Research Paper

Effect of a Company's Credit Rating Downgrade on Changes in Leverage, Debt Issuance and Equity Capital Raising

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ABSTRACT: *This study examines the effect of credit rating downgrade on changes in debt issuance and equity capital raising for companies with credit ratings among companies listed on the Korea Exchange from January 1, 2005 to December 31, 2020. The effect was analyzed empirically. First, if a company's credit rating downgrades, the cost of capital increases in attracting capital in the capital raising market and gives a signal to the market that the future business prospect is uncertain, making investment attraction at a disadvantage. Therefore, the management gives a signal to the market that it manages corporate risk through austerity fiscal policy as well as stable business operation through cost reduction such as reducing debt rather than investment internally. Second, the management is stabilizing the business by reducing costs by reducing debt rather than investing, and gives a signal to the market that it is managing the company's risk. In addition, if a company's credit rating downgrades, there is no change in equity capital raising by issuing stocks or reducing stocks. In other words, if there is an incentive to lower a company's credit rating, such as a deterioration in profitability or a decrease in sales, it will overcome the crisis by prioritizing capital raising through the company's internal reserves and loans to financial institutions rather than issuing stocks or reducing stocks. This supports the capitalization sequence theory.*
KEYWORDS: Credit rating, leverage, debt issuance, equity capital raising

I. INTRODUCTION AND LITERATURE REVIEW

Most listed companies consider the cost of capital as an important consideration in raising capital. Although raising capital such as secured loans and credit loans is one way, they usually try to reduce the cost of capital by getting good credit ratings. Credit rating is useful information that can show a company's creditworthiness and has an important influence on the corporate value, so it offers a company's competitiveness in the capital raising market. Listed companies can know in advance that their credit ratings will go down, so they calculate the cost of capital in the future capital raising market and set up a capital raising plan to secure the necessary investment amount and operating capital by issuing stocks or using internal capital. Kisgen (2006) proposed the hypothesis that credit ratings significantly affect capital structure. He said that since credit ratings have a discontinuous effect on the cost of capital and the company value, the company value has a discontinuous relationship with the capital structure. It is said that the credit rating directly affects the capital structure because companies with imminent credit rating adjustment have less net debt issuance compared to stock issuance compared to companies that are not in impending credit rating adjustment. He also said that credit rating is an important variable that can further explain the capital structure in the conflict theory and the debt issuance sequence theory. Lang and Stultz (1992) stated that the more competitive firms within an industry, the greater the effect of bankruptcy disclosures of firms with high competitiveness on competitive firms within the industry. It can be said that industry competitiveness and credit rating changes are also related to a company's competitive position in the industry. In other words, a company with low competitiveness will receive a stronger influence from the credit rating change as its competitive position increases due to a change in credit rating in the industry. Rating adjustments such as a company's credit rating downgrade directly affect a company's investment return

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and capital raising costs and influence the capital structure policies of competing companies in the same industry. Such corporate capital structure policies are important to corporate stakeholders such as investors, management, and government officials. However, there are still few studies in the domestic academic community on the effect of credit rating downgrade on corporate capital structure policies in a competitive environment. In domestic studies, there are few companies with credit ratings, and the analysis period is short, so the empirical results on credit ratings and capital structure are weak.

Based on the preceding research described above, this study is based on the reduction in the credit rating of companies listed on the Korea Exchange's stock market from January 1, 2005, to December 31, 2020, on leverage, debt issuance, and equity capital. We want to analyze the impact of procurement changes. Through these attempts, we intend to expand the research area in the credit rating and capital structure field and suggest implications for credit rating policy.

II. MODELS AND VARIABLES

In this study, an estimation model as shown in Equation (1) is established to analyze the effect of credit rating downgrade on changes in leverage, debt issuance and equity debt issuance.

$$\Delta L_t = \alpha_0 + \alpha_1 CR_{t-1}^{down} + \alpha_2 MB_{t-1} + \alpha_3 TANG_{t-1} + \alpha_4 PROFIT_{t-1} + \alpha_5 DEPA_{t-1} + \alpha_6 SIZE_{t-1} + \alpha_7 SALES_{t-1} + \varepsilon_t \quad (1)$$

In Equation (1), the dependent variable, the change in leverage (ΔL_t), is measured as [(t-year leverage(L_t)) - t-1 year leverage(L_{t-1})], and the t-year leverage(L_t) is [(t year liabilities)/(t year) Total liabilities + market capitalization of equity capital in year t)] The dummy (CR_{t-1}^{down}) for year t-1 credit rating downgrade used as an explanatory variable assigns a value of 1 to companies with a downgrade in year t-1, and other companies is a dummy variable given a value of 0. Kisgen (2009) stated that companies are sensitive to credit rating downgrades but not insensitive to the rise in order to avoid disadvantages due to credit rating change. Therefore, the credit rating downgrade dummy (CR_{t-1}^{down}) is expected to have a negative (-) effect on the leverage change (ΔL_t) in the next year.

