THE JOURNAL OF FINANCE • VOL. LXI, NO. 3 • JUNE 2006

Credit Ratings and Capital Structure

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ABSTRACT

This paper examines to what extent credit ratings directly affect capital structure decisions. The paper outlines discrete costs (benefits) associated with firm credit rating level differences and tests whether concerns for these costs (benefits) directly affect debt and equity financing decisions. Firms near a credit rating upgrade or downgrade issue less debt relative to equity than firms not near a change in rating. This behavior is consistent with discrete costs (benefits) of rating changes but is not explained by traditional capital structure theories. The results persist within previous empirical tests of the pecking order and tradeoff capital structure theories.

MANAGERS APPEAR TO TAKE CREDIT RATINGS into account when making capital structure decisions. For example, the *Wall Street Journal* (WSJ) (2004) reported that EDS was issuing more than $1 billion in new shares, "hoping to forestall a credit-rating downgrade," Barron's (2003) reported that Lear Corp. reduced its debt because they were "striving to win an investment-grade bond rating above the current BB-plus from Standard & Poor's," and the WSJ (2002) reported that Fiat was "racing" to reduce the company's debt because it was "increasingly worried about a possible downgrade of its credit rating." More formally, 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 were important or very important in how they choose the appropriate amount of debt for their firm. Moreover, Graham and Harvey report that credit ratings ranked higher than many factors suggested by traditional capital structure theories, such as the "tax advantage of interest deductibility."

This paper contributes to the theoretical and empirical capital structure decision frameworks by examining the influence of credit ratings on capital structure decisions. The impact of credit ratings on capital structure decisions has not been formally investigated in the capital structure literature to date. This paper argues that credit ratings are significant for capital structure decisions, given discrete costs (benefits) of different credit rating levels and empirically

*Department of Finance at Boston College. This paper is derived from my doctoral dissertation in finance completed at the School of Business, University of Washington. The paper has substantially benefited from the input and advice of my advisor, Edward Rice. I also gratefully acknowledge the comments received from Wayne Ferson, Charles Hadlock, Jonathan Karpoff, Jennifer Koski, Paul Malatesta, Mitchell Peterson, an anonymous referee, and seminar participants at the 2004 American Finance Association meetings, Boston College, Indiana University, Northwestern University, Rice University, University of Pittsburgh, University of Virginia, University of Washington, West Virginia University, and Xavier University.

examines whether capital structure decisions are affected by these costs (benefits). The behavior documented in this paper does not appear to be explained by traditional theories of capital structure, and the results are robust when nested into previous capital structure tests. To my knowledge, this is the first paper to show that credit ratings directly affect capital structure decision making.

This paper argues that managers' concern for credit ratings is due to the discrete costs (benefits) associated with different ratings levels. For instance, several regulations on bond investment are based directly on credit ratings: credit rating levels affect whether particular investor groups such as banks or pension funds are allowed to invest in a firm's bonds and to what extent investor groups such as insurance companies or brokers–dealers incur specific capital requirements for investing in a firm's bonds. Ratings can also provide information to investors and thereby act as a signal of firm quality. If the market regards 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 (benefits) for the firm, such as a change in bond coupon rate, a loss of a contract, a required repurchase of bonds, or a loss of access to the commercial paper market.

The empirical tests of this paper examine whether capital structure decisions are directly affected by ratings concerns. I construct two distinct measures that distinguish between firms close to having their debt downgraded or upgraded versus those not close to a downgrade or upgrade. Controlling for firm-specific factors, I test whether firms near a change in rating issue less net debt relative to net equity over a subsequent period compared to other firms. I find that concerns for the benefits of upgrades and costs of downgrades directly affect managers' capital structure decisions. Firms with a credit rating designated with a plus or minus (e.g., AA+ or AA−) issue less debt relative to equity than firms that do not have a plus or minus rating (e.g., AA). Also, when firms are ranked by thirds within each specific rating (e.g., BB−) based on credit quality determinates, the top third and lower third of firms within ratings issue less debt relative to equity than firms that are in the middle of their individual ratings. The results are both statistically and economically significant, with firms near a change in credit rating issuing annually approximately 1.0% less net debt relative to net equity as a percentage of total assets than firms not near a change in rating.

Although this is the first paper to examine the direct effects of credit ratings on capital structure decisions, extensive research examines how credit ratings affect stock and bond valuations.[1] These studies suggest that credit ratings are

[1] Hand, Holthausen, and Leftwich (1992) find statistically significant negative average excess bond and stock returns upon the announcement of downgrades of straight debt. Ederington, Yawitz, and Roberts (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 spreads. Ederington and Goh (1998) show that credit rating downgrades result in negative equity returns and that equity analysts tend to revise earnings forecasts "sharply downward" following the downgrade. They further conclude that this action is a result of the "downgrade itself—not to earlier negative information or contemporaneous earnings numbers."

significant in the financial marketplace. This paper takes the next step and analyzes to what extent credit ratings are significant in capital structure decision making. The rest of this paper is organized as follows. In Section I, I describe why credit ratings might factor into managerial capital structure decisions. In Section II, I examine how credit rating concerns complement existing theories of capital structure. Section III contains general empirical tests of the impact of credit ratings on capital structure decisions, and Section IV contains specific tests that nest credit rating factors into empirical tests of traditional capital structure theories. Section V concludes.

I. The Significance of Credit Ratings for Capital Structure

The fundamental hypothesis of this paper is that credit ratings are a material consideration in managers' capital structure decisions due to the discrete costs (benefits) associated with different rating levels (henceforth referred to as the Credit Rating–Capital Structure Hypothesis or "CR-CS"). The primary testable implication of CR-CS considered in this paper is that concern for the impact of credit rating changes directly affects capital structure decision making, with firms near a ratings change issuing less net debt relative to net equity than firms not near a ratings change (the Appendix provides an illustration of this implication). Outlined below are reasons that credit ratings are significant for capital structure decisions.

The CR-CS is distinct from financial distress arguments. CR-CS implies that firms near either an upgrade or a downgrade will issue less debt on average than firms not near a change in rating; distress concerns, 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, CR-CS implies credit rating effects for firms at all ratings levels; financial distress concerns, on the other hand, are unlikely to be significant for firms with high ratings, such as AA, for example. CR-CS implies discrete costs (benefits) associated with a change in rating and therefore a discontinuous relationship between leverage and firm value, whereas financial distress concerns suggest no such discontinuity. In some instances, however, distress concerns and CR-CS have similar empirical implications. For this reason, variables that control for the financial condition of the firm are included in the empirical tests to identify credit rating effects that are distinct from any financial distress effects.

A. Regulations on Bond Investment

Several regulations relating to financial institutions' and other intermediaries' investments in bonds are directly tied to credit ratings. Cantor and Packer (1994, p. 5) observe "the reliance on ratings extends to virtually all financial regulators, including the public authorities that 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), and West (1973)), and in 1989, savings and

loans were prohibited from holding any speculative-grade bonds by 1994. Since 1951, regulators have determined capital requirements for investments made by insurance companies based on a ratings scoring system, with investments in bonds rated A or above assigned a value of 1, firms rated BBB assigned a value of 2, BB firms assigned a value of 3, B firms assigned a value of 4, any C-level firm assigned a value of 5, and any D-rated firm assigned a value of 6. In 1975, the Securities and Exchange Commission (SEC) adopted Rule 15c3-1 whereby the SEC uses credit ratings as the basis for determining the percentage reduction in the value ("haircut") of bonds owned by brokers–dealers for the purpose of calculating their capital requirements (Partnoy (2002)). Finally, pension fund guidelines often restrict bond investments to investment-grade bonds (Boot, Milbourn, and Schmeits (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, ceteris paribus. Also, to the extent that the demand curve for bonds is downward sloping, placing a restriction on certain investors participating in a particular bond market will cause the yield to increase in that market. Therefore, although a firm itself may not have any higher risk of default, it may be required to pay a higher interest rate on its debt merely as a result of its credit rating.

Regulations may also affect the liquidity for bonds by rating. Patel, Evans, and Burnett (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 (see Stiglitz and Weiss (1981) for an analysis of "credit rationing"). Firms with those credit ratings would therefore incur additional costs.

Regulations generally do not distinguish between firms with or without notch ratings (e.g., AA and AA− firms are generally treated the same from a regulatory perspective). Accordingly, the best way to test empirically the effects of regulations will be to focus on changes in broader ratings categories. Also, since several regulations are specific to the investment-grade versus speculative-grade designation, effects should be greatest around this change if these regulations are significant for decision making. Liquidity issues are most significant for speculative-grade bond rating levels, which would suggest that firms with speculative-grade ratings would be more concerned with ratings effects than investment-grade firms.

B. Information Content of Ratings

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 creditworthiness. Millon and Thakor (1985) propose a model for the existence of "information gathering agencies" such 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, Milbourne, and Schmeits (2003, p. 84) argue that "rating agencies could be seen as information-processing agencies that may speed up the dissemination of information to financial markets."[2]

If 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. Thus, even though a firm may be a particularly good BB−, for example, its credit spreads would not be lower than credit spreads of other BB− firms. Firms near a downgrade in rating will then have an incentive to maintain the higher rating. Otherwise, if they are given the lower rating (even though they are only a marginally worse credit), they will be pooled into the group of all firms in that lower credit class. Likewise, firms near an upgrade will have an incentive to obtain that upgrade to be pooled with firms in the higher ratings category. Arguably, any ratings category should contain information, so unlike with regulations, a potential change in rating of any kind, including from BB to BB− for example, should be significant for capital structure decisions. Empirical tests are constructed to test this as well as the broader ratings change.

C. Costs Directly Imposed on the Firm

Different bond rating levels impose direct costs on the firm. A firm's rating affects operations of the firm, access to other financial markets such as commercial paper, disclosure requirements for bonds (e.g., speculative-grade bonds have more stringent disclosure requirements), and bond covenants, which can contain ratings triggers whereby a ratings change can result in changes in coupon rates or a forced repurchase of the bonds.

Ratings can affect business operations of the firm in several ways. Firms entering into long-term supply contracts may require specific credit ratings from their counterparty,[3] firms entering into swap arrangements or asset-backed

[2] Previous empirical literature finds that ratings convey information. Elton et al. (2001, p. 254) examine rate spreads on corporate bonds by rating and maturity from 1987 to 1996 and conclude, "bonds are priced as if the ratings capture real information." Ederington et al. (1987, p. 225) find that credit ratings are significant predictors of yield to maturity beyond the information contained in publicly available financial variables and conclude that "ratings apparently provide additional information to the market."

[3] The Financial Times (2004) reported, for example, that U.S. Airways' downgrade to CCC+ might directly inhibit its ability to complete a significant jet order: "news of US Airways' lower credit rating gives [GE] a chance to withdraw financing for its regional jets," since "one condition was that US Airways' credit rating not fall below B minus."

securities transactions may require a particular rating (e.g., A− or above), and mergers can be conditional on ratings. Further, lower ratings levels may negatively affect employee or customer relationships.[4]

Access to the commercial paper market is affected by long-term bond ratings. The two main tiers of ratings in the commercial paper market are A1 and A2—97% of commercial paper carried this rating in 1991 (Crabbe and Post (1994)). Standard and Poor's (2001b) states there is a "strong link" between a firm's long-term rating and its commercial paper rating. Firms with a rating of AA− or better generally receive an A1+ commercial paper rating, firms with an A+ or A rating receive an A1 commercial paper rating, and firms with a BBB to A− rating receive an A2 rating. Money market funds, which make up a significant portion of commercial paper investment, invest almost exclusively in A1-rated paper, and A1-rated commercial paper also has more favorable firm liquidity requirements than lower rated paper (Hahn 1993). Therefore, a BBB long-term rating generally is necessary for commercial paper access, and an A long-term bond rating generally is necessary to access the universe of commercial paper investors. Tests at individual ratings levels will examine whether concern for these ratings levels affects decision making.

