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# Do Firms Target Credit Ratings or Leverage Levels?

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## Abstract

Firms reduce leverage following credit rating downgrades. In the year following a downgrade, downgraded firms issue approximately 1.5%–2.0% less net debt relative to net equity as a percentage of assets compared to other firms. This relationship persists within an empirical model of target leverage behavior. The effect of a downgrade is larger at downgrades to a speculative grade rating and if commercial paper access is affected. In particular, firms downgraded to speculative are about twice as likely to reduce debt as other firms. Rating upgrades do not affect subsequent capital structure activity, suggesting that firms target minimum rating levels.

## I. Introduction

This paper examines whether managers target credit ratings in making capital structure decisions. Kisgen (2006) provides the first examination of this topic, arguing that higher credit rating levels provide benefits to a firm. Consistent with this assertion, he shows that firms at both the lower and upper range of ratings boundaries reduce leverage relative to firms in the middle of ratings categories to avoid downgrades and achieve upgrades, respectively. If managers care about maintaining better ratings, they will not only alter capital structure to avoid downgrades and obtain upgrades, but they will also reduce leverage after downgrades to regain their target rating (but not necessarily increase leverage after upgrades). This paper complements Kisgen (2006) by studying leverage behavior *following* rating changes. I find that firms react asymmetrically to such changes, lowering leverage after downgrades but responding little to upgrades. These two studies together imply that managers target specific minimum credit rating levels, and

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that a complete model of capital structure must include credit ratings along with standard tax, information, agency, and financial distress factors.

Previous research finds significant stock and bond price reactions to credit rating changes, and survey results in Graham and Harvey (2001) indicate that chief financial officers focus on credit ratings to guide debt decisions.[1] Nevertheless, academic studies have generally ignored credit ratings in both theoretical and empirical models of capital structure. In recent years, a number of studies have modeled leverage changes with variables capturing both the firm's target leverage as well as the effect of adjustment costs on dynamics.[2] In this paper, I add credit rating changes to these models.

I find that changes in credit ratings affect capital structure decisions. Firms that have been downgraded issue approximately 1.5%–2.0% less net debt as a percentage of assets relative to equity compared to other firms. I rely on two previous models of capital structure decisions to account for other capital structure influences. The first models target leverage behavior in a partial adjustment model incorporating adjustment costs (Flannery and Rangan (FR) (2006)). The second models net capital issuance decisions using changes in and levels of factors that have been shown to predict subsequent capital issuance behavior (e.g., profitability, probability of bankruptcy, market-to-book (M/B)).[3] I find that a downgrade is incrementally associated with subsequent leverage reductions in both models. In contrast, an upgrade is not statistically significantly associated with subsequent capital structure decisions once other capital structure factors are considered. Furthermore, recently downgraded firms adjust more quickly toward target leverage levels in a partial adjustment model. These results are consistent with firms targeting minimum credit rating levels.

Because rating changes are not exogenous, the paper considers unobserved factors that may jointly explain downgrades in one year and leverage reductions in the next year (reverse causality is less likely, since a leverage reduction decreases the probability of a downgrade). I investigate two additional sets of tests to rule out omitted variables bias.[4] First, I include dummy variables for the firm's industry by year. Industry shocks that result in downgrades in one year and leverage reductions the next year (perhaps due to shocks to expected aggregate investment demand) would compromise the interpretation of the results. To control for this, I include dummy variables that effectively demean a firm's leverage decision within its industry every year. I include dummy variables for each of the 17 years of the sample crossed with all possible 2-digit SIC codes, resulting in approximately 1,000 additional variables. The downgrade remains predictive for leverage

[1]Regarding stock and bond price reactions, see Ederington and Goh (1998), Hand, Holthausen, and Leftwich (1992), and Ederington, Yawitz, and Roberts (1987).

[2]See, for example, Flannery and Rangan (2006), Leary and Roberts (2005), and Hovakimian, Opler, and Titman (2001).

[3]This model is similar to several previous capital structure tests, such as Graham (1996) and MacKie-Mason (1990).

