expand the research area in the fields of credit rating and capital structure and suggest implications for credit rating policy.

II. MODELS AND VARIABLES

This study intends to analyze the effect of industrial competition on the speed of capital adjustment among companies with credit ratings. First, the following equation (1) is established to measure and analyze whether companies with credit ratings have an important influence on the capital structure decision and the speed of the capital adjustment.

$$L_t = \beta_0 + \beta_1 L_{t-1} + \beta_2 MB_{t-1} + \beta_3 TANG_{t-1} + \beta_4 PROF_{t-1} + \beta_5 DEPA_{t-1} + \beta_6 SIZE_{t-1} + \beta_7 SALES_{t-1} + \varepsilon_t \quad (1)$$

In Equation (1), the dependent variable is the leverage (L_t) of the year t, the explanatory variable is the 1st lag leverage (L_{t-1}), and the control variable is composed of 6 1st lag determinants of the capital structure. In other words, it consists of variables that are found to be those giving significant effect on the capital structure as claimed in the previous studies. Rajan and Zingales (1995) analyzed capital structure determinants for G7 countries using international data, and claimed that M/B ratio, tangible ratio, profitability ratio, and company size are common variables that affect capital structure. Fama and French (2002) said that the non-debt tax reduction effect due to depreciation also affects the capital structure.

First, the leverage ratio (L_{t-1}) is measured as [(total debt in year t-1)/(total debt in year t-1 + market capitalization of equity capital in year t-1)], and M/B ratio (MB_{t-1}) is [(total debts in year t-1 + market capitalization of equity in year t-1)/(total assets in year t-1)], and the tangible ratio ($TANG_{t-1}$) is measured as [(inventory assets in year t-1 + tangible assets in year t-1)/(total assets in year t-1)], and the profitability ratio ($PROF_{t-1}$) is measured as [(EBITDA in year t-1)/(total assets in year t-1)]. The depreciation expense ratio ($DEPA_{t-1}$) is measured as [(depreciation expense in year t-1)/(total assets in year t-1)], and the size of the company ($SIZE_{t-1}$) is measured as [total assets in year t-1 (unit: 1 million won)], and the sales growth rate ($SALES_{t-1}$) is measured as [(sales in year t-1 - sales in year t-2)/(sales in year t-2)]. In addition, when estimating Equation (1), credit ratings and industry competition may be different for each company, so to control these problems, company dummy, year dummy and industry dummy were added.

In order to analyze the effect of a corporate credit rating on the speed of capital adjustment according to the degree of industrial competition, a model such as Equation (2) is established.

$$L_t = \gamma_0 + \gamma_1 L_{t-1} + \gamma_2 CRF \times HHI_{t-1} + \gamma_3 Top25\%CRF \times HHI_{t-1} + \gamma_4 Bottom25\%CRF \times HHI_{t-1} + \varepsilon_t \quad (2)$$

This study examines the interaction variable of credit rating companies and industry concentration, the interaction variable of industry competition among the top 25% in sales among credit rating companies, and the capital adjustment speed of companies in the bottom 25% in sales among credit rating companies. Competitiveness is measured using three interaction variables that are cross-variables, and capital structure

policies such as cash holdings and debt adjustment according to the level of industry competition based on sales are examined.

In Equation (2), industry concentration was measured by Equation (3) Herfindahl-Hirschman Index (HHI), and the effect of rating downgrade was analyzed according to the level of competition in the market. HHI in Equation (3) is calculated by adding up the squares of each company's market share as follows. In general, a market with HHI less than 1,500 is classified as a moderately concentrated market, a market between 1,500 and 2,500 as a slightly concentrated market, and a market with HHI above 2,500 as a highly concentrated market.

$$\mathrm{HHI} = \sum_{i=1}^{k} (\mathrm{MarketShare}_i)^2 \quad (3)$$

III. DATA AND DESCRIPTIVE STATISTICS

In this study, sample companies are selected according to the following criteria among companies listed on the Korea Stock Exchange from January 1, 2005 to December 31, 2020. First, we excluded companies for which financial and stock price data from January 1, 2005 to December 31, 2020 are not available from KIS Value Library, FnGuide, and TS2000. In addition, financial industries such as banking, securities, and insurance are excluded from the sample companies because they differ from general manufacturing industries in terms of capital structure, business methods, and government regulatory supervision. Companies that have been delisted during the analysis period are also excluded from the sampling, and companies that have been merged or managed are also excluded from the sampling because there is a problem with the continuity of financial data. In addition, companies with less than 1 billion won in total assets or no sales may generate outliers for variables, so they are excluded from the sampling, and the 1% above and below for each variable were winsorized to control the effect of the outliers on the analysis results. The number of companies that meet the above conditions and have a credit rating is 2,568, of which the number of companies in the top 25% in sales is 606 and 682 companies are in the bottom 25% in sales.