Firms can incur discrete costs from ratings-triggered events such as a required repurchase of bonds. For example, Enron faced $3.9 billion in accelerated debt payments as a result of a credit rating downgrade. Standard and Poor's (2002) surveyed approximately 1,000 U.S. and European investment-grade issues and found that 23 companies show serious vulnerability to ratings triggers or other contingent calls on liquidity; that is, a downgrade would be compounded by provisions such as ratings triggers or covenants that could create a liquidity crisis. Further, the survey showed that at least 20% of the companies surveyed have exposure to some sort of contingent liability. Costs to a firm triggered by ratings changes generally are tied to broad ratings levels, without a distinction for notch ratings, and are most prominent around the investment-grade to speculative-grade bond distinction.

II. Credit Ratings in the Context of Existing Capital Structure Theories

A. *Tradeoff Theory*

The tradeoff theory of capital structure argues that a value-maximizing 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 for the firm. 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 (see e.g., Fama and French (2002)).

[4] For example, Enron's downgrade made it "practically impossible for [Enron's] core trading business, which contributed 90% of earnings, to operate" (Standard and Poor's (2001a, p. 10)), and EDS was primarily concerned about a downgrade because it "could make signing new customers more difficult" (WSJ, 2004).

CR-CS states that different credit rating levels are associated with discrete costs (benefits) to the firm. If the rating-dependent cost (benefit) is material, managers will balance that cost (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.

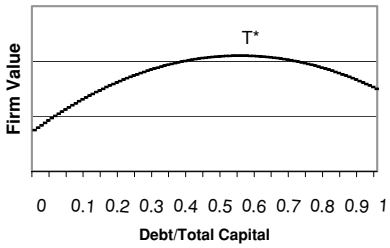
To illustrate this point, consider the change from investment-grade to speculative-grade rating status. If there is no discrete cost related to credit ratings, a firm may face the situation depicted in Figure 1A. This graph depicts firm value as a function of leverage and illustrates the tradeoff between the benefits and the costs of higher leverage. A value-maximizing manager in this situation will choose the leverage implying firm value shown as T^*.

Now consider a firm that faces a discrete cost (benefit) at the change from investment-grade to speculative-grade status due to credit rating effects. Further assume that the optimal leverage as implied by the tradeoff theory is a leverage that would have caused the firm to have a high rating within speculative-grade bond ratings (e.g., a BB+ rating). A firm in this position will choose a smaller leverage than that implied by traditional tradeoff theory factors to obtain an investment-grade rating, as is depicted in Figure 1B. The benefits from the better rating outweigh the traditional tradeoff theory factor benefits of remaining at T^*, the optimal capital structure considering only traditional tradeoff effects. C^* is the new optimum, taking into account credit rating effects as well. Figure 1B also illustrates how a firm at C^*, near a downgrade, will be less likely to issue debt relative to equity to avoid a downgrade. Likewise, a firm at the lower rating slightly to the right of C^*, near an upgrade to the higher rating, will be more likely to issue equity relative to debt to obtain the upgrade.

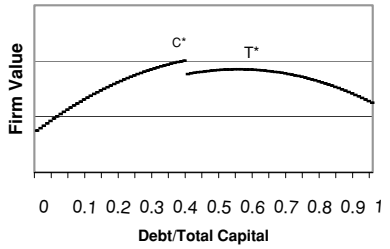
Figures 1C and D depict cases in which tradeoff theory effects outweigh CR-CS effects, as the firms are not near the change in credit rating. Figure 1C depicts a firm whose value-maximizing leverage as implied by the tradeoff theory implies a high rating for the firm (e.g., an A rating). If the only change in credit rating level associated with a discrete cost (benefit) is the change to speculative-grade status, a firm with a high rating is not affected by that potential credit rating cost. Figure 1D depicts a firm whose optimal leverage as implied by the tradeoff theory implies a low credit rating within the speculative-grade ratings (e.g., a CCC-rating). In this case, the firm may choose to stay at the low rating because, although there are benefits to be obtained by achieving an investment-grade rating for the firm, the costs imposed on the firm of moving so far from the tradeoff optimum may be more significant.

Figure 1E shows a more complete depiction of the tradeoff theory combined with credit rating effects by showing several jumps. Here it is possible that credit rating effects will be relevant to a firm of any quality, but once again the extent of the effects will depend on how near that firm is to a change in rating. The graph shows one example in which credit rating effects create an optimum that is different from tradeoff predictions alone. Similar graphs can be

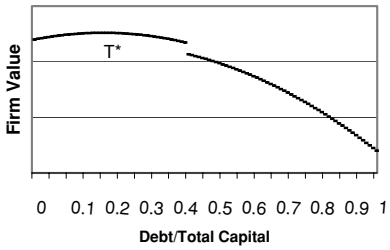
Panel A: No credit rating level costs (benefits)



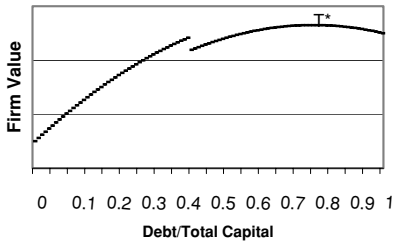
Panel B: One rating cost, firm near rating change



Panel C: One rating cost, firm not near change



Panel D: One rating cost, firm not near change



Panel E: Tradeoff theory and discrete costs (benefits) at multiple credit rating levels

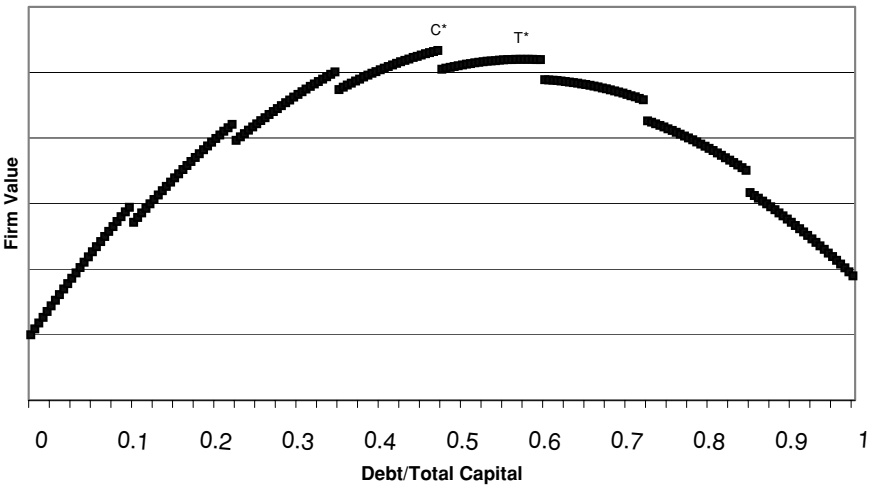


Figure 1. Firm value and optimal capital structure under tradeoff theory and credit rating effects. This figure illustrates the value of a firm, given different levels of leverage, assuming both costs and benefits of leverage and an interior leverage optimum. Panel A depicts tradeoff theory factors alone; Panels B–E depict cases in which discrete costs (benefits) exist for credit rating level differences. T^* denotes the optimal value with tradeoff effects alone and C^* is the optimal value with tradeoff theory and credit rating effects (when C^* and T^* differ).

depicted wherein firms choose a different optimum as a result of any potential credit rating jump (e.g., from AA to A).

Note that firms somewhat farther away from a downgrade will be less concerned about a small offering of debt; however, these firms will still be concerned about the potential effects of a large debt offering, since a large offering could generate a downgrade for them. Likewise, firms that are relatively far from an upgrade may consider a large equity offering to obtain an upgrade; however, they would be less likely to issue smaller equity offerings relative to firms very close to an upgrade. This distinction is significant in the empirical tests of CR-CS.

B. Pecking Order Theory

The pecking order theory argues that firms will generally prefer not to issue equity due to asymmetric information costs (Myers (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.

CR-CS implies that for some incremental change in leverage, a discrete cost (benefit) will be incurred due to a credit rating change. Assuming that for some level of leverage both CR-CS 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 may 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.

III. Empirical Tests of CR-CS

A. Empirical Design

The hypotheses of Section I 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. This implication is illustrated in Figure 2 for debt offerings. The main empirical tests examine this implication by regressing measures of net debt issuance relative to net equity issuance on dummy variables that distinguish between firms near a change in credit rating and those that are not.

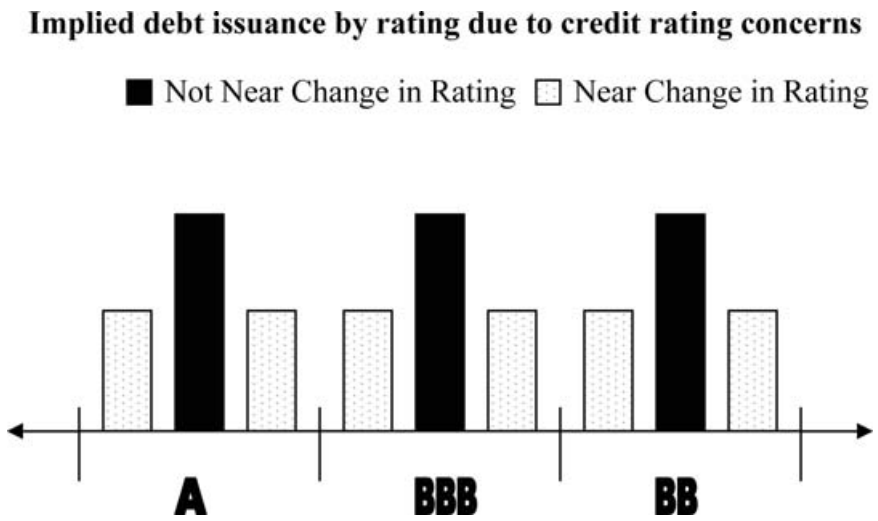


Figure 2. Net debt usage implied by credit rating concerns. This figure depicts debt usage for firms near a change in rating and firms not near a change in rating as implied by CR-CS. CR-CS implies firms near a rating change will issue less debt than firms not near a rating change.

I measure proximity to a ratings change in two ways.[5] The hypotheses of Section I imply that in certain cases firms will be most concerned with a ratings change from one broad ratings category to another, for example, from BBB to A, while in other cases firms will be concerned with a ratings change of any kind. To examine the former, I define "Broad Ratings" as ratings levels including the minus, middle, and plus specifications for a particular rating; that is, a Broad Rating of BBB refers to firms with ratings of BBB+, BBB, and BBB−. I categorize firms as near a Broad Ratings change if their rating is designated with either a "+" or a "−" within a Broad Rating and not near a ratings change if they do not have a plus or minus notch within the Broad Rating (they are in the middle of the Broad Rating). For example, within the Broad Rating of BB, both BB− and BB+ firms are defined to be near a ratings change and firms that are BB are not. Tests using this measure are designated "Plus or Minus" tests (or "POM tests").

The Broad Ratings measure should accurately reflect proximity to a change in rating since the ratings themselves are used to distinguish firms. The distinctions might be too broad, however, which would reduce the precision of the tests. For example, a strong BB− firm may not be near a downgrade within the BB Broad Rating and likewise a weak BB+ firm may not be near an upgrade. If this is true, the tests might underestimate the true effect. Also, the Broad Ratings measure implicitly assumes that managers care more about a change

[5] S&P's Creditwatch was another measure considered for determining whether firms are near a rating change. However, this distinction is generally used when a specific event has been announced, such as a merger, recapitalization, or regulatory action, and only lasts until that event has been resolved, usually within 90 days.

in Broad Rating than a change in rating within a Broad Rating (e.g., from A to A−). Since firms might be concerned with a change in rating of any kind, firms in the middle of a Broad Rating might reasonably be concerned with upgrades or downgrades to a plus or minus category.

The second measure allows for testing of credit rating effects at all ratings changes. I define "Micro Ratings" as specific ratings that include a minus or plus modification, if given. Thus the Micro Rating of BBB refers only to the middle BBB firms (without a plus or minus), and the Micro Rating of, for example, BBB− refers only to BBB−. The measure takes firms within each Micro Rating and ranks them within that rating based on the factors that tend to indicate credit quality. I compute a "Credit Score" for each firm that assigns a credit quality value to each firm based on firm data used by rating agencies, such as debt/equity ratios, interest coverage, etc., with weightings determined by regressing ratings on these factors (the Credit Score is specifically derived in Section III.D). I separate firms within each Micro Rating into a high third, middle third, and low third based upon their respective Credit Scores.[6] Firms that are in the high or low third of a Micro Rating are then considered to be near a change in rating, whereas firms in the middle third are not. Tests using this measure are designated "Credit Score" tests.