[4]In unreported tests, I also instrument a downgrade using dummy variables for if the year is after the Enron bankruptcy, if the firm's auditor is high quality, if a firm is in the S&P 500 Index, and if the firm is listed on the New York Stock Exchange. The coefficient on the downgrade variable has the same sign (negative) and is statistically significant when these instruments are used, but the statistical significance is reduced.

decisions with these controls. The downgrade is also significant with firm fixed effects; however, including firm fixed effects assumes that the unobserved effect is time invariant, whereas the use of these industry dummies by year allows for time-varying industry effects. I conclude that the results are not due to industry shocks to investment. Second, I examine downgrades that move firms into the speculative grade market or that coincide with commercial paper rating downgrades. If firms target rating levels, these instances should be associated with a greater effort to move back to a target rating than a downgrade by itself. If the change in rating affects capital structure behavior for some other nonrating reason, these interactions should not be important. I find that downgrades matter more in both cases. These results suggest that the effect of a downgrade on subsequent leverage decisions is rating specific.[5]

This paper extends Kisgen (2006) in several directions. First, by examining capital structure behavior after rating changes instead of before rating changes, I test whether managers' ex post behavior is consistent with the ex ante behavior documented in Kisgen (2006). The main finding of this paper, that managers attempt to regain a target rating after a downgrade, is consistent with also trying to avoid that downgrade ex ante. Second, I conduct tests that examine how and why ratings affect capital structure decisions. For example, by conducting tests that directly examine whether concerns for commercial paper access drive ratings behavior, this paper helps clarify why firms are concerned with higher ratings. I also examine which particular financing mechanisms (e.g., debt issuance, share repurchases) are more affected by changes in ratings to determine whether ratings affect certain channels of funding more directly. Finally, the results in this paper are by some measures larger and wider in scope. The identification strategy of Kisgen (2006) requires that large offerings are excluded, whereas no such exclusion is required in this paper; therefore, the implications of this paper cover a broader set of capital market behavior. Furthermore, the results of this paper are by some measures four times larger than those reported in Kisgen (2006).

The rest of the paper is organized as follows. In Section II, I discuss the empirical design for testing whether firms target ratings. In Section III, I conduct empirical tests to identify whether firms target minimum ratings. In Section IV, I examine whether the downgrade effects are driven by certain financial decision mechanisms, by particular ratings, or by certain years. In Section V, I conclude.

## II. Empirical Design

I test for the impact of rating changes on capital structure decisions within two different capital structure empirical frameworks. The first framework is the partial adjustment model of capital structure as formulated in FR (2006). The second is regressions of net capital issuance on various factors that should predict

[5] In unreported falsification tests, I also estimate credit ratings for firms that do not have a credit rating based on factors that have been shown in previous literature to predict ratings for firms. Using these "pseudo ratings," I construct pseudo-downgrades and pseudo-upgrades. I find that pseudo-downgrades and upgrades do not predict subsequent capital structure behavior for nonrated firms after including other changes in the firm as controls. This counterfactual evidence indicates that rating changes lead to subsequent leverage reductions for a reason specific to the credit rating.

capital issuance and reduction decisions, as similarly conducted in Graham (1996) and MacKie-Mason (1990), among others. I use two different models to verify whether any rating effects I find are robust within alternate frameworks.

Kisgen (2006) provides the hypothesis that credit ratings are a material consideration in managers' capital structure decisions due to discrete benefits associated with higher rating levels (the credit rating-capital structure (CR-CS) hypothesis). Within the two different empirical models, I examine changes to a firm's credit rating and consider the implications for subsequent capital structure behavior given CR-CS and positive adjustment costs.[6] In this context, CR-CS has the following distinct implications for leverage behavior: i) firms that are downgraded are more likely to undertake leverage-reducing behavior in the subsequent period compared to nondowngraded firms, even when controlling for target leverage behavior, changes in leverage, and firm characteristics that measure distress; ii) after controlling for changes in leverage and other firm characteristics, an upgrade will not significantly affect subsequent capital structure behavior (an upgrade itself is beneficial to a firm, so a firm will not seek to reverse it); iii) downgrades at ratings levels at which discrete rating costs are larger increase the likelihood for leverage-reducing capital market decisions; and iv) firms will undertake a more significant adjustment toward a target leverage level if the firm has been downgraded.[7]