As a control variable, the M/B ratio (MB_{t-1}) is measured as [(total liabilities in year t-1 + market capitalization in equity capital in year t-1)/(total assets in year t-1)], and the tangible ratio ($TANG_{t-1}$) is [(Inventories in year t-1 + tangible assets in year t-1)/(total assets in year t-1)], and the profitability ratio ($PROF_{t-1}$) is [(EBITDA in year t-1)/(total assets in year t-1)]], and the depreciation ratio ($DEPA_{t-1}$) is measured as [(t-1 year depreciation)/(t-1 year total assets)], and the company size ($SIZE_{t-1}$) is measured as ln[t-1 year total assets (1 million won))], and the sales growth rate ($SALES_{t-1}$) is measured as [(t-1 year sales - t-2 year sales)/(t-2 year sales)]. In addition, when estimating Equation (1), capital structure policies such as leverage, debt issuance, and equity capital raising among companies with lower credit ratings may differ for each company, we added a company dummy, a year dummy and an industry dummy in order to control this problem.

In this study, a logit model, as shown in Equations (2) to (5), was established to analyze the effect of a credit rating downgrade on changes in capital raising in the following year. If the source of capital raising is divided into debt issuance and equity capital raising, debt issuance changes through debt issuance and debt reduction, and equity capital raising changes through stock issuance and stock reduction. And the issuance and reduction criteria for debt and stock are defined as the case of issuance or reduction of debt and stock compared to the previous year according to the methodology of Hovakimian et al. (2001). For example, debt issuance refers to an increase in debt compared to the previous year, and a decrease in debt refers to a decrease in debt compared to the previous year.

$$In[\frac{Pr(Debt\ (issue\ )_t)}{1-Pr(Debt\ (issue\ )_t)}] = \beta_0 + \beta_1 CR_{t-1}^{down} + \beta_2 MB_{t-1} + \beta_3 TANG_{t-1} + \beta_4 PROFIT_{t-1} + \beta_5 DEPA_{t-1} \qquad (2)$$
$$+\beta_6 SIZE_{t-1} + \beta_7 SALES_{t-1} + \epsilon_t$$

$$In[\frac{Pr(Debt\ (reduce\ )_t)}{1-Pr(Debt\ (reduce\ )_t)}] = \beta_0 + \beta_1 CR_{t-1}^{down} + \beta_2 MB_{t-1} + \beta_3 TANG_{t-1} + \beta_4 PROFIT_{t-1} + \beta_5 DEPA_{t-1} \qquad (3)$$
$$+\beta_6 SIZE_{t-1} + \beta_7 SALES_{t-1} + \epsilon_t$$

$$In[\frac{Pr(Equity\ (issue\ )_t)}{1-Pr(Equity\ (issue\ )_t)}] = \beta_0 + \beta_1 CR_{t-1}^{down} + \beta_2 MB_{t-1} + \beta_3 TANG_{t-1} + \beta_4 PROFIT_{t-1} + \beta_5 DEPA_{t-1} \qquad (4)$$
$$+\beta_6 SIZE_{t-1} + \beta_7 SALES_{t-1} + \epsilon_t$$

$$In[\frac{Pr(Equity\ (reduce\ _t)}{1-Pr(Equity\ (reduce\ )_t)}] = \beta_0 + \beta_1 CR_{t-1}^{down} + \beta_2 MB_{t-1} + \beta_3 TANG_{t-1} + \beta_4 PROFIT_{t-1} + \beta_5 DEPA_{t-1} \qquad (5)$$
$$+\beta_6 SIZE_{t-1} + \beta_7 SALES_{t-1} + \epsilon_t$$

$Pr(Debt(issue)_t)$ in Equation (2) represents the probability that the company will have a value of 1 if it issues debt in the next year, otherwise 0. $Pr(Debt(reduce)_t)$ in Equation (3) represents the probability that the company will have a value of 1 if it reduces the debt in the next year, otherwise 0. $Pr(Equity(issue)_t)$ in Equation (4) represents the probability that the company will have a value of 1 if it issues new stocks in the next year, otherwise 0, and $Pr(Equity(reduce)_t)$ in Equation (5) represents that the company will have a value of 1 if it decreases stocks in the next year, otherwise 0. Among the explanatory variables, the credit rating downgrade dummy (CR_{t-1}^{down}) is a dummy variable having a value of 1 if the credit rating declines in year t-1, otherwise 0.

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.