If the Credit Scores are measured correctly, the test group of firms should be very close to a ratings change, which should increase the precision of these tests. The measure also accounts for all potential ratings changes. A disadvantage of this measure is that the measurement of the Credit Scores will be inherently noisy, and this may reduce the power of the test.[7] Also, since some of the hypotheses of Section I apply only to Broad Ratings changes, tests with the Credit Score measure will not explicitly test these hypotheses.

The dependent variables in the regressions that follow are measures of the amount of net debt relative to net equity issued (or simply net debt or net equity issued). CR-CS directly predicts capital structure decisions over a subsequent period based on the credit rating situation a firm faces at a particular point in time. Credit rating dummy variables are created for firms at the end of each fiscal year, and the firm's capital structure decision measures are computed for the subsequent 12 months. I use book values since these are the variables credit rating agencies emphasize (Standard and Poor's (2001b)), and these measures also directly reflect managerial decision making. However, the main results of this paper are robust to using market values as well, although the statistical significance is somewhat reduced.

[6] I also check robustness of this definition by defining firms near a rating change separately as the top and bottom fourths and as the top and bottom fifths within each rating; neither alternate specification affects the results.

[7] For the plus or minus measure, 16% of firms defined as near a Broad Rating change experience a Broad Rating change the subsequent year compared to 8% of firms defined as not near a Broad Rating change. For the Credit Score measure, 23% of firms defined as near a Micro Rating change experience a Micro Rating change the subsequent year compared to 19% of firms defined as not near a Micro Rating change. Of course, if firms near a rating change take steps to avoid the change in rating, the differences across groups should be diminished.

A complicating factor in these tests is that debt and equity issuances and reductions have material transactions costs, and as a result capital structure changes are lumpy and sporadic. For example, there may be several years during which managers do not undertake offerings of any kind for a firm. Furthermore, the credit rating situation for a firm could change during the middle of a year, making the credit rating measure at the beginning of the year inaccurate. Lastly, capital structure transactions also require time to execute, so there may be a significant lag between the time a decision is made and the time it appears in the data. These factors likely add noise to the empirical tests, and therefore the estimated coefficients from these tests may underestimate the true credit rating effects.

The implication that firms near a change in rating will issue less debt relative to equity applies most directly to small- or medium-sized offerings. For these sized offerings, the rating implications for firms near a change in rating differ from the implications for firms not near a change in rating. For example, a small debt offering might result in a downgrade for a firm close to a downgrade, whereas it would not result in a downgrade for a firm distant from a downgrade. A very large debt offering might result in a downgrade for a firm near a downgrade or for a firm not near a downgrade. For extreme levels of debt offerings, virtually any firm might expect a downgrade. Large offerings might also be associated with acquisitions, reorganizations, or changes in management, and it is less likely that credit rating changes will be significant in these contexts. Because of this, the empirical tests exclude very large offerings (defined as greater than 10% of assets).[8]

The empirical tests exclude both very large debt and equity offerings, and large debt offerings only. The decision to issue a large- versus small-sized offering is likely different for equity relative to debt. Equity offerings involve larger transaction costs (Lee et al. (1996)) and happen less frequently (e.g., Table II indicates that debt offerings are five times more frequent than equity offerings). Lee et al. (1996) find that equity offerings have "substantial economies of scale" relative to debt offerings. If equity offerings have some form of minimum size, excluding large equity offerings based on a percentage of assets may disproportionately exclude smaller firms. Indeed, the median size of a firm undertaking an equity offering greater than 10% of assets is $670 million, significantly below the median size of the sample ($2.2 billion) and below the similar value for debt offerings ($1.5 billion). Equity offerings might most appropriately be thought of as binary decisions, in which case a large versus small distinction may not be relevant.

[8] Table I indicates that for this size of transaction, a firm might move several rating categories. Robustness to this definition is examined by changing the percentage to 20% and 5%; the results are qualitatively identical. At 10%, approximately 14% of firm-years are excluded (at 20%, only 5% of firm-years are excluded). Case 2 of the Appendix provides an illustration distinguishing large offerings from small offerings. The effect illustrated could result in firms near a downgrade conducting more large debt offerings than firms in the middle (even though they conducted fewer offerings in total). Since the dependent variable is a continuous measure of capital issuance, including large offerings could therefore confound the results.

B. Data and Summary Statistics

The sample is constructed from all firms with a credit rating in Compustat at the beginning of a particular year.[9] The credit rating used is Standard & Poor's Long-Term Domestic Issuer Credit Rating (Compustat data item 280). This rating is the firm's "corporate credit rating," which is a "current opinion on an issuer's overall capacity to pay its financial obligations" (Standard and Poor's (2001b, p. 61) "SP"). The sample period is 1986 to 2001 (1985 is the first year for which this rating is available in Compustat). I exclude firm-years in which the firm has missing data in the fields regularly required in the calculations of the tests in the paper.[10] Previous papers (e.g., Fama and French (2002) and Frank and Goyal (2003)) often exclude financial companies and utilities (SIC codes 4000-4999 and 6000-6999, respectively), however, ratings considerations are likely to affect these firms as well as industrial firms. I include these firms but I also show robustness to their exclusion from the sample.

Some of the more commonly used notation for the empirical tests is defined as follows (for notational convenience, i and t subscripts are suppressed for the credit rating dummy variables):

D_{it} = book long-term debt plus book short-term debt for firm i at time t (Compustat data item 9 plus data item 34).

ΔD_{it} = long-term debt issuance minus long-term debt reduction plus changes in current debt for firm i from time t to $t+1$ (Compustat data item 111 minus data item 114 plus data item 301).[11]

ΔLTD_{it} = long-term debt issuance minus long-term debt reduction for firm i from time t to $t+1$ (Compustat data item 111 minus data item 114).

E_{it} = book value of shareholders' equity for firm i at time t (Compustat data item 216).

ΔE_{it} = sale of common and preferred stock minus purchases of common and preferred stock for firm i from time t to $t+1$ (Compustat data item 108 minus data item 115).

A_{it} = beginning-of-year total assets for firm i at time t (Compustat data item 6).

[9] Faulkender and Peterson (2006) find that 78% of outstanding debt is issued by firms with a public debt rating. Cantillo and Wright (2000) find that firms that are larger and that have higher cash flow margins are more likely to have a bond rating. Houston and James (1996) find that firms that access the public debt market are larger, older, and have higher leverage.

[10] These are Compustat data items 6, 9, 12, 13, 34, 108, 111, 114, 115, and 216.

[11] For all net issuance measures, I use the direct cash flow variables as opposed to changes in balance sheet levels. Balance sheet level changes can include noncash changes, such as accretion of debt that was originally issued at a discount, changes from new translated balances of foreign debt due to changes in exchange rates, or marking to market hedging instruments that can be included with debt if related to the debt instrument. The cash flow statement variables are more direct measures of the specific issuance and reduction decision activity that I try to measure. The results of the paper are largely robust to using the balance sheet measures as well, however, the statistical significance is reduced to 5% or 10% in certain cases.

CR_{Plus} = dummy variable (equal to 1) for firms that have a plus credit rating at the beginning of the period, as described above.

CR_{Minus} = dummy variable for firms that have a minus credit rating at the beginning of the period, as described above.

$CR_{POM} = CR_{Plus} + CR_{Minus}$ = dummy variable for firms that have a minus or plus credit rating at the beginning of the period, as described above.

CR_{High} = dummy variable for firms that are in the top third of their Micro Rating with regard to their Credit Score at the beginning of the period, as described above.

CR_{Low} = dummy variable for firms that are in the bottom third of their Micro Rating with regard to their Credit Score at the beginning of the period, as described above.

$CR_{HOL} = CR_{High} + CR_{Low}$ = dummy variable for firms that are in the top or bottom third with regard to their Credit Score at the beginning of the period.

K_{it} = set of control variables, including leverage: $D_{i,t-1}/(D_{i,t-1} + E_{i,t-1})$, profitability: $EBITDA_{i,t-1}/A_{i,t-1}$ (EBITDA is Compustat data item 13), and size: $\ln(Sales_{i,t-1})$ (Sales is Compustat data item 12).

$NetDIss_{it} = (\Delta D_{i,t} - \Delta E_{i,t})/A_{i,t}$.[12]

Summary statistics for the sample are shown in Tables I and II. The sample contains 12,336 firm-years. Table I shows statistics for debt to total capitalization ratios by credit rating within the sample, and it also indicates the number of firm-years by rating. Table II shows the capital raising and reducing activity within the sample.

The debt to total capitalization ratios have the expected relationships to ratings—for example, the top four credit ratings have median debt to total capital ratios ranging from 31% to 44%, whereas the bottom four credit ratings have median debt to total capital ratios ranging from 66% to 72%. The variances within each rating for the debt to total capitalization ratios are generally high, indicating that although a relation exists between debt to total capitalization and ratings, the potential for differences within each rating is significant.

Table I indicates that the sample is relatively well distributed by rating. Although the range is from 172 B− firm-years to 1,380 A firm-years, 10 of the 17 rating categories have between 600 and 1,200 firm-years. This indicates that the empirical results in this paper are not likely driven by any specific ratings category.

Within offerings, Table II shows that nearly 40% of the sample raised only debt for the firm-year, compared to approximately 7% issuing only equity, with an offering defined as a net amount greater than 1% of total assets. A small

[12] Note that this variable reflects only changes in capitalization resulting from capital market transactions. This excludes changes in equity resulting from earnings for the year, as I am interested in capital structure decision making, not changes in leverage that result from firm performance.

Table I
Sample Summary Statistics—Ratings and Leverage

Means, medians, and standard deviations of debt/(debt + equity) by credit rating within the sample, and the number of firm-years (out of the total sample of 12,336 firms-years) that had the indicated rating at the beginning of the firm-year. The sample is Compustat firms from 1986 to 2001, excluding firms with missing values for regularly used variables in the empirical tests of the paper (these include credit ratings, total assets, debt, and equity). Debt/(debt + equity) is book long-term and short-term debt divided by book long-term and short-term debt plus book shareholders' equity (leverage statistics exclude firms with $D/(D + E)$ greater than 1 or less than 0).

	AAA	AA+	AA	AA−	A+	A
Number of Firm-Years	342	199	622	703	1,135	1,380
Debt/(Debt + Equity)						
Mean	39.3%	30.7%	39.0%	43.2%	46.7%	45.2%
Median	30.5%	37.4%	41.1%	44.1%	46.6%	46.1%
Std Dev.	28.2%	16.7%	18.2%	19.5%	20.5%	18.7%
	A−	BBB+	BBB	BBB−	BB+	BB
Number of Firm-Years	1,067	1,083	1,149	847	521	636
Debt/(Debt + Equity)						
Mean	46.4%	46.9%	48.9%	50.2%	55.4%	55.3%
Median	40.3%	42.1%	45.7%	48.6%	53.1%	53.6%
Std dev.	16.6%	15.9%	16.4%	17.4%	17.9%	17.7%
	BB−	B+	B	B−	CCC+ or Below	
Number of Firm-Years	785	1,067	419	172	209	
Debt/(Debt + Equity)						
Mean	59.5%	63.3%	68.0%	68.0%	62.5%	
Median	57.9%	66.2%	72.1%	70.6%	71.4%	
Std dev.	19.0%	21.0%	18.9%	23.0%	28.6%	

number issued both equity and debt (7%), leaving nearly half of the firm-years with no offerings. The propensities are similar for capital reductions, with approximately 27% reducing debt levels only compared to 13% reducing equity levels only. Once again both a debt and equity reduction is rare (5%), with approximately half of the sample not reducing capital.

