The effects of credit ratings on capital structure: Evidence from Korea

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ABSTRACT

This paper shows evidence that firms near either a plus(+) or minus(-) notch ratings issue less debt on average than firms with a zero(0) notch ratings, because the former have more acute proximity to either a ratings upgrade or downgrade than the latter. Firms near a plus(+) notch ratings that are near an upgrade choose to issue equity instead of debt in order to obtain the benefit of a higher rating, and firms near a minus(-) notch ratings that are near a downgrade issue less debt in order to prevent the extra costs that result from a downgrade. Moreover, the investment grade firms that are near an downgrade to speculative grade issue less debt in order to prevent the extra costs that result from a downgrade, and the speculative grade that are near an upgrade to investment grade choose to issue equity instead of debt in order to obtain the benefit of a higher grade. The effects between credit ratings and capital structure persist significantly in the context of tradeoff and pecking order theory. These findings suggest policy implication into how credit ratings can be particularly valuable for capital structure decision; that is, credit ratings are an important aspect of capital structure decision.

Keywords: credit ratings, capital structure, notch ratings, investment grade, speculative grade

INTRODUCTION

Credit ratings have played an increasingly important role in the capital structure decisions. Managers try to issue new shares to forestall a credit rating downgrade, and strive to deduce firm's debt for upgrade from speculative grade to investment grade. Graham and Harvey (2001) find that credit ratings are the second highest concern for CFOs when determining their capital structure, with 57.1% of CFOs saying that credit ratings are important or very important in how they choose the appropriate amount of debt for their firm. Moreover, they report that credit ratings rank higher than many factors suggested by traditional capital structure theories, such as the tax advantage of interest deductibility.

Credit ratings are important for capital structure decisions, given discrete costs and benefits associated with different ratings levels. For instance, several regulations on bond investment are based directly on credit ratings. So to speak, credit rating levels affect whether particular investor groups such as banks or pension funds are allowed to invest in a firm's bonds. Credit ratings can also provide information to investors and thereby act as a signal of firm quality. If the market regards credit ratings as informative, firms will be pooled together by rating and thus a ratings change would result in discrete changes in a firm's cost of capital. Ratings changes can also trigger events that result in discrete costs and benefits for the firm, such as a change in bond coupon rate, a required repurchase of bonds, or a accessibility to the bond market. Therefore, the benefits of upgrades and costs of downgrades affect managers' capital structure decisions.

The previous studies have almost analyzed the effects of credit ratings on bond and stock returns. Hand et al. (1992) find a significant and negative average excess bond and stock returns upon the announcement of downgrade of straight bond. Ederington et al. (1987) and West (1973) find that credit ratings are significant predictors of yield to maturity beyond the information contained in publicly available financial variables and other factors that would predict yield spreads. Ederington and Goh (1998) show that credit rating downgrades result in negative equity returns and that equity analyst tends to revise earnings forecasts sharply downward following the downgrade. Moreover, Kisgen (2006) suggests the credit ratings and capital structure hypothesis which credit ratings affect firm's capital structure.

This paper analyses empirically the effects of credit ratings on capital structure of firms listed on Korea Exchange. Broad ratings is defined as ratings level including plus(+), zero(0), and minus(-) notch ratings; that is, a broad rating of AA refers to firms with notch ratings of AA+, AA0, and AA-. Firms are categorized such as near a broad rating change if they have either a plus(+) or minus(-) notch within a broad rating and not near a broad rating change if they have a zero(0) notch within a broad rating. For example, within the broad rating of AA, both AA+ and AA- notch ratings firms are defined to be near a ratings change and firms that are AA0 are not. So to speak, the AA+ and AA- notch ratings firms should have more acute proximity to a ratings change than the AA0 notch ratings firms. To explore ratings change effects further, broad ratings are categorized into investment grade (AAA~BBB-) and speculative grade (BB+~D).

The reminder of this paper proceeds as follows. Section 2 reviews the literature in this field and develops hypothesis. Section 3 provides details on the research design, section 4 shows the empirical results, and section 5 presents conclusions and policy implications of this study.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Literature Review

Kisgen (2006) suggests the credit ratings and capital structure hypothesis which credit ratings affect firm's capital structure decisions. The primary testable implication of credit ratings and capital structure hypothesis is that firms near a ratings change issue less net debt relative to net equity than firms not near a ratings change due to the discrete costs and benefits associated with different rating levels.

The credit ratings and capital structure hypothesis is distinct from financial distress arguments. The former implies that firms near either an upgrade or a downgrade will issue less debt on average than firms not near a change in rating; the latter, on the other hand, imply that firms of a given rating level will issue more debt on average if near an upgrade since they are of better credit quality. Moreover, the former implies credit rating effects for firms at all ratings levels; the latter, on the other hand, are unlikely to be significant for firms with high ratings, such as AAA, for example. The former implies discrete costs and benefits associated with a change in rating and therefore a discontinuous relationship between leverage and firm value, whereas the latter suggest no such discontinuity.

Several regulations relating to financial institution's investments in bonds are directly tied to credit ratings. Cantor and Packer (1994) observe that the reliance on ratings extends to virtually all financial regulators, including the public authorities such as oversee banks, thrifts, insurance companies, securities firms, capital markets, mutual funds, and private pensions. For example, banks have been restricted from owning speculative grade bonds since 1936 (Partnoy, 1999; West, 1973), and pension fund guidelines often restrict bond investments to investment grade bonds (Boot et al., 2003). To the extent that regulations affect the cost to investors of investing in a particular class of bond, yields on bonds with higher regulatory costs will be higher to compete with bonds that have lower regulatory costs.