Table 1 shows basic statistics[1)] such as mean, standard deviation, median, minimum and maximum values for leverage and company characteristic variables of sample companies. These variables are used as explanatory variables and control variables for analyzing the analysis model. The average leverage ratio (L_{t-1}) in year t-1 is 68.62%, which is smaller than the median 69.11%. Among the company characteristic variables, the average M/B ratio (MB_{t-1}) in year t-1 is 0.8857, the average tangible ratio ($TANG_{t-1}$) in year t-1 is 46.92%, and the average profitability ratio ($PROF_{t-1}$) in year t-1 is 9.83% and average depreciation ratio ($DEPA_{t-1}$) in year t-1 is 0.65%, the average company size ($SIZE_{t-1}$) in year t-1 is 27.5368, and the average sales growth rate ($SALES_{t-1}$) in year t-1 was found to be 9.746%. All of the company characteristic variables do not show much difference when compared with the median, indicating that the stability of the samples, such as the sampling distribution, is high.

Table 1: Descriptive statistics for the whole sample

Variable	Average	Median	Standard deviation	Minimum value	maximum value
L_{t-1}	0.6862	0.6911	0.2463	0.0336	0.9976
MB_{t-1}	0.8857	0.8576	0.3217	0.3205	1.9886
$TANG_{t-1}$	0.4692	0.4604	0.2009	0.0009	0.9005
$PROF_{t-1}$	0.0983	0.0889	0.0656	-0.1388	0.3963
$DEPA_{t-1}$	0.0065	0.0032	0.0104	0.0001	0.0890
$SIZE_{t-1}$	27.5368	27.1855	3.9009	22.2429	31.3064
$SALES_{t-1}$	0.0976	0.0908	0.3514	-0.9843	3.9427

Note) All variables are presented by winsorizing 1% extreme values from top and bottom

Table 2 shows the correlation between variables using the Pearson correlation coefficient. First, M/B ratio has a significant negative (-) effect on the leverage ratio, the tangible ratio has a significant positive (+) effect, the profitability ratio has a significant negative (-) effect, and depreciation ratio has a significant negative (-) effect. It was found that the company size had a significant positive (+) effect, and the sales growth rate had a significant negative (-) correlation. Therefore, all six variables were found to have a significant correlation with leverage, and it can be said that they have high relevance and reliability as control variables in setting up the analysis model.

Table 2: Correlation coefficients

Variable	L_{t-1}	MB_{t-1}	$TANG_{t-1}$	$PROF_{t-1}$	$DEPA_{t-1}$	$SIZE_{t-1}$	$SALES_{t-1}$
L_{t-1}	1						
MB_{t-1}	-0.269**	1					
$TANG_{t-1}$	0.217**	0.108	1				
$PROF_{t-1}$	-0.221**	0.183**	0.258**	1			
$DEPA_{t-1}$	-0.113**	0.196*	0.139**	0.242**	1		
$SIZE_{t-1}$	0.088*	0.217**	0.118**	0.109**	0.183*	1	
$SALES_{t-1}$	-0.175**	0.185**	0.185**	0.266**	0.154*	0.233**	1

Note) The above are Pearson's correlation coefficients of major variables, and ** and * indicate significance at 1% and 5% levels (both sides), respectively.

IV. EMPIRICAL RESULTS

This section empirically analyzes the effect of a company's credit rating and industrial competitiveness on its capital structure and its adjustment speed. According to the methodology of Flannery and Rangan (2006), in order to analyze the effect on the capital structure using sample companies with credit ratings, conflict theory variables are considered and analyzed as control variables. In addition, the speed of capital adjustment is measured directly by considering the conflict theory variables as control variables.

Table 3: Effect of credit rating on corporate capital adjustment speed - entire samples

Classification		Model 1	Model 2
Constant term	β_0	0.704 (1.56)	0.727* (1.68)
L_{t-1}	β_1		0.196*** (3.86)
MB_{t-1}	β_2	-0.097* (-1.73)	-0.113* (-1.79)
$TANG_{t-1}$	β_3	0.011* (1.85)	0.013* (1.93)
$PROF_{t-1}$	β_4	-0.450** (-1.99)	-0.462** (-2.06)
$DEPA_{t-1}$	β_5	-1.463 (-1.60)	-1.483* (-1.67)
$SIZE_{t-1}$	β_6	0.135* (1.85)	0.128* (1.80)
$SALES_{t-1}$	β_7	-0.205** (-2.31)	-0.218** (-2.40)
Adjustment speed (θ)	$1-\beta_1$		0.804
Firmeffect		included	included
Yeareffect		included	included
Industryeffect		included	included
Number of observations		2,568	2,568
Adjusted $-R^2$		0.250	0.286
F − value		524.83***	576.94***

Note) ( ) indicates the t-value to which White-corrected standard errors of White(1980) are applied considering the heteroscedasticity of the White (1980)' errors, and ***, **, and * indicate the significance at the level of 1%, 5%, and 10% levels (both sides), respectively.