To illustrate the intuition behind these implications, consider the simple example of two firms, X and Y. Both firms have leverage of 50% and a credit rating of BBB at time $t - 2$, which is optimal for both firms given traditional capital structure factors (e.g., the tax benefits of debt) together with the benefits of higher credit rating levels. Assume at $t - 1$ that both firms have exogenous shocks to cash flow, such that leverage changes to 55% but optimal leverage does not change, and assume that Firm X is downgraded to BB but Firm Y's credit rating remains BBB. Neither firm is at its optimal leverage of 50% at $t - 1$, and so both have an incentive to adjust back to the optimum of 50% at time $t$ by reducing leverage. Absent any benefits of a higher rating, each firm adjusts back to its optimal leverage if the benefits outweigh the adjustment costs, and the likelihood of leverage reduction is equal for both firms. If the rating downgrade, however, imparts specific costs to Firm X, the likelihood that Firm X adjusts is different from that of Firm Y. In particular, the rating-specific costs associated with a BB rating may alone exceed adjustment costs, which would imply a subsequent leverage reduction regardless of the size of the departure from the firm's optimal leverage.

The implication is different for an upgraded firm. For this case, assume that leverage has changed for both firms to 45% (and the optimum is still 50%), yet Firm X receives an upgrade to an A rating and Firm Y remains at BBB. Absent credit rating benefits, each firm will again adjust back to its optimal leverage, depending on the benefits relative to adjustment costs. However, if the rating

[6] Adjustment costs can be a significant influence on capital structure variation and policy, implying that in certain cases a firm will depart from its optimal leverage over periods of time (Fischer, Heinkel, and Zechner (1989), Leary and Roberts (2005), and FR (2006)).

[7] A more formal model that derives these implications is available from the author. See Kisgen (2006) for a detailed description of the potential benefits to a firm of higher rating levels.

upgrade imparts specific benefits to Firm X, the upgrade itself makes it less likely that Firm X will bear the adjustment costs for moving back to the optimal leverage. An upgrade therefore makes it less likely that a firm subsequently changes its leverage, all else being equal.

The first framework I use to examine the effect of a change in rating is the partial adjustment model proposed and tested in FR (2006). FR examine whether firms target leverage levels, considering that firms may only partially adjust to a target leverage level over time due to adjustment costs. They begin their analysis by proposing that a firm's target market debt ratio (MDR) can be determined as a linear combination of various capital structure factors:

$$\text{MDR}^{*}_{i,t+1} = \beta X_{i,t}. \tag{1}$$

MDR is defined as short-term debt plus long-term debt, divided by total debt plus the market value of equity. The variables in $X$ include measures of profitability, depreciation, M/B, size, fixed assets, and research and development (R&D). If firms target leverage levels, then absent adjustment costs, a firm will adjust back to its target debt ratio if the firm's leverage is not at its target. FR (2006) construct a model that incorporates the possibility that firms might only partially adjust toward the target due to adjustment costs as follows:

$$\text{MDR}_{i,t+1} - \text{MDR}_{i,t} = \lambda\left(\text{MDR}^{*}_{i,t+1} - \text{MDR}_{i,t}\right) + \varepsilon_{i,t+1}. \tag{2}$$

In this equation, MDR$^{*}$ is the firm's target leverage and $\lambda$ is the speed of adjustment (for example, if $\lambda$ is 1, then firms adjust immediately). FR (2006) test this model by inserting equation (1) into equation (2), yielding

$$\text{MDR}_{i,t+1} - \text{MDR}_{i,t} = \lambda\beta X_{i,t} - \lambda\text{MDR}_{i,t} + \varepsilon_{i,t+1}. \tag{3}$$

This equation can be modified to examine the incremental effects of rating changes by directly including rating changes in this equation (FR (2006) examine other factors in this same fashion on pp. 486–491 and in eq. (7) of that paper):

$$\begin{aligned}\text{MDR}_{i,t+1} - \text{MDR}_{i,t} = {} & \lambda\beta X_{i,t} - \lambda\text{MDR}_{i,t} + \Phi_1\text{DOWNGRADE}_{i,t} \\ & + \Phi_2\text{UPGRADE}_{i,t} + \varepsilon_{i,t+1}.\end{aligned} \tag{4}$$

DOWNGRADE and UPGRADE are dummy variables equal to 1 if the firm was downgraded or upgraded the previous year, respectively. Lagged changes in ratings are used to reduce potential endogeneity issues. The additional implication of CR-CS in this equation is that the coefficient on $\Phi_1$ is less than 0; that is, firms reduce leverage following a downgrade. Further, CR-CS implies that an upgrade should have no impact, so the coefficient of $\Phi_2$ should not be different from 0.