<Table 1> Descriptive statistics for the whole sample

Variable	Average	Median	Standard deviation	Minimum value	maximum value
ΔL_t	-0.0159	-0.0163	0.1402	-0.6814	0.9240
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 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 leverage change ratio (ΔL_t) in year t is −1.59%, which is larger than the median −1.63%. 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 2> Correlation coefficients

Variables	ΔL_t	CR_{t-1}^{down}	MB_{t-1}	$TANG_{t-1}$	$PROF_{t-1}$	$DEPA_{t-1}$	$SIZE_{t-1}$	$SALES_{t-1}$
ΔL_t	1							
CR_{t-1}^{down}	-0.005*	1						
MB_{t-1}	-0.105**	-0.013	1					
$TANG_{t-1}$	0.039*	0.025	0.108	1				

$PROF_{t-1}$	-0.076**	-0.176**	0.183**	0.258**	1			
$DEPA_{t-1}$	-0.020*	-0.019**	0.196*	0.139**	0.242**	1		
$SIZE_{t-1}$	0.107**	0.002	0.217**	0.118**	0.109**	0.183*	1	
$SALES_{t-1}$	-0.119*	-2.431*	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.

<Table 2> shows the correlation between variables using the Pearson correlation coefficient. First, the credit rating downgrade has a significant negative (-) correlation at the 5% level in the leverage change, the M/B ratio has a significant negative (-) effect, and the tangible ratio has a significant positive (+), the profitability ratio has a significant negative (-) effect, the depreciation ratio has a significant negative (-) effect, and the size of the company has a significant positive (+) effect, and the sales growth rate was found to have 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 a control variables in setting up an analysis model.

IV.   EMPIRICAL RESULTS

This section analyzes the impact of a credit rating downgrade on changes in capital structure, and also analyzes the asymmetric effect of a credit rating downgrade on changes in debt issuance and equity capital raising. According to the methodology of Kisgen (2009), we analyzed whether a credit rating downgrade has a significant negative (-) effect on changes in the capital structure in the following year.

<Table 3> Effect of credit rating downgrade on the change in the capital structure-Overall sample

Classification	Model 1	Model 2
Constant term	-0.016*** (-4.69)	0.316*** (6.98)
CR_{t-1}^{down}	-0.005*** (-2.63)	-0.006** (-2.51)
MB_{t-1}		-0.002* (-1.70)
$TANG_{t-1}$		0.079** (2.41)
$PROF_{t-1}$		-0.193** (-2.37)
$DEPA_{t-1}$		-0.795* (-1.76)
$SIZE_{t-1}$		0.005*** (2.70)
$SALES_{t-1}$		-0.153** (-2.05)
Firm effect	Inclusive	Inclusive
Year effect	Inclusive	Inclusive
Industry effect	Inclusive	Inclusive
Number of observations	2,568	2,568
$Adjusted - R^2$	0.143	0.176
F-value	257.94***	308.62***

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 a credit rating downgrade on changes in the capital structure. [Model 1] shows that a credit rating downgrade (CR_{t-1}^{down}) has a significant negative (-) effect at the 1% level on the change in leverage in the next year (ΔL_t). [Model 2] shows that a credit rating downgrade(CR_{t-1}^{down}) has a significant negative (-) effect at the 5% level on the change in leverage in the next year (ΔL_t) as a result of analysis including control variables. In other words, if a company's credit rating declines, the cost of capital increases in attracting capital from the capital raising market, and it plays a role of giving a signal to the market that the future business prospect is uncertain, making it disadvantageous in attracting investment. Therefore, Tanle 3 shows that the management gives a signal to the market that the company manages risk through austerity fiscal policy as well as stable business operation through cost reduction such as reducing debt rather than investment.

Among the control variables, the M/B ratio (MB_{t-1}), a growth variable, has a significant negative (-) effect at the 10% level on the change in leverage in the next year (ΔL_t), and the tangible ratio ($TANG_{t-1}$) had a significant positive effect at the 5% level (+), the profitability ratio ($PROF_{t-1}$) had a significant negative (-) effect at the 5% level, and the depreciation ratio ($DEPA_{t-1}$) had a significant negative (-) effect at the 10% level, the company size ($SIZE_{t-1}$) had a significant positive (+) effect at the 1% level, and the sales growth rate ($SALES_{t-1}$) had a significant negative (-) effect at the 5% level.