Table II shows that firms are more likely to use one form of financing (debt or equity) during the year as opposed to both debt and equity. For example, conditional on an offering taking place, approximately 87% of firms will issue debt only or equity only versus issuing both during the year. To the extent firms follow the tradeoff theory and target a specific debt to capitalization level, they do not do this on an annual basis using both debt and equity offerings.[13]

Figure 3 shows average *NetDIss* by rating, and Figure 4 depicts debt and equity offerings by rating. The figures show a general relationship of firms of

[13] This is consistent, however, with the argument that firms might adjust toward target leverages over periods longer than 1 year, as argued in Leary and Roberts (2005) and Flannery and Rangan (2005).

Table II
Sample Summary Statistics—Capital Activity

Number of firm-years in the sample with the indicated capital activity. A debt or equity offering or reduction is defined as the net amount raised or reduced equal to 1% of total assets or greater for the calendar year. The sample is Compustat data covering security issuance from 1986 to 2001 and excludes firms with missing values for regularly used variables in the empirical tests of the paper (these include credit ratings, total assets, debt, and equity).

	Offerings		Reductions	
	N	%	*N*	%
Debt only	4,829	39.1%	3,264	26.5%
Equity only	896	7.3%	1,657	13.4%
Debt and equity	829	6.7%	641	5.2%
Neither	5,782	46.9%	6,774	54.9%
Total	12,336	100.0%	12,336	100.0%

higher credit quality issuing more debt and less equity than firms of lower credit quality. The empirical tests control for the financial condition of the firm to account for this general relationship. The raw data also indicates that firms near a rating change issue less debt than equity (as depicted in Figure 2) for several rating categories. Average *NetDIss* has the predicted pattern in four of six Broad Ratings categories. For debt issues, firms near a rating change in the AA, B, and CCC categories issue less debt than firms not near a rating change. For equity issues, firms near a rating change in the AA, BB, B, and CCC categories issue more equity than firms not near a rating change. This behavior is not explained by traditional capital structure theories. The figures indicate that a firm's credit rating situation appears to affect capital structure decisions; I now formally test this finding.

C. Plus or Minus Tests

In this section, I evaluate the concern for a change in Broad Rating using the POM test. CR-CS implies that firms with a minus or plus rating will issue less debt relative to equity than firms that are in the middle. The following three regressions test this hypothesis:

$$NetDIss_{it} = \alpha + \beta_0 CR_{POM} + \phi K_{it} + \varepsilon_{it} \tag{1}$$

$$NetDIss_{it} = \alpha + \beta_1 CR_{Plus} + \beta_2 CR_{Minus} + \phi K_{it} + \varepsilon_{it} \tag{2}$$

$$NetDIss_{it} = \alpha + \beta_3 CR_{POM} + \varepsilon_{it}. \tag{3}$$

These equations test whether a firm's net issuance of debt versus equity for a particular year is affected by how near that firm is to an upgrade or a downgrade in their credit rating at the end of the previous period. The implication that

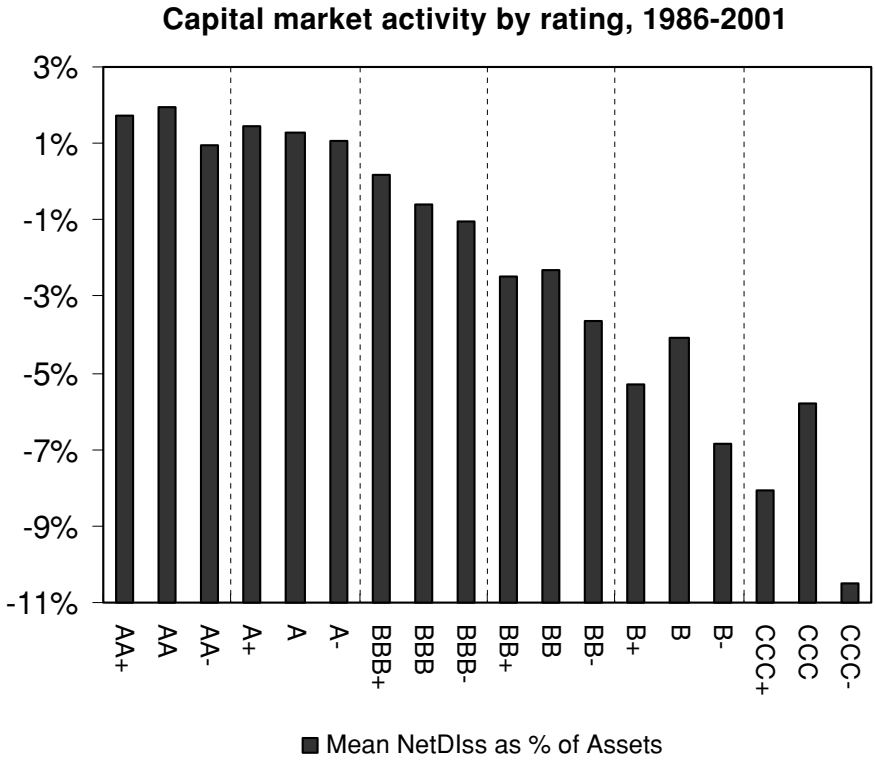


Figure 3. Average net debt issuance minus net equity issuance by rating. This figure depicts the mean value of *NetDIss,* $(\Delta D_{i,t} - \Delta E_{i,t})/A_{i,t}$, by rating across firm-years from 1986 to 2001. The sample is all Compustat firms with a credit rating at the beginning of the year, excluding firm-years with a very large debt offering.

firms near a rating change will have more conservative debt financing policies than firms in the middle, as implied by CR-CS, predicts that $\beta_i < 0, i = 0, 1, 2, 3$. The null hypothesis is $\beta_i \geq 0$. Results of these regressions are shown in Table III, where Panel A excludes large debt offerings and Panel B excludes large debt and equity offerings.

These results strongly support CR-CS, with rejection of the null at the 1% level that firms are indifferent to being near a credit rating change for capital structure decisions. The signs for the coefficients are as predicted as well; firms near a change in credit rating are less likely to issue debt relative to equity than firms in the middle.[14] The value for the coefficient β_3 of equation (3) in column 3 of Panel A indicates that firms with a plus or minus rating annually issue approximately 1.0% less debt net of equity as a percentage of total assets (or 1.0% more equity net of debt as a percentage of total assets) than firms in the

[14] The null would be accepted for any positive values of the coefficient, so this is a one-sided statistical test and *t*-statistics will be interpreted as such throughout the paper.

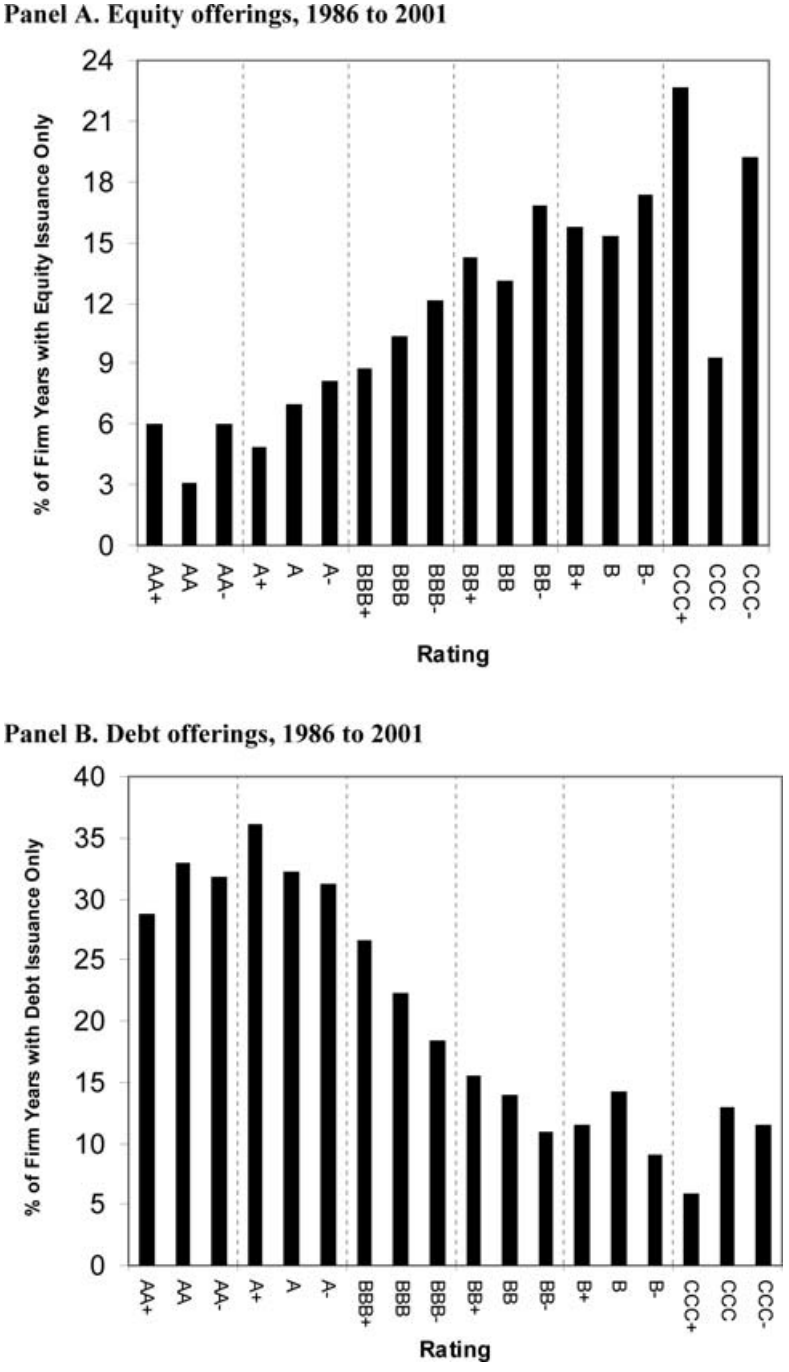


Figure 4. Debt and equity offerings by rating. This figure depicts the percentage of firm-years within a given rating that have an equity offering (Panel A) or debt offering (Panel B), from 1986 to 2001. The sample is all Compustat firms with a credit rating at the beginning of the year. An offering is defined as an issuance greater than 1% of total assets for the year.

Table III
Credit Rating Impact on Capital Structure Decisions—Plus or Minus Tests

Coefficients and standard errors from pooled time-series cross-section regressions of net debt raised for the year minus net equity raised for the year divided by beginning-of-year total assets on credit rating dummy variables and on control variables measured at the beginning of each year. CR_{POM} is a credit rating dummy variable equal to 1 if the firm has either a plus or a minus credit rating and 0 otherwise. CR_{Plus} and CR_{Minus} are credit rating dummy variables equal to 1 if the firm has a plus or minus rating, respectively and 0 otherwise. The control variables include $D/(D+E)$, book debt divided by book shareholder's equity plus book debt, *EBITDA/A*, previous year's *EBITDA* divided by total assets, and ln(*Sales*), the natural log of total sales. The sample covers security issuance from 1986 to 2001 and excludes observations with missing values for any of the variables. A large offering is defined as an offering greater than 10% of total assets in the year. Errors are White's consistent standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: Excluding Large Debt Offerings			Panel B: Excluding Large Debt and Equity Offerings		
	1	2	3	1	2	3
Intercept	−0.0787**	−0.0787**	−0.0006	−0.0384***	−0.0384***	0.0043***
	(0.0082)	(0.0082)	(0.0012)	(0.0051)	(0.0051)	(0.0010)
CR_{POM}	−0.0058***		−0.0102***	−0.0027**		−0.0050***
	(0.0016)		(0.0017)	(0.0013)		(0.0013)
CR_{Plus}		−0.0064***			−0.0012	
		(0.0020)			(0.0015)	
CR_{Minus}		−0.0051***			−0.0044***	
		(0.0019)			(0.0015)	
$D/(D+E)$	−0.0153**	−0.0153**		−0.0095**	−0.0095**	
	(0.0066)	(0.0066)		(0.0045)	(0.0046)	
EBITDA/A	0.1288***	0.1293***		0.1139***	0.1133***	
	(0.0265)	(0.0264)		(0.0123)	(0.0123)	
ln(*Sales*)	0.0090***	0.0090***		0.0042***	0.0042***	
	(0.0008)	(0.0008)		(0.0004)	(0.0004)	
Adj. R^2	0.0541	0.0542	0.0030	0.0407	0.0410	0.0015
N	10,842	10,842	10,842	10,573	10,573	10,573

middle.[15] This indicates that the results are not only statistically significant but also economically significant. These results are robust to excluding SIC codes 4000-4999 and 6000-6999 and to examining binary decisions (e.g., debt vs. equity) using logit tests (not reported). The effects are also evident when the dependent variable is broken into net debt only or net equity only.[16]

[15] Previous versions of this paper report results excluding SIC codes 4000-4999 and 6000-6999, with coefficients on CR_{POM} as large as −0.015 (significant at 1%). The smaller coefficients including all firms may be a result of utilities issuing securities less often than other firms (see Lee et al. (1996)). I also conduct tests with all SIC codes but excluding firm-years for which no offering was undertaken (defined as 1% of assets) to focus on firm-years such that firms were active in the capital markets. The coefficients in this case on CR_{POM} in Columns 1 and 3 are −0.0073 and −0.0128, respectively, both statistically significant at 1%.