Equation (3) can also be used to examine the influence of rating changes by examining the magnitude of adjustment toward a target leverage conditional on whether the firm was downgraded, upgraded, or experienced no rating change. CR-CS implies that a downgrade will accelerate a firm's adjustment toward its target leverage given positive adjustment costs, whereas an upgrade will have no

impact on the speed of adjustment. If ratings are insignificant to a firm, the adjustment speed will be the same for firms regardless of any rating change. I examine this by implementing the following additional test:

$$(5)\quad \text{MDR}_{i,t+1} - \text{MDR}_{i,t} = (\lambda_0 + \lambda_1 \text{DOWNGRADE}_{i,t} + \lambda_2 \text{UPGRADE}_{i,t}) \times (\text{MDR}^*_{i,t+1} - \text{MDR}_{i,t}) + \varepsilon_{i,t+1}.$$

CR-CS implies that the coefficient on $\lambda_1$ is positive and the coefficient on $\lambda_2$ is not significant. This equation reduces to equation (3) with the addition of several interaction variables, since the MDR variable and each variable in $X$ is interacted with the DOWNGRADE and UPGRADE variables. This test requires numerous additional variables, but a technically identical approach is to test equation (3) on subsamples of firms that are downgraded, upgraded, and with no rating change. I report these results in Section III.

The second set of tests implements the following regressions:

$$(6)\quad \text{NetDIss}_{i,t} = \alpha + \Phi_1 \text{DOWNGRADE}_{i,t-1} + \Phi_2 \text{UPGRADE}_{i,t-1} + \beta K_{i,t-1} + \varepsilon_{i,t}.$$

NetDIss is a measure of the firm's leverage-changing capital market decision at time $t$, equal to a firm's net debt issuance minus net equity issuance divided by assets (specifically, net debt issuance is long-term debt issuance minus long-term debt reduction plus changes in current debt, and net equity issuance is the sale of common and preferred stock minus the purchase of common and preferred stock[8]). This measure identifies direct capital market activity decisions of managers (Berger, Ofek, and Yermack (1997), Leary and Roberts (2005), and Kisgen (2006) use a similar measure). Here, $K$ includes variables that measure a firm's change in financial condition, such as changes in profitability, $z$-score, and leverage (these variables are discussed in further detail in Section III.B). As in the FR (2006) tests, the variables DOWNGRADE and UPGRADE are included in these tests to examine whether rating changes incrementally affect capital structure behavior. The additional implication for CR-CS again is that the coefficient on $\Phi_1$ is less than 0, and the coefficient of $\Phi_2$ is not different from 0.[9]

## III. Main Empirical Tests

### A. Data and Summary Statistics

The sample is constructed from all firms with a credit rating in Compustat. Approximately 78% of outstanding debt is issued by firms with a public debt

[8]These measures correspond to Compustat data items 111, 114, 301, 108, and 115, respectively.

[9]Tests of incremental capital structure decisions of this nature implicitly assume that firms at certain points in time are not at optimal leverage levels, and therefore specific subsequent capital market activity is implied. I proceed similarly by assuming that firms are at their optimal credit rating prior to the change in rating identified in equation (6) and test the implications for NetDIss given movements away from the optimum. Since some changes in ratings may instead represent movements toward the optimum, thereby implying no specific capital market activity, coefficients identifying credit rating effects in equation (6) are biased toward 0 (assuming the firm does not move partially back to the target).

rating (Faulkender and Petersen (2006)), suggesting that this sample covers a significant portion of firms active in capital markets. 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 (2001)). Compustat also includes subordinated ratings and commercial paper ratings for firms. Subordinated ratings have a strict correspondence to long-term ratings, so little additional information is gained from these ratings for tests of this paper. Commercial paper ratings are examined separately in individual tests. The sample period for the tests is 1987 to 2003 (1985 is the first year credit ratings are available in Compustat and at least 2 years of lagged data are required for all tests). I exclude firm years in which the firm has missing data in the fields required regularly for the tests in the paper.[10] I also exclude financial companies and utilities (SIC codes 4000–4999 and 6000–6999) for the tests of this paper that specifically replicate the model of FR (2006), as that is the approach of that paper. For other tests, I exclude financial firms (SIC codes 6000–6999) only, since leverage and security issuances for these firm may have a different meaning than those for nonfinancial firms. All of the main results are robust to any combination of inclusion or exclusion of these two industry classifications.