Regulations may also affect the liquidity for bonds by rating. Patel et al. (1998) find that liquidity affects whether speculative grade bonds experience abnormal positive or negative returns. If firms incur higher interest rates in less liquid markets as distinguished by credit rating, there may be incentives to avoid these ratings levels. Also, at certain credit rating levels (e.g., speculative grade), during difficult economic times, a firm may not be able to raise debt capital (Stiglitz and Weiss, 1981). Firms with those credit ratings would therefore incur additional costs. Regulations generally do not distinguish between firms with or without notch ratings, because those regulations will be to focus on changes in broader ratings categories. For example, AA and AA− firms are generally treated the same from a regulatory perspective. Also, since several regulations are specific to the investment grade versus speculative grade, the effects should be greatest around this change. Moreover, firms with speculative grade ratings would be more concerned with ratings effects than investment grade firms.

Credit ratings may provide information on the quality of a firm beyond other publicly available information. Rating agencies may receive significant company information that is not public. For instance, firms may be reluctant to release information to the market that would compromise their strategic programs, in particular with regard to competitors. Credit agencies might also specialize in the information gathering and evaluation process and thereby provide more reliable measures of a firm's credit ratings. Millon and Thakor (1985) propose a model for the existence of the information gathering agencies as credit rating agencies based on information asymmetries. They argue that credit rating agencies are formed to act as screening agents, certifying the values of firms they analyze. Boot et al. (2003) argue that rating agencies could be seen as information processing agencies that may speed up the dissemination of information to financial markets.

If credit ratings contain information, they will signal overall firm quality and firms would be pooled with other firms in the same rating category. In the extreme, all firms within the same ratings group would be assessed similar default probabilities and associated yield spreads for their bonds. Firms near a downgrade in rating will then have an incentive to maintain the higher rating. Likewise, firms near an upgrade will have an incentive to obtain that upgrade to be pooled with firms in the higher ratings category.

The credit ratings and capital structure hypothesis can be explained in the context of the tradeoff theory of capital structure. The tradeoff theory argues that a firm will balance the value of interest tax shields and other benefits of debt against the costs of bankruptcy and other costs of debt to determine an optimal level of leverage. An implication of the tradeoff theory is that a firm will tend to move back toward its optimal leverage to the extent that it departs from its optimum (Fama and French, 2002).

The credit ratings and capital structure hypothesis states that different credit rating levels are associated with discrete costs and benefits to the firm. Managers will balance the rating-dependent cost and benefit against the traditional costs and benefits implied by the tradeoff theory. In certain cases, the costs associated with a change in credit rating may then result in capital structure behavior that is different from that implied by traditional tradeoff theory factors. In other cases, the tradeoff theory factors may outweigh the credit rating considerations.

The pecking order theory argues that firms will generally prefer not to issue equity due to asymmetric information costs (Myers and Majluf, 1984). Firms will prefer to fund projects first with internal funds and then with debt, and only when internal funds have been extinguished and a firm has reached its debt capacity will a firm issue equity. The pecking order model implies debt will increase for firms when investment exceeds internally generated funds and debt will fall when investment is lower than internally generated funds. The pecking order predicts a strong short-term response of leverage to short-term variations in earnings and investment.

The credit ratings and capital structure hypothesis implies that for some incremental change in leverage, a discrete cost and benefit will be incurred due to a credit rating change. Assuming that for some level of leverage both credit ratings and capital structure hypothesis and pecking order effects are material, a firm will face a tradeoff between the costs of issuing equity and the discrete cost associated with a potential change in credit rating. This conflict will exist most strongly for firms that are near a change in rating, be it an upgrade or a downgrade. Therefore, contrary to the implications of the pecking order theory, in some cases firms that are near an upgrade choose to issue equity instead of debt in order to obtain the benefits of a higher rating, and firms that are near a downgrade may avoid issuing debt to prevent the extra costs that result from a downgrade.

Hypothesis Development

To examine the effects of credit ratings on capital structure, broad ratings are defined as ratings level including (+), zero, and minus notch ratings. Firms are categorized such as near a broad rating change if they have either a plus(+) or minus(-) notch within a broad rating and not near a broad rating change if they have a zero(0) notch within a broad rating. And there is assumed that plus(+) or minus(-) notch ratings firms should have more acute proximity to a ratings change than zero(0) notch ratings firms. Therefore, credit ratings and capital structure hypotheses imply that firms close to a credit rating upgrade or downgrade will issue less debt relative to equity (or simply less debt or more equity) to either avoid a downgrade or increase the chances of an upgrade. So to speak, firms with (+) notch rating will issue less debt relative to equity to increase the benefits associated with credit rating upgrade, and firms with (-) notch rating will issue less debt relative to equity to avoid the costs associated with credit rating downgrade. So research hypothesis is as below.

H1: Firms with (+) or (-) notch ratings issue less debt relative to equity than firms with (0) notch rating.

All credit ratings(AAA~D) can be divided into investment grade(AAA~BBB-) and speculative grade(BB+~D), and so BBB- and BB+ are at the border lines between investment grade and speculative grade. Because regulations are specific to the credit ratings change between investment grade and speculative grade, the regulation effects should be greatest around this change. Moreover, firms with speculative grade would be more concerned with ratings effects than investment grade firms. Therefore, BBB- firms will issue less debt relative to equity to decrease the costs associated with credit rating downgrade from investment grade to speculative grade, BB+ firms will issue less debt relative to equity to increase the benefits associated with credit rating upgrade from speculative grade to investment grade. So research hypothesis is as below.

H2: Firms near either a investment or speculative grade issue less debt relative to equity than the other firms.

We build research hypotheses as below, to test whether credit rating effects persist in the context of traditional capital structure theories such as trade-off theory and pecking order theory.

H3: The credit ratings and capital structure hypothesis has a persistent effect in the context of the tradeoff theory and pecking order theory.

REASEARCH DESIGN

Data

The sample firms are constructed from all firms with a credit rating listed on Korea Exchange during the periods from January 1999 to December 2011 from the KIS Value Library database, according to the criterion as follows: (1) firms need to have complete financial reports from 1999 to 2011 since certain variables are lagged for a period of one fiscal year; (2) firms in financial industries (i.e., bank, securities, insurance, financial holding companies) are excluded due to their being subject to special financial regulations; (3) also excluded are M&A firms because of the continuity problems of financial data.