Table 3 shows the results of analyzing the effect of credit rating companies on capital adjustment speed for the entire samples. First, looking at the analysis results for Model 1, the conflict theory variables, growth

opportunity (MB_{t-1}), tangibility ratio ($TANG_{t-1}$), profitability ratio ($PROF_{t-1}$), depreciation ratio ($DEPA_{t-1}$), company size ($SIZE_{t-1}$), and sales growth rate ($SALES_{t-1}$) were found to have a significant effect on the speed of capital adjustment at the level of 5~10%. As a result of analyzing how much capital structure is adjusted for only companies with credit ratings using the conflict theory variable that has a significant effect as a control variable, the regression coefficient (β_1) of the leverage ratio (L_{t-1}) in year t-1 is estimated to be 0.196 that the capital adjustment speed ($\theta=1-\beta_1$) is measured to be 0.804. The capital adjustment rate (θ) of 0.804 means that if the actual leverage ratio deviates from the target leverage ratio, the gap will be partially adjusted by 80.4% every year.

Table 4 shows the results of comparative analysis of the effects of credit rating companies on capital adjustment speed by classifying them into top 25% in sales and companies in the bottom 25% in sales. The capital adjustment speed ($\theta=1-\beta_1$) of companies in the top 25% in sales was 42.8%, which was slower than the speed of capital adjustment ($\theta=1-\beta_1$) of companies in the bottom 25% in sales, which is 78.4%. This means that among companies with credit ratings, companies in the top 25% in sales adjust their leverage slower than companies in the bottom 25% in sales. Companies in the bottom 25% in sales reduces the leverage preemptively in order to prevent the decrease of credit rating or earnings in the next year, so their capital adjustment speed is fast. On the other hand, companies in the top 25% in sales can maintain their target credit ratings and earnings for the next year, meaning they don't necessarily need to increase their leverage. In other words, the management change their leverage asymmetrically in response to changes in credit ratings and earnings.

Table 4: Effect of credit rating on capital adjustment speed of the company

Classification		Companies in the top 25% in sales	Companies in the bottom 25% in sales
Constant term	β_0	0.695*** (3.25)	0.726** (2.36)
L_{t-1}	β_1	0.572*** (4.03)	0.216*** (3.75)
MB_{t-1}	β_2	-0.120* (-1.86)	-0.086* (-1.68)
$TANG_{t-1}$	β_3	0.038* (1.73)	0.014* (1.69)
$PROF_{t-1}$	β_4	-0.505*** (-2.88)	-0.537*** (-2.64)
$DEPA_{t-1}$	β_5	-1.516* (-1.77)	1.386 (1.55)
$SIZE_{t-1}$	β_6	0.137** (2.41)	0.135** (2.34)
$SALES_{t-1}$	β_7	-0.220** (-2.39)	-0.207** (-2.44)
Adjustment speed (θ)	$1-\beta_1$	0.428	0.784
Firmeffect		included	included
Yeareffect		included	included
Industryeffect		included	included
Number of observations		606	682
Adjusted $-R^2$		0.398	0.217
F − value		254.50***	167.48***

Note) ( ) indicates the t-value to which White-corrected standard errors of White(1980) are applied considering the heteroscedasticity of the White (1980)' errors, and ***, **, and * indicate the significance at the level of 1%, 5%, and 10% levels (both sides), respectively.

Table 5 analyzes the effect of credit rating companies on the speed of capital adjustment according to industry competitiveness. It was found that the interaction variable (CRF × HHI) of credit rating companies and industry concentration had a significant negative (-) effect on the leverage ratio (L_t) at the level of 5%. It can be

said that companies with credit ratings and highly competitive industries adhere to conservative capital structure policies rather than the policy to expand investment and reduce debt by increasing the use of debt. In addition, the industry concentration interaction variables (Top25%CRF × HHI) of credit-rated companies and companies in the top 25% in sales and the industry concentration interaction variable (Bottom25%CRF × HHI) of credit-rated companies and companies in the bottom 25% in sales were both significant negative effect at the level of 5% in the leverage ratio (L_t). This can be said that credit rating companies in the top 25% in sales, which are highly competitive in the industry, also adhere to a conservative capital structure policy rather than a policy to expand investment and reduce debt by increasing the use of debt.