Tables 1–2 and Figures 1–2 display summary statistics for the sample. Table 1 indicates the downgrade and upgrade activity at each rating. With few exceptions, each rating category has significant firm years in which firms are both upgraded and downgraded to the particular rating. A total of 815 downgrades are to ratings that are investment grade, and 716 downgrades are to ratings that are speculative grade, while 601 upgrades are to ratings that are investment grade, and 447 upgrades are to ratings that are speculative grade.

TABLE 1

Credit Rating Upgrades and Downgrades by Rating Level

Number of firm years in the sample in which the firm was downgraded or upgraded to the indicated rating level. Percentages are shown for the number of downgrades/upgrades to a rating as a percentage of the number of firm years with that rating. The sample is all nonfinancial Compustat firms from 1987 to 2003 with a credit rating for 3 consecutive years and 3 years of nonmissing variables required for conducting the tests of the paper. The credit rating is a firm's long-term domestic issuer credit rating.

| Rating Change | AA+ | AA | AA– | A+ | A | A– | BBB+ | BBB | BBB– |
|---|---|---|---|---|---|---|---|---|---|
| #Downgraded to | 7 | 16 | 41 | 61 | 107 | 132 | 141 | 184 | 126 |
| (% of firm years) | 6.4% | 4.2% | 9.7% | 8.2% | 8.8% | 13.6% | 13.4% | 15.9% | 13.6% |
| #Upgraded to | 6 | 14 | 21 | 50 | 92 | 110 | 103 | 90 | 115 |
| (% of firm years) | 5.5% | 3.7% | 4.9% | 6.8% | 7.6% | 11.3% | 9.8% | 7.8% | 12.4% |
| Total firm years | 110 | 379 | 425 | 741 | 1,210 | 973 | 1,049 | 1,158 | 926 |
| Rating Change | BB+ | BB | BB– | B+ | B | B– | CCC+ | CCC | CCC– |
| #Downgraded to | 91 | 111 | 111 | 118 | 132 | 67 | 55 | 22 | 9 |
| (% of firm years) | 15.0% | 13.2% | 12.6% | 11.6% | 28.9% | 32.2% | 52.9% | 48.9% | 37.5% |
| #Upgraded to | 95 | 111 | 99 | 76 | 31 | 18 | 8 | 5 | 4 |
| (% of firm years) | 15.6% | 13.2% | 11.2% | 7.4% | 6.8% | 8.7% | 7.7% | 11.1% | 16.7% |
| Total firm years | 608 | 840 | 881 | 1,021 | 457 | 208 | 104 | 45 | 24 |

[10]These are Compustat data items 6, 12, 13, 25, 35, 108, 111, 114, 115, and 199.

Table 2 presents the percentage of firm years that have debt and equity issuance and reduction activity, with firm years separated by the previous year's change in rating. An issuance or reduction is defined as a net amount greater than 5% of beginning of period assets, as in Hovakimian et al. (2001). The table indicates that downgraded firms are more likely to reduce debt or issue equity and are less likely to issue debt or reduce equity than other firms. For example, downgraded firms are 85% more likely to reduce debt than nondowngraded firms. Furthermore, firms that are downgraded to a speculative grade rating from an investment grade rating are more likely to reduce debt and less likely to issue debt or reduce equity than other downgraded firms. For example, firms downgraded to speculative are 35% more likely to reduce debt than other downgraded firms, and they are nearly three times more likely to reduce debt than other firms in general.