The total number of observations of total credit ratings (AAA～D) throughout the entire period is 2,242, the number of observations of the investment grade (AAA～BBB-) is 1,677, and the number of observations of the speculative grade (BB+～D) is 565. About 75% (or 1,677) of these total 2,242 observations involve the investment grade. Among the total credit ratings (AAA～D), the number of observations of the BBB0 notch rating is 313, which is most frequent. However, the data structure is an unbalanced panel data since there is no requirement that the observations data for credit ratings are all available for each firms throughout the entire period from the KIS Value Library database.

Model and Variable

Regression model is built as equation (1) to examine **H1** that firms with (+) or (-) notch ratings issue less debt relative to equity than firms with (0) notch rating.[1]

$$\begin{aligned} \mathrm{NDA}_t = {} & \alpha_0 + \alpha_1 \mathrm{CR}_{t-1}^{\mathrm{POM}} + \alpha_2 \mathrm{CR}_{t-1}^{\mathrm{Plus}} + \alpha_3 \mathrm{CR}_{t-1}^{\mathrm{Minus}} + \alpha_4 \mathrm{MB}_{t-1} + \alpha_5 \mathrm{TANG}_{t-1} \\ & + \alpha_6 \mathrm{PROF}_{t-1} + \alpha_7 \mathrm{DEPE}_{t-1} + \alpha_8 \mathrm{SIZE}_{t-1} + \alpha_9 \mathrm{L}_{t-1} + \mu + \lambda_t + \varepsilon_t \end{aligned} \qquad (1)$$

where NDA_t represents the net debt issue ratio in year t; $\mathrm{CR}_{t-1}^{\mathrm{POM}}$, $\mathrm{CR}_{t-1}^{\mathrm{Plus}}$, and $\mathrm{CR}_{t-1}^{\mathrm{Minus}}$ denote (+) or (-) notch rating dummy, (+) notch rating dummy, and (-) notch rating dummy in year t-1, respectively; and MB_{t-1}, TANG_{t-1}, PROF_{t-1}, DEPE_{t-1}, SIZE_{t-1}, and L_{t-1} stand for the M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and leverage ratio in year t-1, respectively; μ, λ_t, and ε_t denote firm-specific effects, time-specific effects, and error term, respectively.

In order to estimate equation (1), fixed effect model is applied after statistical tests such as the Lagrange multiplier test and the Hausman test. Chamberlain and Griliches (1984) state that although existing relations between the omitted variables and the independent variables in the fixed effects model, there is the advantage that biases do not arise in the estimate results. First, firm-specific effects (μ) and time-specific effects (λ_t) are identified, according to Lagrange multiplier test which Breusch and Pagan (1980) suggest. Also, **it is** verified whether fixed effect model is more adequate than random effect model on the ground of Hausman test. Firm-specific effects (μ) are unobservable but have a significant effect on the net debt issue ratio. They differ across firms, but are fixed for a given firm over time. In contrast, time-specific effects (λ_t) vary over time, but are the same for all firms in a given year, capturing mainly economy wide factors that are outside the firm's control.

The dependent variable is the net debt issue ratio (NDA_t), which is measured as [(year t debt change - year t equity change)/(year t capital stock)]. Year t debt change is measured as (year t non-current debt - year t-1 non-current debt), and year t equity change is measured as (year t equity - year t-1 equity).

The explanatory variables are three notch rating dummies such as (+) or (-) notch rating dummy ($\mathrm{CR}_{t-1}^{\mathrm{POM}}$), (+) notch rating dummy ($\mathrm{CR}_{t-1}^{\mathrm{Plus}}$), and (-) notch rating dummy ($\mathrm{CR}_{t-1}^{\mathrm{Minus}}$). $\mathrm{CR}_{t-1}^{\mathrm{POM}}$ takes the value 1 if a firm has (+) or (-) notch rating in year t-1and 0 otherwise, $\mathrm{CR}_{t-1}^{\mathrm{Plus}}$

[1] For the simplification of the model and the variables, the year subscript (t) is included but the individual firm subscript (i) is omitted.

takes the value 1 if a firm has (+) notch rating in year t-1and 0 otherwise, and $\mathrm{CR}_{t-1}^{\mathrm{Minus}}$ takes the value 1 if a firm has (-) notch rating in year t-1and 0 otherwise. These three notch rating dummies as proxy variables for the proximity to a rating change are expected to have negative effects on the net debt issue ratio.

The control variables are a standard set of determinants of leverage such as the M/B ratio (MB_{t-1}), tangibility ratio (TANG_{t-1}), profitability ratio (PROF_{t-1}), depreciation cost ratio (DEPE_{t-1}), firm size (SIZE_{t-1}), and leverage ratio (L_{t-1}). Rajan and Zingales (1995) argue that the M/B ratio, tangibility, profitability, and firm size are common factors of leverage, Fama and French (2002) state that depreciation expenses have the non-debt tax shield effect on leverage, and Kisgen (2006) use the lagged leverage as a control variable to test the credit ratings and capital structure hypotheses.

M/B ratio (MB_{t-1}) is measured as [(year t-1 market capitalization of equity + year t-1 total liabilities)/(year t-1 total asset)], and it is expected to have a negative effect on the net debt issue ratio as growth opportunities variable. Higher M/B ratio could be viewed as a sign of greater future growth opportunities and firms may try to protect by retaining their leverage (Hovakimian et al., 2004; Flannery and Rangan, 2006). Tangibility ratio (TANG_{t-1}) is measured as [(year t-1 inventory asset + year t-1 tangible asset)/(year t-1 total asset)], and it is expected to have a positive effect on the net debt issue ratio as a collateral value variable. Firms with greater tangible assets, potentially collateralized, are likely to have relatively lower bankruptcy costs, ant thus higher debt capacity(Titman and Wessels, 1988; Hovakimian et al., 2004). Profitability ratio (PROF_{t-1}) is measured as [(year t-1 EBITDA)/(year t-1 total assets)], which is expected to have a negative effect on the net debt issue ratio. Firms with higher EBITDA tend to operate with lower leverage because high retained earnings reduce the need to issue debt.