[16] The coefficient on CR_{POM} in Column 1 of Panel A, Table III, is −0.0035 for net debt only and 0.0023 for net equity only, and for Column 3 of Panel A the coefficients are −0.0051 and 0.0051 for net debt and equity only, respectively (all statistically significant at 1%).

The coefficients are smaller and the significance is reduced in the Panel B results with large debt and equity offerings excluded. Since excluding large equity offerings disproportionately excludes smaller firms, I also test equations (1)–(3) with large debt and equity offerings excluded, except for large equity offerings for firms with assets less than $500 million. In these tests (not reported), the results are similar to the stronger Panel A results.

Equation (2) examines whether firms are more sensitive to being near an upgrade versus a downgrade. In both Panel A and B of Table III, the coefficients on the plus and minus dummy variables are negative, consistent with CR-CS. Although the plus dummy variable is not statistically significant in Panel B, it is significant when large debt and equity offerings are excluded, except for large equity offerings for firms with assets less than $500 million. The Panel A results indicate that firms near an upgrade issue 0.6% less debt relative to equity, and firms near a downgrade issue 0.5% less debt relative to equity than firms not near a change in rating.

These tests mitigate concerns that the results may be driven by financial distress. The results for firms near an upgrade distinguish credit rating effects from financial distress arguments because credit rating concerns have the opposite implications of financial distress arguments in this test. Firms near an upgrade are on average of higher credit quality and thus should have lower probabilities of bankruptcy. The results for firms near a downgrade, controlling for leverage, profitability, and size, also indicate that the credit rating results are distinct from financial distress. In particular, to the extent that larger firms have lower probabilities of distress, the size of a firm is an explicit measure of financial distress. The positive coefficient on the log of sales indicates that firms with lower probability of distress issue more debt relative to equity. The credit rating dummy variables provide additional explanatory power beyond these distress effects.

Concern for credit ratings is evident on a year-by-year basis as well. Table IV shows that for 13 of 16 individual years the coefficient on CR_{POM} is the correct sign, for 5 of 16 years the coefficient is statistically significant at the 5% level, and for 7 of 16 years the coefficient is significant at the 10% level. For 9 of 16 years the coefficient implies at least 0.5% less debt relative to equity annually and 5 years have coefficients less than -1.0%, suggesting economic significance across years as well. Twelve of 16 of both the plus and minus coefficients are negative, implying concern for both upgrades and downgrades across years.

I conduct a number of tests to evaluate the robustness of the t-statistics, given potential nonindependence of observations due to the pooled time-series cross-section regression approach. Specifically, I calculate Fama and MacBeth (1973) t-statistics as suggested by Fama and French (2002), I conduct a random effects test and a two-way fixed effects test, and I conduct regressions that include dummy variables for the firm's industry (based on the two-digit SIC code) and for individual years. The results are not robust to a two-way fixed effects test due to the test's reliance on time-series credit rating variation within firms to identify the relationship between credit ratings and capital structure. The

Table IV

Credit Rating Impact on Capital Structure Decisions—POM Coefficients by Year

Coefficients and standard errors from cross-sectional regressions by year of net debt raised for the year minus net equity raised for the year divided by beginning-of-year total assets on a constant, credit rating dummy variables and control variables measured at the beginning of each year. CR_{POM} is a credit rating dummy variable equal to 1 if the firm has either a plus or a minus credit rating and 0 otherwise. CR_{Plus} and CR_{Minus} are credit rating dummy variables equal to 1 if the firm has a plus or minus rating, respectively and 0 otherwise. Regression 1 includes the CR_{POM} dummy variable and Regression 2 includes the CR_{Plus} and CR_{Minus} credit rating dummy variables. The control variables (not shown) are $D/(D+E)$, book debt divided by book shareholder's equity plus book debt, *EBITDA/A*, *EBITDA* divided by total assets, and ln(*Sales*), the natural log of total sales. The samples exclude observations with missing values for any of the variables. The sample also excludes a firm-year if the firm had a debt offering greater than 10% of total assets in the year. Errors are White's consistent standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1986	1987	1988	1989	1990	1991	1992	1993
Regression 1								
CR_{POM}	0.0051	−0.0173**	−0.0145***	0.0048	−0.0043	−0.0069	0.0031	−0.0141**
	(0.0080)	(0.0084)	(0.0051)	(0.0059)	(0.0047)	(0.0067)	(0.0068)	(0.0068)
Regression 2								
CR_{Plus}	0.0002	−0.0106	−0.0157***	0.0016	0.0022	−0.0042	0.0010	−0.0168**
	(0.0092)	(0.0105)	(0.0063)	(0.0068)	(0.0057)	(0.0086)	(0.0081)	(0.0092)
CR_{Minus}	0.0119	−0.0249***	−0.0131**	0.0090	−0.0110**	−0.0096*	0.0052	−0.0117*
	(0.0102)	(0.0097)	(0.0067)	(0.0074)	(0.0065)	(0.0068)	(0.0082)	(0.0083)

	1994	1995	1996	1997	1998	1999	2000	2001
Regression 1								
CR_{POM}	−0.0104**	−0.0129**	−0.0052	−0.0023	−0.0080*	0.0040	−0.0046	−0.0066*
	(0.0052)	(0.0058)	(0.0067)	(0.0065)	(0.0052)	(0.0072)	(0.0060)	(0.0044)
Regression 2								
CR_{Plus}	−0.0132**	−0.0187***	−0.0062	−0.0011	−0.0066	−0.0029	−0.0033	−0.0044
	(0.0063)	(0.0089)	(0.0086)	(0.0072)	(0.0061)	(0.0092)	(0.0072)	(0.0053)
CR_{Minus}	−0.0077	−0.0064	−0.0039	−0.0037	−0.0096*	0.0122	−0.0060	−0.0091**
	(0.0072)	(0.0064)	(0.0075)	(0.0079)	(0.0064)	(0.0077)	(0.0074)	(0.0050)

within-firm credit rating variance is not sufficiently large, especially relative to the between-firm variance of the credit rating dummy variables, so the power of that test is reduced. For all the other tests, the results are robust. The Fama and MacBeth t-statistics imply significance at the 1% level, and coefficients on the plus or minus dummy variable in regressions with random firm effects or with industry and year dummy variables remain negative and significant at the 1% level.

The tests of this section strongly indicate that firms near a change in Broad Rating issue less debt relative to equity than firms not near a change in rating, excluding very large offerings. As discussed previously, very large offerings are likely to have ratings consequences for all firms, so discrete costs (benefits) of ratings changes do not obviously imply distinguishing behavior for firms near

a change in rating for these offerings. The Appendix provides an example of the somewhat nonintuitive implication of CR-CS that conditional on undertaking an offering, firms near a ratings change may undertake large debt (equity) offerings more (less) often than firms not near a change in rating.

Although the implications are less straightforward, I conduct limited tests to explore large offerings (not reported). I test equation (1) excluding firm-years except cases in which a large offering was conducted (greater than 10% of assets). For this test, the coefficient on CR_{POM} is negative but not significantly different from 0, as suggested by rating consequences for all firms. I also conduct a logit test wherein the decision is between a large and a small offering conditional on undertaking an offering. These tests indicate that firms near a rating change are more likely to undertake a large debt offering conditional on undertaking a debt offering, consistent with Case 2 in the Appendix. Firms near a rating change are also more likely to issue large equity, however, conditional on undertaking an equity offering. This result is inconsistent with the illustration in the Appendix. Since equity offerings have higher transaction costs and significant economies of scale, equity offerings may be most appropriately considered as binary decisions, that is, to issue or not issue, where offering size is predetermined. Nevertheless, the finding that firms near a change in rating issue more large equity offerings is not something directly inferred from the hypotheses of this paper.

D. Credit Score Tests

In this section, I evaluate the concern for a potential change in rating of any kind using the Credit Score test. To identify firms near a ratings change, I compute a Credit Score for each firm and rank firms within each Micro Rating.[17] To derive the equation to calculate scores, I regress credit ratings on factors that are thought to predict ratings. The dependent variable is equal to 1 for a rating of CCC−, up to a value of 18 for a rating of AA+ (see Horrigan (1966) for a similar approach).[18] The explanatory variables here are motivated by previous studies predicting credit ratings and also by the criteria that the ratings agencies themselves argue are significant for determining ratings.[19] I consider the following explanatory variables (with selected citations in parentheses): Net Income/ Total Assets (Pogue and Soldofsky (1969) (PS), Kaplan and Urwitz (1979)

[17] Financial firms and utilities are ranked separately from industrials as these firms have different ratings criteria (see Standard and Poor's (2001b)).

[18] I use an ordinary least squares regression to determine the equation for calculating Credit Scores; however, I also verify robustness of this section's tests to use scores calculated using an ordered probit model (see Ederington (1985)). The results are very similar.

[19] Ederington (1985, p. 247) (E) states that, "while the exact list of independent variables varies from study to study, measures of (1) leverage, (2) coverage and/or profitability, (3) firm size, and (4) subordination status, have consistently appeared on the lists of important determinates of ratings." Standard and Poor's (2001b) (SP) outlines key criteria for ratings, of which the financial factors are size, profitability and coverage, capital structure/leverage and asset protection, and cash flow ratios. The objective is simply to obtain a sufficiently predictive measure within this sample of firms that is also theoretically consistent.

(KU), Kamstra, Kennedy, and Suan (2001) (KKS)), Debt/Total Capitalization (PS, Ederington (1985) (E), Standard and Poor's (2001b) (SP)), Debt/Total Capitalization squared (PS), EBITDA/Interest Expense (KU, SP), EBIT/Interest Expense (SP), (Log of) Total Assets (KKS, SP), and EBITDA/Total Assets (included as an additional measure of profitability). In a regression including all of these variables, several of the variables are redundant or have counterintuitive coefficient signs. By systematically dropping the redundant or nonpredictive variables, a regression including only (Log of) Total Assets, EBITDA/Total Assets, and Debt/Total Capitalization has an adjusted R^2 of 0.631, approximately the same as a regression with all of the explanatory variables, and the coefficients on each of the variables are the correct sign and significant. I use the coefficients from this parsimonious regression to calculate the Credit Score as

$$\begin{aligned} CreditScore = {} & 1.4501 Log(A) + 11.6702 EBITDA/A \\ & - 6.0462 Debt/TotalCap. \end{aligned} \tag{4}$$

The sample used for calculating this Credit Score equation is the same as in the previous section; however, I also exclude any firm whose debt/total capitalization is greater than 1 or less than 0. These values are outliers that obscure the calculation of the Credit Score equation if included. Previous studies also often look at ratings of new issues. The interest in this paper, however, is predicting ratings for existing bonds of firms, so I use all firm ratings across the sample.