TABLE 2

Debt and Equity Decisions Following Rating Changes

Percentage of firm years in which the firm undertakes the indicated capital market activity, given the change in rating the previous year. Issuance and reduction are defined as a net issuance or reduction greater than 5% of beginning of year assets. The indicated change in rating is as of the year prior to the capital structure decision. "Downgrade to Speculative" indicates a downgrade from an investment grade rating at time $t - 2$ to a speculative grade rating at time $t - 1$, and "Upgrade to Investment Grade" indicates the opposite. The sample is all nonfinancial Compustat firms from 1987 to 2003 with a credit rating for 3 consecutive years and 3 years of nonmissing variables required for conducting the tests of the paper.

| Rating Change (previous year) | % of Firms Issue Debt | % of Firms Reduce Debt | % of Firms Issue Equity | % of Firms Reduce Equity |
|---|---|---|---|---|
| *Panel A. Downgrades* | | | | |
| No Downgrade | 24.7% | 13.3% | 5.8% | 6.9% |
| Downgrade | 14.8% | 24.6% | 6.2% | 3.0% |
| Downgrade to Speculative | 11.7% | 33.1% | 5.8% | 1.9% |
| *Panel B. Upgrades* | | | | |
| No Upgrade | 22.5% | 15.2% | 5.8% | 6.4% |
| Upgrade | 32.3% | 11.1% | 6.4% | 6.7% |
| Upgrade to Investment Grade | 30.3% | 8.3% | 6.2% | 6.2% |

The capital market activity following upgrades is less consistent. For example, upgraded firms are more likely to issue debt, but firms that are upgraded to investment grade are less likely to issue debt than other upgraded firms. Upgraded firms are also more likely to issue equity and more likely to reduce equity. To some extent, however, the pattern for upgraded firms indicates that upgraded firms are more likely to conduct leverage-increasing capital market activity.

Figure 1 shows the percentage of firm years in which a firm undertakes leverage-increasing or -decreasing capital market activity, with firm years grouped based on their previous year changes in leverage and credit rating. In Graph A of Figure 1, firms that were downgraded the previous year are compared to firms with no rating change that had a similar change in leverage during the same year. Graph A indicates that firms that are downgraded are consistently more likely to undertake leverage-decreasing behavior the subsequent year than firms that are not downgraded that had a similar change in leverage. This is consistent with the implications of CR-CS described in Section II.B. This preliminary evidence also suggests that downgrades lead to leverage reductions independent of any previous capital market timing. Graph B of Figure 1 shows the same statistics but

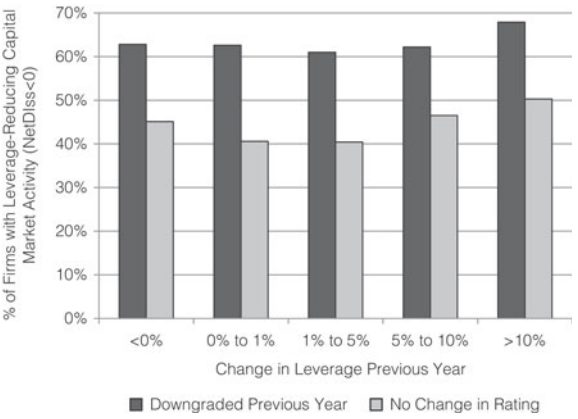
considers upgraded firms compared to firms with no rating change that have a similar leverage change during the same year. Also consistent with CR-CS, upgraded firms are not consistently more likely to increase leverage following an upgrade. In both Graphs A and B, a minimal relationship exists between leverage changes and the likelihood of leverage-increasing and -decreasing behavior the subsequent year.

FIGURE 1

Firm Capital Structure Behavior Given Previous Year's Change in Leverage and Credit Rating

Grouping firms by the previous year's leverage change, Figure 1 shows capital structure decisions of downgraded firms (Graph A) and upgraded firms (Graph B) compared to firms with no rating change.