Depreciation cost ratio (DEPE_{t-1}) is measured as [(year t-1 depreciation expenses)/(year t-1 total asset)], and it is expected to have a negative effect on the net debt issue ratio as non-debt tax shield variable. Firms with higher depreciation expenses are less likely to issue debt for tax shield purpose. Firm size (SIZE_{t-1}) is measured as ln(year t-1 total assets), which is expected to have a positive effect on the net debt issue ratio. Larger firms tend to have higher leverage, because they have lower cash flow volatilities, better access to capital markets, and are less likely to become financially distressed (Rajan and Zingales, 1995; Hovakimian et al., 2004). And leverage ratio (L_{t-1}) is measured as [(year t-1 total liabilities)/(year t-1 market capitalization of equity + year t-1 total liabilities)], which is expected to have a negative effect on the net debt issue ratio.

Regression model is built as equation (2) to examine **H2** that firms near either a investment or speculative grade issue less debt relative to equity than the other firms.

$$\mathrm{NDA}_t = \beta_0 + \beta_1 \mathrm{CR}_{t-1}^{\mathrm{IOS}} + \beta_2 \mathrm{MB}_{t-1} + \beta_3 \mathrm{TANG}_{t-1} + \beta_4 \mathrm{PROF}_{t-1} + \beta_5 \mathrm{DEPE}_{t-1} + \beta_6 \mathrm{SIZE}_{t-1} + \beta_7 \mathrm{L}_{t-1} + \mu + \lambda_t + \varepsilon_t \quad (2)$$

where $\mathrm{CR}_{t-1}^{\mathrm{IOS}}$ denote the investment grade or speculative grade dummy in year t-1.

The explanatory variable in equation (2) is the investment grade or speculative grade dummy ($\mathrm{CR}_{t-1}^{\mathrm{IOS}}$), which takes the value 1 if a firm has a investment grade (BBB- or BBB0~BBB-) or speculative grade (BB+ or BB+~BB0) in year t-1 and 0 otherwise. Because $\mathrm{CR}_{t-1}^{\mathrm{IOS}}$ represents a proxy variable for the rating change proximity between investment grade and speculative grade, it is expected to have negative effects on the net debt issue ratio.

Regression models are built as equation (3) and (4) to examine **H3** that the credit ratings and capital structure hypothesis have a persistent effect in the context of the tradeoff and pecking order theory.

$$\mathrm{NDA_t} = \gamma_0 + \gamma_1 \mathrm{CR}_{t-1}^{\mathrm{POM}} + \gamma_2 \mathrm{DIST_t} + \gamma_3 \mathrm{MB_{t-1}} + \gamma_4 \mathrm{TANG_{t-1}} + \gamma_5 \mathrm{PROF_{t-1}} + \gamma_6 \mathrm{DEPE_{t-1}} + \gamma_7 \mathrm{SIZE_{t-1}} + \gamma_8 \mathrm{L_{t-1}} + \mu + \lambda_t + \varepsilon_t \quad (3)$$

$$\mathrm{NDA_t} = \delta_0 + \delta_1 \mathrm{CR}_{t-1}^{\mathrm{POM}} + \delta_2 \mathrm{DEF_{t-1}} + \delta_3 \mathrm{MB_{t-1}} + \delta_4 \mathrm{TANG_{t-1}} + \delta_5 \mathrm{PROF_{t-1}} + \delta_6 \mathrm{DEPE_{t-1}} + \delta_7 \mathrm{SIZE_{t-1}} + \delta_8 \mathrm{L_{t-1}} + \mu + \lambda_t + \varepsilon_t \quad (4)$$

where $\mathrm{DIST_t}$ denotes the absolute distance between target leverage and real leverage in year t, and $\mathrm{DEF_{t-1}}$ stands for the financial deficit in year t-1.

The additional control variable in equation (3) is the absolute distance between target leverage and real leverage($\mathrm{DIST_t}$), which is measured as |year t target leverage - year t-1 real leverage|, and y ear t target leverage ($\mathrm{TL_t}$) is measured by target leverage estimation model (5). Tradeoff theory assumes that firms adjust the real leverage partially when the real leverage deviates from the target one. De Miguel and Pindado (2001), Heshmati (2002), Banerjee et al. (2004), and Flannery and Rangan (2006) assert that firms adjust partially the real leverage toward target leverage when the real leverage deviates temporarily from the target leverage, because firm's leverage has a mean-reverting property historically. The absolute distance between target leverage and real leverage ($\mathrm{DIST_t}$) as a typical proxy variable of tradeoff theory is expected to have a positive effect on the net debt issue ratio.

The additional control variable in equation (4) is the financial deficit ($\mathrm{DEF_{t-1}}$), which is measured as [(year t-1 cash dividend + year t-1 net investment + year t-1 change in working capital + year t-1 portion of the long-term debt - year t-1 cash flow after interest and taxes)/(year t-1 total assets)] according to the method of Frank and Goyal (2003). Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) assert that the financial deficit ($\mathrm{DEF_{t-1}}$) as a typical proxy variable of pecking order theory is expected to have a positive effect on the net debt issue ratio. We build the target leverage estimation model as equation (5) according to the methodolgy of Heshmati (2002), De Miguel and Pindado (2001), Hovakimian et al. (2001), and Drobetz and Wanzenried (2006).

$$\mathrm{TL_t} = \theta_0 + \theta_1 \mathrm{MB_{t-1}} + \theta_2 \mathrm{TANG_{t-1}} + \theta_3 \mathrm{PROF_{t-1}} + \theta_4 \mathrm{DEPE_{t-1}} + \theta_5 \mathrm{SIZE_{t-1}} + \varepsilon_t \quad (5)$$

where $\mathrm{TL_t}$ denotes the target leverage in year t.

Estimating the target leverage using equation (5), the absolute distance between target leverage and real leverage used as a control variable in equation (3) can be measured. Real leverage ($\mathrm{L_t}$) used as the dependent variable for estimating target leverage ($\mathrm{TL_t}$) is measured as [(year t total liabilities)/(year t total liabilities + year t market capitalization of equity)]. Explanatory variables for estimating the target leverage are the same as the control variables in equation (1), which are identified as the significant determinants of capital structure in the context of tradeoff theory.