I calculate Credit Scores for each firm-year with this equation, and I then rank firms within each Micro Rating into high thirds, middle thirds, and low thirds.[20] Dummy variables are then constructed from these thirds for inclusion in the test equations. For example, within the Micro Rating A−, firms with a Credit Score that places them in the high or low third within A− are given a value of 1 for the dummy variable CR_{HOL} and firms with Credit Scores that place them in the middle third are assigned a 0 for that dummy variable. I also create dummy variables for the individual high and low categories. I then run the regressions[21]

$$NetDIss_{it} = \alpha + \beta_0 CR_{HOL} + \phi K_{it} + \varepsilon_{it} \tag{5}$$

$$NetDIss_{it} = \alpha + \beta_1 CR_{High} + \beta_2 CR_{Low} + \phi K_{it} + \varepsilon_{it} \tag{6}$$

$$NetDIss_{it} = \alpha + \beta_3 CR_{HOL} + \varepsilon_{it}. \tag{7}$$

[20] The ranking uses the entire sample for each Micro Rating, which requires the further assumption that the credit rating agencies maintain the same requirements for a particular rating throughout the sample period. The alternative would be to rank on a year-by-year basis, but this would require the (perhaps more unrealistic) assumption that the quality distribution of firms within each Micro Rating is constant over time.

[21] Note that this approach has a potential errors-in-variables complication, since the measure for the Credit Score is measured with error. The Credit Scores are not used directly; however, they are used to group firms into high and low thirds and to create dummy variables based on these groupings. Thus, the effects of the errors-in-variables complication should be reduced given this approach.

The sample for these tests is similar to that above, although some additional observations are lost since in some cases the terms required to calculate the Credit Score are missing. Initially I also exclude debt offerings greater than 10% of total assets for the year.

The individual variables used to calculate a score are highly related to the financial condition of the firm, and firms with relatively worse financial condition issue, on average, less debt relative to equity (as shown in Figure 3). This correlation would therefore likely produce a negative coefficient on the dummy variable for the low third and a positive coefficient for the high third dummy variable, independent of the credit rating effects I try to identify. Including both the high third and low third within the dummy should negate this effect by offsetting one against the other. Therefore, once again CR-CS predicts that the coefficient β_0 in equation (7) will be less than 0, as those firms closer to a change in rating will be more conservative (issue less debt relative to equity) with respect to their financing choices.

Another approach to mitigate the effects of the financial condition of the firm is to include control variables as in equation (5). One potential problem with this is that the control variables are the same or similar to the variables used in the score calculation. However, the control variables in the regression allow for a linear relationship with the particular variable and the dependent variable, and the variables in the score calculation enter the regression only indirectly in the determination of the dummy variable (which by construction is not a linear relationship). Equation (6) tests the individual high and low dummy variables separately, to determine to what extent the results are driven by one or the other.

Table V shows results for the regressions (5)–(7). The first and third regressions of Panel A show that the coefficient on CR_{HOL} is statistically significantly negative at the 1% confidence level. The size of the coefficient is similar to the Broad Rating results, where the third regression indicates that firms in the high or low third within a particular credit rating annually issue nearly 1% less net debt minus net equity as a percentage of total assets than firms in the middle.[22] Once again, credit ratings appear to be both statistically and economically significant, but in this case specifically with regard to any potential ratings change. I also conduct the tests with the alternative large offering distinctions (not tabulated), and the implications are similar to the POM tests. The results hold additionally both for net debt and for net equity separately, implying that firms are concerned about Micro Ratings for both debt and equity issuances.[23] I examine the results including only very large offerings and find that the coefficient on the credit rating dummy variable is negative but not

[22] I also conduct tests excluding firm-years for which no offering was undertaken (defined as 1% of assets) to focus on firm-years such that firms were active in the capital markets. The coefficients in this case on CR_{HOL} in Columns 1 and 3 are -0.0104 and -0.0116, respectively, both significant at 1%. The effects are thus larger when conditioning on capital market activity being undertaken.

[23] The coefficient on CR_{HOL} in Column 1 of Panel A, Table V is -0.0053 for net debt only and 0.0030 for net equity only, and both are statistically significant at 1%.

Table V

Credit Rating Impact on Capital Structure Decisions—Credit Score Tests

Coefficients and standard errors from pooled time-series cross-section regressions of net debt raised for the year minus net equity raised for the year divided by beginning-of-year total assets on credit rating dummy variables and on various control variables measured at the beginning of each year. CR_{HOL} is a credit rating dummy variable equal to 1 if the firm's Credit Score is in the high or low third of its Micro Rating and 0 otherwise. CR_{High} and CR_{Low} are credit rating dummy variables equal to 1 if the firm's Credit Score is in the high or low third, respectively, within its Micro Rating and 0 otherwise. The control variables include $D/(D+E)$, book debt divided by book shareholder's equity plus book debt, *EBITDA/A*, *EBITDA* divided by total assets, ln(*Sales*), the natural log of total sales. The sample covers security issuance from 1986 to 2001 and excludes observations with missing values for any of the variables. The sample excludes a firm-year if the firm had a debt offering greater than the indicated percentage of total assets in the year. Errors are White's consistent standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: Excl. Debt Offerings >10%			Panel B: Excl. Debt Offerings >5%		
	1	2	3	1	2	3
Intercept	−0.0781**	−0.0782**	−0.0009	−0.0916***	−0.0894***	−0.0129***
	(0.0082)	(0.0081)	(0.0013)	(0.0088)	(0.0086)	(0.0013)
CR_{HOL}	−0.0083***		−0.0091***	−0.0088***		−0.0098***
	(0.0017)		(0.0017)	(0.0017)		(0.0018)
CR_{High}		−0.0084***			−0.0075***	
		(0.0020)			(0.0020)	
CR_{Low}		−0.0083***			−0.0103***	
		(0.0025)			(0.0026)	
$D/(D+E)$	−0.0152**	−0.0153**		−0.0155**	−0.0153**	
	(0.0067)	(0.0068)		(0.0069)	(0.0073)	
EBITDA/A	0.1290***	0.1291***		0.1047***	0.1029***	
	(0.0272)	(0.0277)		(0.0294)	(0.0300)	
ln(*Sales*)	0.0092***	0.0092***		0.0098***	0.0098***	
	(0.0008)	(0.0008)		(0.0009)	(0.0009)	
Adj. R^2	0.0554	0.0554	0.0022	0.0589	0.0590	0.0027
N	10,547	10,547	10,547	9,154	9,154	9,154

statistically significant.[24] Finally, the results are also robust to the exclusion of SIC codes 4000-4999 and 6000-6999.

The large offering distinction for the Credit Score tests arguably needs to be applied on a smaller scale than for the POM tests. The size of offerings included in the sample would have to be small enough such that firms in the high or low third would be concerned with an upgrade or a downgrade when considering offerings of that size, and firms in the middle third would not face an upgrade or a downgrade if they undertook offerings of that size. To consider this sample issue, I also examine a large offering cutoff of 5%, with results

[24] For both POM and HOL tests, I also conduct tests with the full sample. In both cases, coefficients on the credit rating dummy are negative but not significantly different from 0.

shown in Panel B of Table V. The results are qualitatively unchanged by this modification.

The second regressions of Panels A and B show results with individual high and low dummy variables. The coefficients on both CR_{High} and CR_{Low} are significantly negative at the 1% level as predicted by CR-CS. Again the results for firms near an upgrade distinguish these findings from those that pertain to financial distress arguments. The Panel A results indicate that firms near a downgrade of their rating annually issue 0.83% less net debt than equity than firms not near a change in rating, and firms near an upgrade issue 0.84% less debt than equity. The credit rating effects appear to be symmetric for upgrades and downgrades and economically significant for both.

E. Results by Rating: Credit Score and POM Tests

Table VI shows results of the Credit Score tests and POM tests by Broad Rating. Credit rating effects persist throughout the ratings spectrum. The power of these tests is reduced as the sample sizes are smaller in each test. However, in 9 of the 12 ratings categories, the coefficients on the combined dummy variables are of the correct sign, and in 8 of 12, the coefficients are less than −0.5%. Firms seem to be particularly concerned with Micro Ratings changes across ratings, with four of six coefficients in the Credit Score tests significant at the 5% level.

Since firms are likely to have their commercial paper rating downgraded from A1+ to A1 with a downgrade in long-term rating to A+ from AA−, the AA− results in the POM test suggest that access to the commercial paper markets may be a significant factor for firms with regard to credit ratings. The HOL results at the A and BBB rating levels are also indicative of the concern for commercial paper access. Firms at the A rating levels might be concerned with losing (or obtaining) an A1 commercial paper rating, and firms at the BBB rating levels might be concerned with losing (or obtaining) an A2 commercial paper rating.[25] The BB and B POM results indicate that firms with speculative-grade bond ratings are particularly concerned with ratings changes, perhaps due to concern for the liquidity of their bonds or the impact on regulations for investors in their bonds.

Several of the explanations outlined in Section I of why credit ratings are significant imply that credit rating concerns should be most prominent around the change from investment-grade to speculative-grade status (i.e., from BBB− to BB+). The coefficients on BB+ and BBB− are negative in the POM tests, providing some support for this predicted behavior; however, neither is significantly different from 0. One possible explanation for the lack of significance is that the distinction in these tests is too narrow, given the significance of this change in rating. To the extent that BB and BBB firms are also concerned with

[25] Consistent with commercial paper concerns, the effects around these ratings are larger when the sample is restricted to include only firms that have a commercial paper rating (results not reported).

Table VI
Credit Rating Impact by Broad Rating

Coefficients and standard errors from pooled time-series cross-section regressions by Broad Rating of net debt raised for the year minus net equity raised for the year divided by beginning-of-year total assets on a constant, credit rating dummy variables and control variables measured at the beginning of each year. Regressions 1 and 2 distinguish different credit rating dummy variables included in the regressions. CR_{POM} is a credit rating dummy variable equal to 1 if the firm has either a plus or a minus credit rating and 0 otherwise. CR_{Plus} and CR_{Minus} are credit rating dummy variables equal to 1 if the firm has a plus or minus rating, respectively, and 0 otherwise. CR_{HOL} is a credit rating dummy variable equal to 1 if the firm's Credit Score is in the high or low third of its Micro Rating, and 0 otherwise. CR_{High} and CR_{Low} are credit rating dummy variables equal to 1 if the firm's Credit Score is in the high or low third, respectively, within its Micro Rating and 0 otherwise. The control variables (not shown) are $D/(D+E)$, book debt divided by book shareholder's equity plus book debt, *EBITDA*/*A*, *EBITDA* divided by total assets, and ln(*Sales*), the natural log of total sales. The sample covers security issuance from 1986 to 2001 and excludes observations with missing values for any of the variables. The sample also excludes a firm-year if the firm had a debt offering greater than 10% of total assets in the year. Errors are White's consistent standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	AA	A	BBB	BB	B	CCC
Panel A: Plus or Minus Tests						
Regression 1						
CR_{POM}	−0.0052**	0.0004	0.0020	−0.0059	−0.0195***	−0.0221
	(0.0024)	(0.0022)	(0.0027)	(0.0055)	(0.0077)	(0.0331)
Regression 2						
CR_{Plus}	−0.0028	0.0007	0.0064	−0.0024	−0.0185***	−0.0212
	(0.0034)	(0.0025)	(0.0031)	(0.0068)	(0.0078)	(0.0343)
CR_{Minus}	−0.0060**	0.00001	−0.0037	−0.0084*	−0.0250**	−0.0263
	(0.0026)	(0.0026)	(0.0033)	(0.0058)	(0.0151)	(0.0510)
Panel B: Credit Score Tests						
Regression 1						
CR_{HOL}	−0.0052**	−0.0062***	−0.0076***	−0.0066	−0.0150**	0.0703
	(0.0025)	(0.0022)	(0.0028)	(0.0057)	(0.0090)	(0.0328)
Regression 2						
CR_{High}	−0.0103***	−0.0043*	0.0024	0.0033	−0.0166*	0.0530
	(0.0032)	(0.0027)	(0.0035)	(0.0071)	(0.0112)	(0.0380)
CR_{Low}	−0.0008	−0.0079***	−0.0175***	−0.0163**	−0.0133	0.0933
	(0.0031)	(0.0026)	(0.0035)	(0.0071)	(0.0118)	(0.0416)

the investment-grade to speculative-grade change, for example, the BBB and BB POM tests of Table VI are misspecified. To explore this further, I create an additional dummy variable defined in two ways: firms with a credit rating of BBB− or BB+, and firms with a rating of BBB, BBB−, BB+, or BB. Denoting this additional variable as $CR_{IG/SG}$, I conduct the following two tests for each definition:

$$NetDIss_{it} = \alpha + \delta CR_{IG/SG} + \phi K_{it} + \varepsilon_{it} \tag{8}$$

$$NetDIss_{it} = \alpha + \delta CR_{IG/SG} + \beta CR_{POM} + \phi K_{it} + \varepsilon_{it}. \tag{9}$$

Table VII shows results of these two equations with the two different definitions of $CR_{IG/SG}$.[26] The coefficient on $CR_{IG/SG}$ is negative for both measures in equation (8), with statistical significance at the 1% level in both cases. For the first measure, $CR_{IG/SG}$ is significant at 5% in equation (9) and the coefficient is negative. For the second measure, $CR_{IG/SG}$ is significant at the 1% level and it also increases the coefficient on CR_{POM} (from -0.58% to -0.71%).[27] The sum of the coefficients of regression 2 of Panel B suggests that firms with a BBB− or BB+ rating issue 1.62% less debt than equity relative to other firms. These tests suggest that credit ratings are incrementally more significant at the investment-grade to speculative-grade credit rating distinction.