*Graph A. Downgraded Firms versus Firms with No Rating Change*




*Graph B. Upgraded Firms versus Firms with No Rating Change*

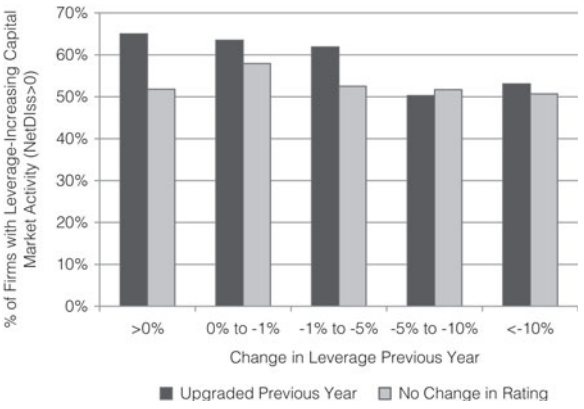


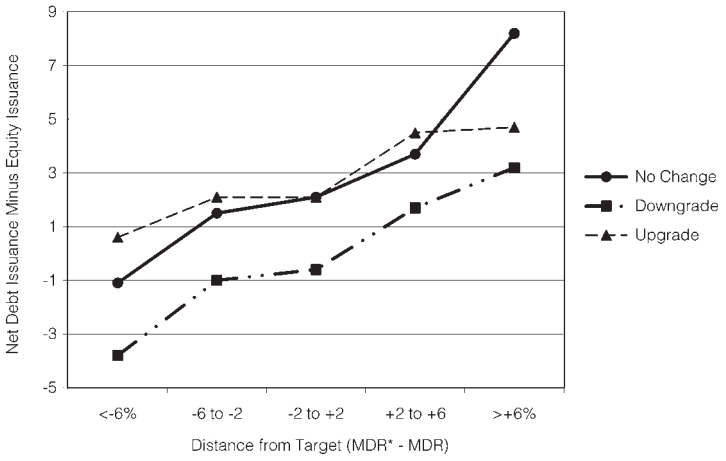

Figure 2 depicts capital structure behavior for firms with a downgrade, upgrade, or no rating change, conditional on the distance between a firm's leverage and its target leverage. The distance between a firm's leverage and target leverage is determined using the methodology of FR (2006), described in the previous section. Firms are sorted into five groups, based on how far they are from their target leverage. Figure 2 indicates that regardless of how far a firm is from its

target leverage, downgraded firms consistently reduce leverage more than firms without a rating change. For example, the middle group represents firms that are near their target leverage, and downgraded firms within this group reduce leverage by over 2% more, as a percentage of assets, than firms without a rating change that are a similar distance from their target leverage (this difference is also statistically significant). An upgrade does not consistently affect a firm's leverage decision in a particular direction conditional on the distance from the target. For example, for firms that are near their target leverage, the subsequent leverage change for upgraded firms is approximately equal to that of firms that had no rating change (and in no case is the difference between the upgraded firms' leverage change and that of the no-rating-change firms' change statistically significant). This evidence is consistent with firms targeting a rating independent of target leverage behavior. These general findings are formally tested in the next section.

FIGURE 2

Capital Structure Behavior Following a Credit Rating Change, Conditional on Distance from Target Leverage

Grouping firms by the distance from target leverage, as defined in Flannery and Rangan (2006), Figure 2 shows capital structure decisions of downgraded firms and upgraded firms compared to firms with no rating change. Points on the line represent the average value of net debt issuance minus net equity issuance, divided by assets.




## B. Main Results

Table 3 presents results of tests using the partial adjustment model of FR (2006). The variables in *X* for equation (4) include profitability (earnings before interest and taxes (EBIT)), M/B ratio, depreciation, size of the firm (log of total assets), fixed assets, R&D, and a dummy variable for missing R&D expenses.[11] The market debt ratio (MDR) is defined as book value of debt divided by the book value of debt plus the market capitalization of equity. The sample differs from the tests of FR since it only includes firms with credit ratings in Compustat. This

[11] All variables for these tests are defined as in FR (2006).

not only restricts the sample to a smaller number of firms, but also a shorter time period. In all other respects, the tests and sample construction follow exactly from FR.