<Table 4> Effect of credit rating downgrade on changes in the debt issuance

	Debt issuance	
	Debt issuance	Debt reduction
Constant term	-1.805*** (-3.99)	-2.486*** (-4.93)
CR_{t-1}^{down}	-0.153* (-1.92)	0.190* (1.80)
MB_{t-1}	-0.061 (-0.42)	0.153 (1.15)
$TANG_{t-1}$	0.467** (1.99)	-0.824*** (3.52)
$PROF_{t-1}$	-1.604** (-2.13)	1.376* (1.71)
$DEPA_{t-1}$	-0.921 (-0.25)	1.107 (1.08)
$SIZE_{t-1}$	0.105*** (5.20)	-0.063*** (-2.72)
$SALES_{t-1}$	-0.568*** (-3.17)	0.605*** (3.24)
Number of observations	2,568	2,568
χ^2	75.62***	94.74***
$Pseudo\ R^2$	0.1765	0.1973

<Table 5> Effect of credit rating downgrade on changes in the equity capital raising

	Equity capital raising	
	Stock issuance	Stock reduction
Constant term	-1.603*** (-3.86)	-2.241*** (-3.47)
CR_{t-1}^{down}	0.210 (1.26)	-0.475 (-1.40)
MB_{t-1}	0.458*** (3.02)	1.053** (2.47)
$TANG_{t-1}$	-0.566** (-2.38)	0.291 (0.75)

$PROF_{t-1}$	-1.519* (-1.82)	1.801*** (-2.66)
$DEPA_{t-1}$	-1.297* (-1.85)	-1.827 (-1.53)
$SIZE_{t-1}$	-0.023 (-1.47)	0.167** (2.09)
$SALES_{t-1}$	-0.463** (-2.28)	0.506** (2.45)
Number of observations	2,568	2,568
χ^2	38.40***	31.98***
$Pseudo\ R^2$	0.1652	0.2073

Note) ( ) indicates the z-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 4> and <Table 5> show the results of analyzing the effects of a credit rating downgrade on changes in debt issuance and equity capital raising using a logit model. First, looking at the results of analyzing the effect of a credit rating downgrade (CR_{t-1}^{down}) on the debt issuance and debt reduction probability, which are the source of debt issuance in the next year, the credit rating downgrade had a significant negative(-) effect at 10% level in the debt issuance probability in the next year while had a significant positive (+) effect at the 10% level on the debt reduction probability. This means that if a credit rating declines, it is more likely to reduce leverage through debt reduction while curbing debt issuance in the following year. In addition, the results of analyzing the effect of a credit rating downgrade (CR_{t-1}^{down}) on the probability of stock issuance and stock reduction, which are sources of equity capital raising in the following year, show that the credit rating downgrade does not have any significant effect on the probability of stock issuance eother stock reduction in the following year.

In conclusion, if a company's credit rating declines, the cost of capital increases in attracting capital from the capital raising market and it serves as a signal to the market that the future business prospect is uncertain, making it unfavorable to attracting investment, so the management tries to give a signal to the market that the company is managing risk through austerity fiscal policy as well as stable business operation through cost reduction such as debt reduction. In addition, it was found that even if the credit rating declines, there was no change in equity capital raising, such as issuing stocks or reducing stocks. This is because, if there is an incentive to lower the credit rating, such as a deterioration in profitability or a decrease in sales, it means that the management will overcome the crisis by prioritizing capital raising such as corporate internal reserves and loans from financial institutions rather than issuing stocks or reducing stocks. This also supports the procurement sequence theory.

V. CONCLUSIONS AND DISCUSSION

This study examines the effect of credit rating downgrade on changes in debt issuance and equity capital raising for companies with credit ratings among companies listed on the Korea Exchange from January 1, 2005, to December 31, 2020. The effect was empirically analyzed, and the main analysis results are as follows.

First, it was found that the credit rating downgrade had a significant effect on the leverage change. In other words, if a company's credit rating declines, the cost of capital increases in attracting capital from the capital raising market and signals to the market that the future business prospect is uncertain, which is disadvantageous in attracting investment. Therefore, the management signals to the market that it is managing corporate risk through austerity fiscal policy and stable business operation through cost reduction, such as reducing debt rather than investment internally.

Second, the credit rating downgrade suppressed debt issuance in the following year and reduced leverage through debt reduction, but it was found that the probability of stock issuance and stock reduction in the next year was not significant because management is stabilizing the business by reducing costs by reducing debt rather than investing and gives the market a signal to manage the company's risk. In addition, if the credit rating declines, there is no change in equity capital raising by issuing stocks or reducing stocks. This is because if there is an incentive to lower a company's credit rating, such as a deterioration in profitability or a decrease in sales, the management prioritizes raising capital through internal reserves and loans from financial institutions rather than issuing stocks and reducing stocks to overcome the crisis. This also supports the procurement sequence theory.

In conclusion, it can be said that, among companies listed on the Korea Exchange's stock market, the credit rating downgrade significantly has an effect on change in their leverage, debt raising, and equity capital raising. From the perspective of the management, it can be said that clear financial policies are needed to change leverage or raise capital in the event of a credit rating downgrade. As this study included only companies listed on the Korea Exchange with credit ratings, excluding companies listed on the KOSDAQ, there is a limit to generalizing the interpretation of the analysis results of this study. Therefore, in the follow-up research, if the number of companies with credit ratings among companies listed on the KOSDAQ increases, it is necessary to use various analysis methods and diversify the control variables and analysis methods used in this study.

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