The leverage ratio (L_{t-1}) of [Model 1~Model 3] has a significant positive (+) effect on the leverage ratio at the 1% level, and the capital adjustment speed ($\theta=1-\gamma_1$) was found to be 55.8%, 39.2%, and 70.2%, respectively. This means that companies with a strong competitive position in the top 25% in sales respond with a conservative capital structure policy to those in a similar competitive position, and the companies in the bottom 25% in sales with a similar competitive position in the same industry (bottom 25% in sales) adhere to a more aggressive capital structure policy. In other words, it was found that the companies in the bottom 25% in sales with high HHI maintained significantly lower cash holding ratio than those in top 25% in sales with high HHI, and adjusted debt faster when the actual leverage ratio deviates from the target leverage ratio. In other words, the management elects to reduce costs such as capital cost through debt adjustment rather than creating jobs through increased investment because companies that have failed to achieve their target sales due to severe industry competition have increased uncertainty about the future due to reduced profits.

Table 5: Effect of credit ratings according to industry competitiveness on the speed of corporate capital adjustment

Classification		Model 1	Model 2	Model 3
Constant term	γ_0	0.637*** (3.08)	0.629*** (3.12)	0.685*** (2.96)
L_{t-1}	γ_1	0.442*** (3.39)	0.608*** (3.16)	0.298*** (3.57)
$CRF \times HHI_{t-1}$	γ_2	-0.036** (-2.45)		
$Top25\%CRF \times HHI_{t-1}$	γ_3		-0.483** (-2.36)	
$Bottom25\%CRF \times HHI_{t-1}$	γ_4			-0.025** (-2.52)
Adjustment speed (θ)	$1-\gamma_1$	0.558	0.392	0.702
Firmeffect		included	included	included
Yeareffect		included	included	included
Industryeffect		included	included	included
Number of observations		2,568	2,568	2,568
$Adjusted - R^2$		0.349	0.327	0.386
$F - value$		716.29***	695.14***	769.52***

Note) ( ) indicates the t-value to which White-corrected standard errors of White(1980) are applied considering the heteroscedasticity of the White (1980)' errors, and ***, **, and * indicate the significance at the level of 1%, 5%, and 10% levels (both sides), respectively.

V. CONCLUSION AND DISCUSSION

This study empirically analyzed the effect of credit ratings and industry competitiveness on the speed of capital adjustment for companies with credit ratings among companies listed on the Korea Exchange from January 1, 2005, to December 31, 2020. The main analysis results are as follows. First, growth opportunity, tangible ratio, profitability ratio, depreciation ratio, company size, and sales growth rate, which are variables of the conflict theory, all significantly affected leverage. In addition, when the actual leverage ratio deviates from the target leverage ratio, it was found that the relevant companies partially adjust the gap by 80.4% annually. Second, among companies with credit ratings, the leverage adjustment speed of the companies in the top 25% in sales was slower than that of those with the bottom 25% in sales. Companies in the bottom 25% in sales adjust

their leverage quickly because they preemptively reduce their leverage to prevent a target credit rating downgrade or earnings decrease in the next year. In contrast, since the companies in the top 25% in sales cam maintain the target credit rating and sales in the next year, they did not need to increase the leverage. Third, credit-rated companies with severe industry competition adhere to conservative capital structure policies rather than policies to expand investment and reduce debt by increasing debt usage. Credit-rated companies with severe industry competition in the top 25% in sales also adhered to the conservative capital structure policy rather than the policy of expanding investment and reducing debt by increasing the debt. In addition, it was found that the companies in the bottom 25% in sales with high HHI maintain a significantly lower cash holding ratio than those in the top 25% in sales with high HHI and adjust debt faster when the actual leverage ratio deviates from the target leverage ratio. This shows that the management elects to reduce costs, such as capital costs through debt adjustment rather than job creation through investment, due to severe industrial competition and companies that failed to achieve their target sales will face more uncertainty about the future due to a decrease in profits.

In conclusion, for the companies with credit ratings among those listed on the Korea Exchange's stock market, credit ratings and industrial competition significantly affect the speed of capital adjustment. The management changes leverage asymmetrically in response to credit ratings and industrial competition. They have target credit ratings, and the credit ratings are important determinants of the corporate structure together with income tax, bankruptcy cost, agency cost and asymmetric information. However, since this study included only companies listed on the Korea Exchange, excluding companies listed on the KOSDAQ, and analyzed only companies with credit ratings among listed companies on the stock market, there are some limitations on generalizing the interpretation of the analysis results. Therefore, in the subsequent studies, if the number of companies with credit ratings among companies listed on the KOSDAQ increases, the studies using various analysis methods need to be carried out. The control variables and analysis methods used in this study need to be more diversified.

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