EMPIRICAL RESULTS

Descriptive Statistics and Bivariate Results

Table 1 shows the descriptive statistics for credit ratings, net debt issue ratio and characteristics variables of the sample firms. These variables are used as the dependent and independent variables of equation (1) ~ (5). Panel A shows total credit ratings (AAA~D), investment grade (AAA~BBB-), and speculative grade (BB+~D), and Panel B shows the broad and notch ratings of the sample firms. The sample firms are relatively well distributed by ratings, which indicate that the empirical results are not likely driven by any specific ratings category. As the results show, the mean of net debt issue ratio is lower than its median, implying that is skewed to the right. The means of M/B ratio, profitability ratio, and depreciation cost ratio are higher than each of their median, while the means of tangibility ratio, firm size, and lagged leverage ratio are lower than each of their median.

Table 2 shows the Pearson (Spearman) correlation coefficients among the variables. Three notch rating dummies such as (+) or (-) notch rating dummy, (+) notch rating dummy, and (-) notch rating dummy used as the explanatory variables have negative and significant relations with net debt issue ratio at the 1~5% level, respectively. Tangibility ratio and firm size have positive and significant relations with net debt issue ratio at the 1% level, while profitability ratio and lagged leverage ratio have negative and significant relations with net debt issue ratio at the 1~5% level, respectively. But M/B ratio and depreciation cost ratio are insignificant. Among the control variables, significant and insignificant coefficients are mixed up. The absolute value of the highest correlation coefficient among the control variables, is 0.390 (0.249) for Pearson (Spearman) correlations, which is below 0.5 and unlikely to lead to multicollinearity (Kennedy, 1992).

However, the bivariate tests present a firm's net debt issue ratio is likely a function of not just one factor, but rather multiple factors such as credit ratings, M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and lagged leverage ratio. Because these factors may have interdependent effects that are not captured in bivariate tests, it is necessary to take multivariate framework for full examinations of the determinants of capital structure in the next section.

Multivariate Results

This paper examines empirically the effects of credit ratings on capital structure in the Korean capital market, controlling for M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and lagged leverage ratio using multivariate regression models. Table 3 shows the results for regression models to examine whether firms with (+) or (-) notch rating issue less debt relative to equity than firms with (0) notch rating. Firm-specific effect and time-specific effect are ascertained by the Lagrange multiplier test, and check out whether fixed effect model is more adequate than the random effect model by the Hausman test.

As the results in model 1 and 2 show, (+) or (-) notch ratings have negative and significant effects on net debt issue ratio at the 5~10% level. Moreover, as the results in model 3 and 4 show, (+) and (-) notch ratings have negative and significant effects on the net debt issue ratio at the 5~10% level, respectively. These results imply that firms close to a credit rating upgrade or downgrade issue less debt relative to equity (or simply less debt or more equity) to either avoid a downgrade or increase the chances of an upgrade. That is, firms with (+) notch rating issue less debt relative to equity to increase the benefits associated with credit rating upgrade, and firms with (-) notch rating issue less debt relative to equity to avoid the costs associated with credit rating downgrade. Thus, **H1** that firms with (+) or (-) notch rating issue less debt relative to equity than firms with (0) notch rating is proved.

Among the control variables, M/B ratio as growth opportunities variable has a negative but insignificant effect on the net debt issue ratio. Tangibility ratio as collateral value variable has a positive and significant effect on the net debt issue ratio at the 5% level, consistent with Titman and Wessels (1988) and Hovakimian et al. (2004) that firms with greater tangible assets, potentially collateralized, are likely to have relatively lower bankruptcy costs, ant thus higher debt capacity. Profitability ratio has a negative and significant effect on the net debt issue ratio at the 1% level. Firms with higher EBITDA tend to operate with lower leverage because high retained earnings reduce the need to issue debt.

Depreciation cost ratio as non-debt tax shield variable has a negative and significant effect on the net debt issue ratio at the 10% level. Firms with higher depreciation expenses are less likely to issue debt for tax shield purpose. Firm size has a positive and significant effect on the net debt issue ratio at the 5% level, consistent with Rajan and Zingales (1995) and Hovakimian et al. (2004) that larger firms tend to have higher leverage, because they have lower cash flow volatility, better access to capital markets, and are less likely to become financially distressed. And leverage ratio has a negative and significant effect on the net debt issue ratio at the 10% level.

Table 4 shows the results for regression models to examine whether firms near either a investment or speculative grade issue less debt relative to equity than the other firms. Total credit ratings (AAA~D) can be divided into investment grade (AAA~BBB-) and speculative grade (BB+~D), and so BBB- and BB+ are at the border lines between investment grade and speculative grade. Because regulations are specific to the credit ratings change between investment grade and speculative grade, the regulation effects should be greatest around this change. Moreover, firms with speculative grade would be more concerned with credit rating effects than investment grade firms. Therefore, BBB- firms will issue less debt relative to equity to decrease the costs associated with credit rating downgrade from investment grade to speculative grade, and BB+ firms issue less debt relative to equity to increase the benefits associated with credit rating upgrade from speculative grade to investment grade.

As the results in Case 1 and 2 show, investment or speculative grade dummy has negative and significant effects on net debt issue ratio at the 5~10% level. These results imply that firms close to a credit rating upgrade from speculative grade to investment grade or downgrade from investment grade to speculative grade will issue less debt relative to equity (or simply less debt or more equity) to either avoid a downgrade or increase the chances of an upgrade. That is, firms close to a credit rating upgrade from speculative grade to investment issue less debt relative to equity to increase the benefits associated with credit rating upgrade, and firms close to credit rating downgrade from investment grade to speculative grade issue less debt relative to equity to avoid the costs associated with credit rating downgrade. Thus, **H2** that Firms near either a investment or speculative grade issue less debt relative to equity than the other firms is proved.