IV. Incorporating CR-CS into Traditional Capital Structure Tests

A. *Shyam-Sunder and Myers (1999) (SSM) Tests*

A.1. Pecking Order Test

The SSM test for pecking order asserts that to the extent that a firm has a deficit in funds (*DEF*) beyond what can be met by internally generated funds, the deficit will be made up through an issuance of debt instead of equity. *DEF* is defined as capital expenditures, dividend payments, the net increase in working capital, and the current portion of long-term debt (at the start of the period) less operating cash flows, after interest and taxes. To determine whether credit rating effects persist in the context of this pecking order test, I consider the following modified tests (where * = POM or HOL):

$$\frac{\Delta LTD_{it}}{A_{it}} = a + b\frac{DEF_{it}}{A_{it}} + \beta_0 CR_* + \varepsilon_{it}. \tag{10}$$

The pecking order theory implies that "*b*" is close to 1 and "*a*" is equal to 0. CR_* is a dummy variable for whether a firm has a plus or minus within its Broad Rating or whether a firm is in the top or bottom third of its Micro Rating based on its Credit Score. If the pecking order model is correct and credit ratings do not matter, the β coefficient should be equal to 0. CR-CS implies β coefficients less than 0. I run these tests using the sample of firms from the previous section, additionally excluding firm-years for which a variable required for calculating

[26] To the extent that the control variables in these tests do not completely control for financial distress, the significant results for the investment-grade to speculative-grade dummy variables could be explained to some extent by distress concerns, since more firms in the control set have higher ratings than the test group of firms. To explore this conjecture, I also conduct the tests of Panel B excluding firms with AAA and AA ratings. The results are similar, although somewhat less significant (but still significant at 1%).

[27] I also test net debt and net equity issuances separately for the last column of Table VII. Interestingly, the results indicate that the IG/SG coefficient is entirely driven by debt activity.

Table VII
Credit Rating Impact on Capital Structure Decisions—Investment-Grade to Speculative-Grade

Coefficients and standard errors from pooled time-series cross-section regressions of net debt raised for the year minus net equity raised for the year divided by beginning-of-year total assets on credit rating dummy variables and on control variables measured at the beginning of each year. CR_{POM} is a credit rating dummy variable equal to 1 if the firm has either a plus or a minus credit rating and 0 otherwise. $CR_{IG/SG}$ is a credit rating dummy variable equal to 1 if the firm has a rating of BBB− or BBB+ in Panel A or BBB, BBB−, BB+, and BB in Panel B, and 0 otherwise. The control variables include $D/(D+E)$, book debt divided by book shareholder's equity plus book debt, *EBITDA/A*, *EBITDA* divided by total assets, and ln(*Sales*), the natural log of total sales. The sample covers security issuance from 1986 to 2001 and excludes observations with missing values for any of the variables. The sample also excludes a firm-year if the firm had a debt offering greater than 10% of total assets in the year. Errors are White's consistent standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: BBB− and BB+		Panel B: BBB, BBB−, BB+, and BB	
	1	2	1	2
Intercept	−0.0826***	−0.0791**	−0.0814***	−0.0745
	(0.0082)	(0.0082)	(0.0083)	(0.0084)
$CR_{IG/SG}$	−0.0086***	−0.0068**	−0.0073***	−0.0091***
	(0.0030)	(0.0031)	(0.0020)	(0.0021)
CR_{POM}		−0.0040***		−0.0071***
		(0.0017)		(0.0017)
$D/(D+E)$	−0.0153**	−0.0152**	−0.0153**	−0.0151**
	(0.0066)	(0.0066)	(0.0066)	(0.0066)
EBITDA/A	0.1278***	0.1278***	0.1262***	0.1251***
	(0.0265)	(0.0266)	(0.0267)	(0.0268)
ln(*Sales*)	0.0092***	0.0090***	0.0092	0.0089***
	(0.0008)	(0.0008)	(0.0007)	(0.0008)
Adj. R^2	0.0542	0.0546	0.0545	0.0559
N	10,842	10,842	10,842	10,842

DEF is missing,[28] firms with SIC codes 4000-4999 and 6000-6999, and I also exclude large offerings.[29]

Column 1, Panel A of Table VIII shows results replicating the test from SSM with my sample. The coefficient on the deficit is equal to 0.54 and is statistically

[28] SSM use a sample of only 157 firms because they require firms to have continuous data available during their sample period. They note, however, that if they were only testing the pecking order theory, this restriction would not be necessary. For the subsequent tradeoff tests, I include a firm if it has 3 years of data over which to calculate the relevant variables, since a sample of 157 firms would make testing credit rating effects difficult considering the dispersion of firms across ratings. Furthermore, as SSM point out, their restriction may bias the sample to large firms with conservative debt ratios.

[29] Restricting the sample only to firms that do not undertake large offerings specifically would weaken the pecking order results, as this would allow firms with large deficits and small debt offerings to be included, yet it would exclude firms with large deficits and large debt offerings, for example. Therefore, I also place the restriction on the deficit itself, limiting the size of the deficit to be less than 10% total assets, in addition to limiting the size of the change in long-term debt to be less than 10%. I proceed similarly for the tradeoff tests.

Table VIII

SSM Tests of Pecking Order and Tradeoff Theories with Credit Rating Factors

Coefficients and standard errors from pooled time-series cross-section regressions of net long-term debt raised for the year divided by beginning-of-year total assets on credit rating dummy variables and on *DEF* or $(LTD' - LTD)$. CR_{POM} is a credit rating dummy variable equal to 1 if the firm has either a plus or a minus credit rating and 0 otherwise. CR_{HOL} is a credit rating dummy variable equal to 1 if the firm's Credit Score is in the high or low third of its Micro Rating and 0 otherwise. *DEF* and $(LTD' - LTD)$ are defined as in Shyam-Sunder and Myers (1999): *DEF* is capital expenditures plus dividend payments plus net increase in working capital and the current portion of long-term debt minus operating cash flows after interest and taxes, and $(LTD' - LTD)$ is target debt level minus current debt level divided by total assets. The sample covers security issuance from 1986 to 2001 and excludes firms with SIC codes 4000-4999 and 6000-6999 and observations with missing values for any of the variables. The sample also excludes a firm-year if the firm had a debt offering greater than 10% of total assets in the year or if the SSM explanatory variable is greater than 10% of total assets for the year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: Pecking Order Tests						Panel B: Tradeoff Tests					
	POM Tests			HOL Tests			POM Tests			HOL Tests		
	1	2	3	4	5	6	1	2	3	4	5	6
Intercept	−0.0195***	−0.0109***	−0.0166***	−0.0198***	−0.0111***	−0.0166***	−0.0044***	−0.0060***	−0.0013***	−0.0046***	−0.0057***	−0.0016
	(0.0008)	(0.0014)	(0.0012)	(0.0008)	(0.0015)	(0.0013)	(0.0007)	(0.0013)	(0.0009)	(0.0009)	(0.0015)	(0.0017)
DEF	0.5396***		0.5384***	0.5453***		0.5444***						
	(0.0116)		(0.0116)	(0.0118)		(0.0118)						
$(LTD' - LTD)$							0.2255***		0.2243***	0.2373***		0.2357***
							(0.0082)		(0.0082)	(0.0086)		(0.0086)
CR_{POM}		−0.0070***	−0.0047***					−0.0069***	−0.0052***			
		(0.0018)	(0.0016)					(0.0017)	(0.0015)			
CR_{HOL}					−0.0067***	−0.0048***					−0.0077***	−0.0046***
					(0.0020)	(0.0017)					(0.0018)	(0.0018)
Adj. R^2	0.3130	0.0029	0.3150	0.3165	0.0024	0.3177	0.1154	0.0029	0.1169	0.1198	0.0032	0.1209
N	4,767	4,767	4,767	4,613	4,613	4,613	5,820	5,820	5,820	5,581	5,581	5,581

significant. This value is smaller than the 0.75 coefficient found in SSM; however, my sample is much broader. Frank and Goyal obtain a coefficient of 0.28 when they use a broader population of U.S. firms from the period 1971 to 1989. The sample is also different from that of Frank and Goyal, most significantly because the time frame I study is 1986–2001 and the sample is restricted to firms that have credit ratings. Again, the results here should be different from those of Frank and Goyal. It appears, however, that the coefficient in Table VIII matches fairly well within the findings of these previous tests.

Column 2, Panel A of Table VIII shows results including the POM credit rating dummy variable only. Although the dependent variable is now long-term debt only and the sample is changed given missing data required for calculating the *DEF* term, the 10% *DEF* exclusion, and the exclusions based on SIC codes, the credit rating variable is still statistically significantly negative at the 1% significance level.

Column 3, Panel A of Table VIII shows results including both the POM credit rating dummy variable and the *DEF* term (equation (10)). This test yields statistical significance for the dummy variable and the predicted sign. Therefore, when pecking order considerations are considered, credit ratings remain relevant for managers. The pecking order results also remain with credit rating effects. Columns 4–6 of Table VIII show results using the Credit-Score-based dummy variables. Once again, CR-CS is supported using this measure for proximity to a rating change, as the credit rating coefficient remains statistically significant at 1% when nested in the SSM pecking order test.

Note that in comparing the CR-CS effects to the traditional effects, there is an important distinction in the nature of these different tests. The credit rating factors are lagged values, and thus they predict future capital-raising activity. On the other hand, the SSM pecking order test uses contemporaneous data in constructing their independent variable *DEF* (with *DEF* effectively equal to debt plus equity issued) so this variable does not predict capital-raising activity. As the POM and HOL credit rating factors persist in this context, again there is strong support for CR-CS.

The definition for *DEF* in the SSM test includes the level of the current portion of long-term debt, as SSM assume that this must be paid in the next year. Frank and Goyal (2003) argue that the current portion of long-term debt should potentially be excluded as part of *DEF*. I also run the tests excluding the current portion of long-term debt in *DEF* (not reported). The implications regarding CR-CS are qualitatively similar to the tests using the SSM definition.

A.2. Tradeoff Theory Test

The tradeoff theory implies that there should be no change in leverage from year to year, regardless of whether the firm is near a change in rating, except to revert back to the target leverage (holding the company's marginal tax rate and distress costs constant). Proceeding as before, the test of the tradeoff theory conducted in SSM can also be modified to incorporate potential effects from credit rating concerns (where * = POM or HOL):

$$\frac{\Delta LTD_{it}}{A_{it}} = a + b\frac{(LTD' - LTD_{it})}{A_{it}} + \beta_0 CR_* + \varepsilon_{it}. \quad (11)$$

LTD′ is the firm's target long-term debt level. A difficulty in implementing this test is that the target debt level is not observed. One approach to estimate the target is to take historical averages of the debt to total capital ratios (e.g., Taggart (1977)). This is the predominate approach SSM use. The target debt level is determined by taking an average debt ratio for each firm for the sample period and multiplying that average by the firm's total capital at the beginning of each year to obtain the target debt level for that particular firm-year. The tradeoff theory states that b will be greater than 0 but less than 1 (it is less than 1 due to transaction costs associated with the changing capital levels).