Table 5 shows the results for regression models to test whether credit rating effects persist in the context of traditional capital structure theories such as trade-off and pecking order theory. As the results show, the absolute distance between target leverage and real leverage used as a typical proxy variable of tradeoff theory has a positive and significant effect on the net debt issue ratio at the 10% level, and the financial deficit used as a typical proxy variable of pecking order theory has a positive and significant effect on the net debt issue ratio at the 1% level. So to speak, (+) or (-) notch ratings have negative and significant effects on net debt issue ratio at the 5% level, controlling additionally for the absolute distance and the financial deficit. These results imply that firms near an upgrade or a downgrade may be less willing to increase their debt levels, even if they are currently below their target levels. However, firms far away from an upgrade or a downgrade will be in a better position to increase their debt levels if they are below their target, since they will be less concerned about a change in rating. Firms that are above their target will reduce their debt no matter where they are with regard to credit ratings; however, they may be even more inclined to reduce their debt if they are near a change in rating. Thus, **H3** that the credit ratings and capital structure hypothesis has a persistent effect in the context of the tradeoff and pecking order theory is proved.

CONCLUSIONS

This paper analyses empirically the effects of credit ratings on capital structure of firms listed on Korea Exchange. Broad ratings is defined as ratings level including the plus(+), zero(0), and minus(-) notch ratings. Firms are categorized such as near a broad rating change if they have either a plus(+) or minus(-) notch within a broad rating and not near a broad rating change if they have a zero(0) notch within a broad rating. To explore ratings change effects further, broad ratings are categorized into investment grade (AAA~BBB-) and speculative grade (BB+~D). The main results of this study can be summarized as follows. Firms near either a plus(+) or minus(-) notch ratings issue less debt on average than firms with a zero(0) notch ratings, because the former have more acute proximity to either a ratings upgrade or downgrade than the latter. Firms near a plus(+) notch ratings that are near an upgrade choose to issue equity instead of debt in order to obtain the benefit of a higher rating, and firms near a minus(-) notch ratings that are near a downgrade issue less debt in order to prevent the extra costs that result from a downgrade. The investment grade firms that are near an downgrade to speculative grade issue less debt in order to prevent the extra costs that result from a downgrade, and the speculative grade that are near an upgrade to investment grade choose to issue equity instead of debt in order to obtain the benefit of a higher grade. The effects between credit ratings and capital structure persist significantly in the context of tradeoff and pecking order theory.

These findings suggest policy implication into how credit ratings can be particularly valuable for capital structure decision; that is, credit ratings is an important aspect of capital structure decision. Capital structure decisions are affected by the potential for both an upgrade as well as a downgrade. The change specifically from investment grade to speculative grade appears incrementally significant, which is consistent with several of the hypotheses outlined for why credit ratings would be significant for firms. Moreover, the effects of credit ratings on capital structure can be viewed as complementary to existing capital structure theories. Credit ratings remain statistically significant when they are nested in empirical tests of the tradeoff and pecking order theory.

This paper contributes to correctly understanding of capital structure decisions. Managers are concerned about credit ratings, and these concerns translate into real economic decision making consequences. Future capital structure research would benefit from including credit ratings as part of the capital structure framework, both to ensure correct inferences in capital structure empirical tests, and more importantly, to obtain a more comprehensive understanding of capital structure behavior.

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TABLE 1: Descriptive Statistics

Categories									
credit ratings	**N**	**Statistics**	$\mathbf{NDA_t}$	$\mathbf{MB_{t-1}}$	$\mathbf{TANG_{t-1}}$	$\mathbf{PROF_{t-1}}$	$\mathbf{DEPA_{t-1}}$	$\mathbf{SIZE_{t-1}}$	$\mathbf{L_{t-1}}$
Panel A: Total Credit Ratings, Investment Grade, and Speculative Grade									
		Mean	-0.0044	0.8763	0.4522	0.0885	0.0051	26.7663	0.6400
		Std. Dev.	0.0984	0.3199	0.2000	0.0610	0.0086	3.8938	0.2454
AAA~D	2,242	Median	-0.0037	0.8465	0.4682	0.0855	0.0021	27.1449	0.6932
		Minimum	-0.3969	0.3231	0.0011	-0.1470	0.0001	22.2329	0.0371
		Maximum	0.4936	1.9970	0.8992	0.3923	0.0897	31.2998	0.9925
		Mean	0.0004	0.8931	0.4612	0.0988	0.0056	27.3692	0.6085
		Std. Dev.	0.0908	0.3229	0.1890	0.0579	0.0094	2.7903	0.2363
AAA~BBB-	1,677	Median	0.0013	0.8537	0.4727	0.0920	0.0022	27.4757	0.6461
		Minimum	-0.3969	0.3231	0.0011	-0.1386	0.0001	23.8945	0.0371
		Maximum	0.4936	1.9970	0.8907	0.3923	0.0897	31.2998	0.9849
		Mean	-0.0191	0.8268	0.4258	0.0578	0.0037	24.9761	0.7337
		Std. Dev.	0.1169	0.3059	0.2278	0.0597	0.0052	5.7309	0.2484
BB+~D	565	Median	-0.0118	0.8299	0.4485	0.0608	0.0019	25.9407	0.8276
		Minimum	-0.3839	0.3912	0.0184	-0.1470	0.0001	22.2329	0.0708
		Maximum	0.4533	1.9362	0.8992	0.3104	0.0359	30.5158	0.9925
Panel B: Broad and Notch Ratings									
AAA	24	Mean	0.0005	1.1379	0.4780	0.2477	0.0012	30.6257	0.2956
AA+	33	Mean	0.0200	0.9235	0.4405	0.1272	0.0113	29.2153	0.3310
AA0	49	Mean	0.0175	1.1251	0.4342	0.1350	0.0107	28.9053	0.3942
AA-	141	Mean	0.0097	1.0233	0.4336	0.1121	0.0087	27.8440	0.4592
A+	162	Mean	-0.0045	0.8973	0.4423	0.1026	0.0103	27.4617	0.4842
A0	206	Mean	0.0104	0.9047	0.4561	0.1000	0.0064	27.8301	0.5541
A-	236	Mean	0.0047	0.9106	0.4501	0.0995	0.0050	27.1803	0.5786
BBB+	222	Mean	-0.0052	0.8795	0.4998	0.0985	0.0052	27.2571	0.6484
BBB0	313	Mean	-0.0014	0.8348	0.4707	0.0892	0.0035	27.1209	0.7256
BBB-	291	Mean	-0.0105	0.8157	0.4640	0.0782	0.0031	26.5310	0.7502
BB+	178	Mean	-0.0257	0.8249	0.4038	0.0669	0.0038	26.4187	0.7694
BB0	159	Mean	-0.0088	0.8003	0.4768	0.0701	0.0049	24.5563	0.7356
BB-	97	Mean	-0.0400	0.8889	0.5009	0.0640	0.0033	25.4281	0.7829
B+	19	Mean	-0.0159	0.7324	0.3617	0.0399	0.0018	21.5300	0.6146
B0	39	Mean	-0.0372	1.0073	0.3621	0.0310	0.0033	25.9477	0.7455
B-	10	Mean	-0.0034	0.7180	0.2230	-0.0096	0.0023	20.7186	0.4638
CCC	22	Mean	-0.0053	0.6294	0.2269	0.0099	0.0018	20.6882	0.4921
CC	5	Mean	0.0085	0.8737	0.2389	0.0299	0.0016	26.4763	0.8524
C	28	Mean	0.0022	0.8250	0.4206	0.0432	0.0031	24.6738	0.7170
D	8	Mean	0.1058	0.6467	0.3893	-0.0040	0.0032	16.4267	0.5178

Notes: Panel A shows total credit ratings (AAA~D), investment grade (AAA~BBB-), and speculative grade (BB+~D), and Panel B shows the broad and notch ratings of the sample firms. The total number of observations of total credit ratings (AAA～D) is 2,242, the number of observations of the investment grade (AAA～BBB-) is 1,677, and the number of observations of the speculative grade (BB+～D) is 565.

TABLE 2: Correlation Coefficients

Variables	$\mathbf{NAD_t}$	$\mathbf{CR^{POM}_{t-1}}$	$\mathbf{CR^{Plus}_{t-1}}$	$\mathbf{CR^{Minus}_{t-1}}$	$\mathbf{MB_{t-1}}$	$\mathbf{TANG_{t-1}}$	$\mathbf{PROF_{t-1}}$	$\mathbf{DEPE_{t-1}}$	$\mathbf{SIZE_{t-1}}$	$\mathbf{L_{t-1}}$
$\mathbf{NAD_t}$	1	-0.018**	-0.033*	-0.012*						
$\mathbf{CR^{POM}_{t-1}}$	-0.018**	1	0.473**	0.471**	0.001	0.010**	-0.010**	-0.020	0.001	-0.040
$\mathbf{CR^{Plus}_{t-1}}$	-0.016*	0.473**	1	-0.453**	0.001	0.036*	-0.006**	-0.009**	0.002	-0.068**
$\mathbf{CR^{Minus}_{t-1}}$	-0.004*	0.471**	-0.453**	1	0.001	0.023*	-0.019*	-0.028	0.003	0.023
$\mathbf{MB_{t-1}}$	-0.023	0.024	0.013	0.012	1	0.092**	0.179**	0.110	0.199**	-0.249**
$\mathbf{TANG_{t-1}}$	0.052**	0.005**	0.036*	0.028*	0.023	1	0.271**	0.142**	0.107**	0.216**
$\mathbf{PROF_{t-1}}$	-0.034**	-0.001**	-0.016**	-0.014*	0.212**	0.261**	1	0.239**	0.114**	-0.164**
$\mathbf{DEPE_{t-1}}$	-0.004	-0.027	-0.085**	-0.052*	0.039	0.172**	0.152**	1	0.164	-0.123**
$\mathbf{SIZE_{t-1}}$	0.026**	0.030	0.020	0.011	0.390**	0.304**	0.232**	0.027	1	0.045*
$\mathbf{L_{t-1}}$	-0.136**	-0.030	-0.066**	0.032	-0.104**	0.252**	-0.130**	-0.059**	0.311**	1

Notes: CR^{POM}_{t-1} is (+) or (-) notch rating dummy, CR^{Plus}_{t-1} is (+) notch rating dummy, and CR^{Minus}_{t-1} is (-) notch rating dummy. MB_{t-1}, $TANG_{t-1}$, $PROF_{t-1}$, $DEPE_{t-1}$, $SIZE_{t-1}$, and L_{t-1} are M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and lagged leverage ratio, respectively. Pearson (Spearman) correlation coefficients are reported below (above) the diagonal. ** and * denote statistical significance at the 1% and 5% levels, respectively, using a two-tailed test.

TABLE 3: The Effects of (+) or (-) Notch Ratings on Capital Structure

Variables	Model 1	Model 2	Model 3	Model 4
Constant	-0.014 (-1.31)	0.125 (0.99)	-0.013 (-1.28)	0.130 (0.63)
$\mathbf{CR_{t-1}^{POM}}$	-0.002* (-1.70)	-0.001** (-2.05)		
$\mathbf{CR_{t-1}^{Plus}}$			-0.006** (-1.99)	-0.008** (-2.44)
$\mathbf{CR_{t-1}^{Minus}}$			-0.008* (-1.80)	-0.009* (-1.79)
$\mathbf{MB_{t-1}}$		-0.009 (-1.23)		-0.010 (-1.16)
$\mathbf{TANG_{t-1}}$		0.068** (2.05)		0.066** (1.99)
$\mathbf{PROF_{t-1}}$		-0.422*** (-2.63)		-0.424*** (-2.59)
$\mathbf{DEPE_{t-1}}$		-0.241* (-1.76)		-0.225* (-1.66)
$\mathbf{SIZE_{t-1}}$		0.002** (2.17)		0.002** (2.06)
$\mathbf{L_{t-1}}$		-0.094* (-1.70)		-0.096* (-1.66)
Number of Observations (n)	2,242	2,242	2,242	2,242
Number of Firms (g)	286	286	286	286
$\mathbf{R^2 - Within}$	0.0953	0.1115	0.0805	0.1107
$\mathbf{R^2 - Between}$	0.0892	0.0911	0.0816	0.0937
$\mathbf{R^2 - Overall}$	0.0964	0.1068	0.0907	0.1084
Lagrange multiplier − test	85.54***	89.64***	85.81***	89.95***
Hausman − test	52.89***	30.56***	51.83***	31.28***
F − value	22.56***	14.50***	21.23***	15.88***