CR-CS implies 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 CR-CS and the tradeoff theory together imply the same results for b and a negative value for β_0.

Panel B of Table VIII provides results considering POM and HOL dummy variables in the context of the tradeoff tests. Columns 1 and 4 of Panel B show results of the same test as conducted in SSM. The target adjustment coefficient, b, in my sample is 0.23–0.24 compared to 0.33 in SSM. My results are for a significantly larger sample, and I exclude large offerings. For these reasons, our results could differ, but the coefficient from my test seems reasonable considering the SSM results. Columns 2 and 5 show results from a regression with the credit rating dummy variables alone, with the modified sample.

Regressions 3 and 6 of Panel B, Table VIII nest the credit rating factors into the tradeoff theory test. The credit rating dummy variables remain statistically significant at 1% when nested in this test, with coefficients in both cases of approximately −0.5%. These results support CR-CS in the context of the tradeoff theory. Note, again, in comparing the CR-CS factors to the traditional factors, there is an important distinction between the factors. The SSM tradeoff theory test uses contemporaneous and future data to calculate the target leverage level. As SSM themselves show, this predisposes this test to perform well, as it can result in nonrejection of the model even when it is false. In contrast, the credit rating factors are lagged values, so they predict future capital structure activity—a more onerous requirement.[30]

[30] I also nest credit rating factors into the capital structure tests of Fama and French (2002). These results (with limited exceptions) also confirm that credit rating effects persist in the context of pecking order and tradeoff effects.

B. Common Variables in Recent Capital Structure Papers

Table IX shows results from regressions including the credit rating dummy variables and several additional variables from various capital structure papers. The variables in these regressions are obtained from the following papers: Graham, Lemmon, and Schallheim (1998) (GLS), Barclay and Smith (1995) (BS), Hovakimian, Opler, and Titman (2001) (HOT), Titman and Wessels (1988) (TW), and Graham (1996) (G). These variables include measures of intangible assets (TW, G), market-to-book ratio (GLS, BS, HOT, G), z-score (GLS, G), a regulation dummy variable (GLS, BS), collateral (HOT, G, GLS, TW), investment tax credit (TW, G, BS), profitability (TW, HOT), SG&A expense (TW, HOT, G), depreciation (TW, G), tax-loss carryforwards (BS, G, HOT), nondebt tax shields (TW, G), research and development expense (TW, GLS, HOT, G), and size (TW, G, GLS, BS, HOT). Where alternate definitions of the same variable are given, I use the most common definition. As the dependent variable is a change in leverage, I follow Graham (1996) by taking deltas of the explanatory variables as appropriate.[31]

Columns 1 and 2 of Table IX show that credit rating effects persist in the context of all these additional variables, with significance at the 1% level, and both coefficients imply that firms near a rating change issue up to 1% less net debt relative to net equity than firms not near a change in rating. Column 3 of Table IX shows results of a regression in which both the Broad Rating and Micro Rating measures are included in the same test, and the size and significance of both coefficients are largely unchanged from their respective individual tests. This test with both measures indicates that the two credit rating effects documented in the paper are distinct.

V. Conclusion

This paper examines the impact of credit ratings on capital structure decisions of the firm. I find that credit ratings directly affect capital structure decisions by managers. In regressions including dummy variables that account for a firm being close to a ratings change—both near a Broad Ratings change and near a Micro Ratings change—firms near a ratings change issue approximately 1.0% less net debt relative to net equity annually as a percentage of total assets than firms not near a ratings change. The Broad Rating results are consistent with managers being concerned with ratings-triggered costs (benefits) to the firm and the effects of regulations on bond investors. The Micro

[31] Excluding observations for which one of the variables required is missing would reduce the sample size from 10,842 to 776. Instead, if the delta variable is missing I set it equal to 0 to maintain the original sample. While this is likely to affect the significance of that variable, the purpose of this test is to examine the persistence of credit rating effects in the context of a comprehensive set of explanatory variables. I also conduct regressions (not reported) with both credit rating variables and the other variables one at a time, excluding observations with any missing data. In each of these 14 regressions, the results are qualitatively similar, with the coefficients on the credit rating variables ranging from -0.6% to -1.4%, all statistically significant at 1% or 5%.

Table IX

Credit Rating Effects in the Context of Various Explanatory Variables

Coefficients and standard errors from pooled time-series cross-section regressions of net debt raised for the year minus net equity raised for the year divided by beginning-of-year total assets on credit rating dummy variables and various explanatory variables. CR_{POM} is a credit rating dummy variable equal to 1 if the firm has either a plus or a minus credit rating. CR_{HOL} is a credit rating dummy variable equal to 1 if the firm's Credit Score is in the high or low third of its Micro Rating. Please see the text for references for each of the additional explanatory variables. All explanatory variables are yearly deltas in the level of the variable, except for the regulation and credit rating dummy variables. Errors are White's consistent standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1	2	3
Intercept	−0.0035**	−0.0041***	−0.0017
	(0.0014)	(0.0015)	(0.0017)
CR_{POM}	−0.0106***		−0.0102***
	(0.0017)		(0.0017)
CR_{HOL}		−0.0088***	−0.0082***
		(0.0017)	(0.0017)
Intangibles	0.1438***	0.1462***	0.1449***
	(0.0483)	(0.0483)	(0.0483)
InvTaxCr	−1.3261**	−1.4003**	−1.3381**
	(0.6509)	(0.6551)	(0.6604)
z-Score	−0.0171***	−0.0172***	−0.0173***
	(0.0044)	(0.0043)	(0.0044)
MktToBk	−0.0017	−0.0019	−0.0020
	(0.0025)	(0.0025)	(0.0025)
Profitability	−0.0895*	−0.0896*	−0.0875*
	(0.0493)	(0.0492)	(0.0493)
S,G&A	−0.0001	−0.0001	−0.0001
	(0.0001)	(0.0001)	(0.0001)
NonDTxS	0.0113	0.0134	0.0113
	(0.0417)	(0.0417)	(0.0416)
RegDum	0.0119***	0.0105***	0.0113***
	(0.0016)	(0.0016)	(0.0016)
Depreciation	−0.0715	−0.0747	−0.0732
	(0.0745)	(0.0745)	(0.0743)
R&D	0.1453	0.1378	0.1430
	(0.2443)	(0.2432)	(0.2436)
TaxLssCar	−0.0696**	−0.0692**	−0.0693**
	(0.0267)	(0.0267)	(0.0267)
Collateral	0.0333	0.0331	0.0335
	(0.0232)	(0.0232)	(0.0232)
Size	−0.0003	−0.0005	−0.0005
	(0.0090)	(0.0090)	(0.0090)
N	10,842	10,547	10,547
R^2	0.0265	0.0254	0.0283

Rating results are consistent with managers viewing ratings as signals of firm quality.

Capital structure decisions are affected by the potential for both an upgrade as well as a downgrade. The results hold when net debt and net equity issuance are tested separately, and the results are robust to several model specifications and econometric approaches. 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. Ratings tests also indicate that firms are most concerned around ratings levels such that access to commercial paper is affected and bond liquidity issues are most severe.

The effects of ratings on capital structure can be viewed as complementary to existing capital structure theories. Credit rating dummy variables remain statistically significant when they are nested in empirical tests of the tradeoff and pecking order capital structure theories found in Shyam-Sunder and Myers (1999) and when explanatory variables from several additional previous papers are included.

This paper contributes to our understanding of capital structure decisions. Managers are concerned about ratings, as observed anecdotally in the press and through survey results. This paper demonstrates that 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 generally, to obtain a more comprehensive depiction of capital structure behavior.

Appendix

Consider a one-period financing decision for a firm such that the firm has exhausted its internal cash and therefore must issue outside capital, debt only or equity only (e.g., to finance a new project). Denote the size of the offering as Z, and the financing choice as F (equal to debt (D) or equity (E)). The value of the financing to the firm, including transaction costs but excluding credit rating effects, is a function of the size and type of offering: $V(F, Z)$. The probabilities of a credit rating upgrade or downgrade given a new offering are $P_D(F, Z)$ and $P_U(F, Z)$, respectively, and the cost/gain from a change in rating is given by γ. Assuming risk neutrality, firms will then choose to maximize the expected value of undertaking an offering: $V(F, Z) - P_D(F, Z)\gamma + P_U(F, Z)\gamma$.

Case 1: Consider two firm types: Firms near a downgrade (Type A), and firms not near a change in rating (Type B) (upgrade results follow similarly). Assume both firms are considering an offering of size Z. If a Type-A firm issues debt, the probability of a downgrade is equal to 1, whereas for Type-B firms, the probability of an upgrade or a downgrade is 0 for debt or equity. Thus, for example, the value of a debt offering to a Type-A firm is $V_A(D, Z) - \gamma$, whereas

Table AI

Firm Type	General Case: Debt, Small	General Case: Debt, Large	General Case: Do Nothing	Example, $\gamma = 0.1$: Debt, Small (%)	Example, $\gamma = 0.1$: Debt, Large (%)	Example, $\gamma = 0.1$: Do Nothing (%)
A	$\frac{3}{8} - \frac{\gamma}{2} - \frac{\gamma^2}{2}$	$\frac{3}{8} - \frac{\gamma}{2} - \frac{\gamma^2}{2}$	$(\gamma + 0.5)^2$	32.0	32.0	36.0
B	$\frac{3}{8} + \frac{\gamma}{2} - \frac{\gamma^2}{2}$	$\frac{3}{8} - \gamma + \frac{\gamma^2}{2}$	$0.5\gamma + 0.25$	42.0	28.0	30.0

for a Type-B firm the value is $V_B(D, Z)$. Firms of Type A will choose to issue equity rather than debt in more cases than firms of Type B.

Case 2: Consider firms of Types A and B, but now assume that debt is the only financing choice that they consider (equity results follow similarly). Here, the firms consider two sizes of offering, large and small. Assume that Type-A firms have a probability of a downgrade equal to 1 for either large or small debt offerings, whereas Type-B firms have a downgrade probability equal to 1 for a large debt offering but 0 for a small offering. Assume V values are independently uniformly distributed, from -0.5 to 0.5, for firms within each type and for each financing choice. Firms will not issue debt if the total value to the firm is less than 0 for both sizes of offerings; thus, a firm may choose not to issue debt at all. Therefore, given values of $V(D, L)$ and $V(D, S)$, a firm of Type A will choose the maximum of $V(D, L) - \gamma$, $V(D, S) - \gamma$, and 0. Likewise, given values of $V(D, L)$ and $V(D, S)$, a firm of Type B will choose the maximum of $V(D, L) - \gamma$, $V(D, S)$, and 0. Table AI depicts the percentages of firms that will choose the three alternatives for a general value of γ, and for the example of $\gamma = 0.1$ (the general percentages assume a value of γ between 0 and 0.5, since for values larger than 0.5, Type-A firms would never undertake a project).

For all relevant values of γ, Type-A firms (near a downgrade) issue fewer small debt offerings than Type-B firms (32.0% vs. 42.0% for $\gamma = 0.1$), and Type-B firms issue more debt offerings of any kind than Type-A firms (70.0% vs. 64.0% for $\gamma = 0.1$), implications consistent with Case 1. However, somewhat nonintuitively, CR-CS implies Type-A firms issue more large debt offerings than Type-B firms for all γ (32.0% vs. 28.0% for $\gamma = 0.1$). Therefore, if firm-years with large offerings are included in tests of credit rating effects such as in equation (1), a positive credit rating dummy variable coefficient could appear even though firms near a ratings change issue debt less frequently.[32] These implications indicate that the most effective tests of CR-CS should exclude large offerings.

[32] Under Case 2 assumptions, it can be shown that the coefficient would be positive if the large offering size divided by the small offering size exceeded the difference in the percentage of small offerings conducted by Type-B versus Type-A firms divided by the difference in the percentage of large offerings conducted by A versus B firms. In the case of $\gamma = 0.1$, this size ratio would be equal to 2.5.

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