Notes: The White corrected t-statistics for the t-test are reported in parentheses. ***,**,* denote statistical significance at the 1%, 5% and 10% levels, respectively, using a two-tailed test. In the regression models, dependent variable is NDA_t, and explanatory variables are CR_{t-1}^{POM}, CR_{t-1}^{Plus}, and CR_{t-1}^{Minus}, respectively. The control variables are composed of variables such as MB_{t-1}, $TANG_{t-1}$, $PROF_{t-1}$, $DEPE_{t-1}$, $SIZE_{t-1}$, and L_{t-1}, which are M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and lagged leverage ratio, respectively.

TABLE 4: The Effects of Rating Change Proximity between Investment Grade and Speculative Grade on Capital Structure

Variables	Categories of Credit Ratings	
	Case 1: 2-Notch Grade (BBB-, BB+)	**Case2: 4-Notch Grade (BBB0, BBB-, BB+, BB0)**
Constant	0.728 (0.89)	1.886*** (3.58)
$\mathbf{CR_{t-1}^{IOS}}$	-0.085** (-2.12)	-0.025* (-1.73)
$\mathbf{MB_{t-1}}$	-0.003 (-1.06)	-0.068* (-1.92)
$\mathbf{TANG_{t-1}}$	0.015** (2.28)	0.027** (2.42)
$\mathbf{PROF_{t-1}}$	-0.440** (-2.10)	-0.467*** (-3.46)
$\mathbf{DEPE_{t-1}}$	-0.165 (-1.25)	-0.306* (-1.80)
$\mathbf{SIZE_{t-1}}$	0.030 (0.98)	0.067*** (3.41)
$\mathbf{L_{t-1}}$	-0.093*** (-3.97)	-0.168*** (-2.76)
Number of Observations (n)	469	941
Number of Firms (g)	127	182
$\mathbf{R^2 - Within}$	0.1497	0.1696
$\mathbf{R^2 - Between}$	0.1056	0.1575
$\mathbf{R^2 - Overall}$	0.1135	0.1620
Lagrange multiplier − test	46.22***	52.73***
Hausman − test	26.05***	36.53***
F − value	11.77***	16.19***

Notes: The White corrected t-statistics for the t-test are reported in parentheses. ***,**,* denote statistical significance at the 1%, 5% and 10% levels, respectively, using a two-tailed test. In the regression models, dependent variable is NDA_t, and explanatory variable is CR_{t-1}^{IOS}. The control variables are composed of variables such as MB_{t-1}, $TANG_{t-1}$, $PROF_{t-1}$, $DEPE_{t-1}$, $SIZE_{t-1}$, and L_{t-1}, which are M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and lagged leverage ratio, respectively.

TABLE 5: Tests of Credit Ratings and Capital Structure Hypothesis in the Context of Tradeoff Theory and Pecking Order Theory

Variables	Tradeoff Theory		Pecking Order Theory	
	Model 1	Model 2	Model 1	Model 2
Constant	-0.012 (-1.14)	0.126 (0.99)	-0.002 (-1.17)	0.134 (1.06)
$\mathbf{CR_{t-1}^{POM}}$	-0.002** (-2.15)	-0.001** (-2.03)	-0.004** (-2.37)	-0.002** (-2.25)
$\mathbf{DIST_t}$	0.083* (1.79)	0.009* (-1.72)		
$\mathbf{DEF_{t-1}}$			0.132** (2.54)	0.140*** (2.61)
$\mathbf{MB_{t-1}}$		-0.010 (-1.29)		-0.013 (-1.48)
$\mathbf{TANG_{t-1}}$		0.066** (2.13)		0.091* (1.80)
$\mathbf{PROF_{t-1}}$		-0.415*** (-2.73)		-0.363*** (-2.65)
$\mathbf{DEPE_{t-1}}$		-0.243 (-1.59)		-0.167 (-1.43)
$\mathbf{SIZE_{t-1}}$		0.003** (2.11)		0.001** (2.18)
$\mathbf{L_{t-1}}$		-0.104* (-1.68)		-0.112** (-1.98)
Number of Observations (n)	2,242	2,242	2,242	2,242
Number of Firms (g)	286	286	286	286
$\mathbf{R^2-Within}$	0.1020	0.0814	0.0541	0.0456
$\mathbf{R^2-Between}$	0.1081	0.0931	0.0645	0.0597
$\mathbf{R^2-Overall}$	0.0911	0.0968	0.0618	0.0604
Lagrange multiplier − test	78.57***	78.84***	63.36***	68.41***
Hausman − test	41.35***	47.53***	57.73***	58.17***
F − value	11.63***	12.30***	13.25***	13.16***

Notes: The White corrected t-statistics for the t-test are reported in parentheses. ***,**,* denote statistical significance at the 1%, 5% and 10% levels, respectively, using a two-tailed test. In the regression models, dependent variable is NDA_t, and explanatory variable is CR_{t-1}^{POM}. The control variables are composed of variables such as $DIST_t$, DEF_{t-1}, MB_{t-1}, $TANG_{t-1}$, $PROF_{t-1}$, $DEPE_{t-1}$, $SIZE_{t-1}$, and L_{t-1}, which are absolute distance between target leverage and real leverage, financial deficit, M/B ratio, tangibility ratio, profitability ratio, depreciation cost ratio, firm size, and lagged leverage ratio, respectively.