TABLE 3

Leverage Changes Following Credit Rating Changes

Coefficients and standard errors from pooled time-series cross-section regressions of changes in market leverage on lagged levels of market leverage, and various explanatory variables for target leverage, as conducted in Flannery and Rangan (FR) (2006). Market leverage, MDR, is defined as the book value of debt divided by the book value of debt plus the market capitalization of equity. Columns 2–4 include the variables DOWNGRADE and UPGRADE, dummy variables equal to 1 if the firm was downgraded or upgraded the previous period, respectively, as an additional explanatory variable. Columns 5–7 represent conditional tests of FR, with the sample separated based on whether a firm was downgraded, upgraded, or had no rating change. "Fixed effects" refers to the inclusion of dummy variables for each firm in the sample. The sample is all Compustat firms from 1987 to 2003 with a credit rating for two consecutive years and two years of nonmissing data for computing the variables. The sample excludes financial firms and utilities. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | All Firms | | | | Downgrade Firms | Upgrade Firms | No Change Firms |
|---|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| $DOWNGRADE_{t-1}$ | | –0.0143*** | –0.0208*** | –0.0281*** | | | |
| | | (0.0043) | (0.0039) | (0.0043) | | | |
| $UPGRADE_{t-1}$ | | –0.0036 | 0.0043 | 0.0036 | | | |
| | | (0.0047) | (0.0043) | (0.0048) | | | |
| $MDR_{t-1}$ | –0.3640*** | –0.3543*** | –0.0516*** | | –0.6305*** | –0.3609*** | –0.3765*** |
| | (0.0178) | (0.0181) | (0.0087) | | (0.1217) | (0.1114) | (0.0203) |
| $EBIT_{t-1}$ | –0.0299 | –0.0414 | –0.0049 | 0.2427*** | –0.0656 | –0.1467 | –0.0062 |
| | (0.0338) | (0.0339) | (0.0206) | (0.0314) | (0.1610) | (0.1864) | (0.0434) |
| $M/B_{t-1}$ | –0.0038 | –0.0032 | 0.0026 | 0.0207*** | –0.0499 | –0.0135 | –0.0039 |
| | (0.0027) | (0.0027) | (0.0016) | (0.0025) | (0.0302) | (0.0087) | (0.0031) |
| $Depreciation_{t-1}$ | –0.3378*** | –0.3301*** | –0.1414*** | –0.1476 | 0.1645 | 1.1212** | –0.4073*** |
| | (0.0914) | (0.0909) | (0.0437) | (0.0929) | (0.5748) | (0.4546) | (0.1063) |
| $\ln(Assets)_{t-1}$ | 0.0054 | 0.0054 | –0.0019** | –0.0040 | 0.0362 | 0.0345** | 0.0005 |
| | (0.0035) | (0.0034) | (0.0010) | (0.0035) | (0.0239) | (0.0165) | (0.0039) |
| $FixedAssets_{t-1}$ | –0.0293 | –0.0313 | 0.0058 | –0.0147 | –0.0617 | –0.1591 | –0.0178 |
| | (0.0244) | (0.0240) | (0.0065) | (0.0249) | (0.1558) | (0.1313) | (0.0284) |
| $R\&D\_Dum_{t-1}$ | –0.0008 | –0.0006 | 0.0034 | 0.0019 | –0.0079 | 0.0198 | 0.0035 |
| | (0.0064) | (0.0063) | (0.0033) | (0.0064) | (0.0488) | (0.0360) | (0.0070) |
| $R\&D_{t-1}$ | –0.0950 | –0.0911 | –0.0802 | 0.0238 | 0.2002 | 2.0544 | –0.0918 |
| | (0.1482) | (0.1481) | (0.0510) | (0.1515) | (1.1624) | (1.5894) | (0.1593) |
| Fixed effects? | Yes | Yes | No | Yes | Yes | Yes | Yes |
| $\Phi_1 > -\Phi_2$ ($p$-value) | N/A | 0.0067 | 0.0073 | 0.0003 | N/A | N/A | N/A |
| $N$ | 7,215 | 7,215 | 7,487 | 7,215 | 937 | 699 | 5,577 |
| $R^2$ | 22.0 | 22.2 | 1.9 | 17.5 | 46.7 | 64.4 | 28.3 |

Column 1 of Table 3 replicates the specification of FR (2006), and the adjustment speed coefficient is similar to that reported in FR (the coefficient on lagged MDR is 36.4% compared to the value reported in FR, which is approximately 34%–36% throughout the paper). This confirms the robustness of the findings of FR on a modified sample. This test includes fixed effects and a lagged value of the dependent variable, which FR note creates a bias in the estimates. They address this issue by instrumenting the lagged value of market leverage using the lagged value of book leverage and the variables in $X$. I proceed similarly. However, when I test for the impact of a rating change, I present the results using this approach and also excluding either the fixed effects or the lagged dependent variable, to

identify whether any potential remaining econometric issues significantly affect the rating effects.

Column 2 of Table 3 includes dummy variables for whether the firm's credit rating was downgraded or upgraded the previous year in the exact specification of FR ((2006), eq. (4)). In this test, the coefficient on the downgrade variable is negative and statistically significant. The coefficient indicates that downgraded firms subsequently reduce market leverage by 1.4% compared to other firms. Columns 3 and 4 modify the FR approach by excluding fixed effects and lagged leverage, respectively. In both of these specifications, the effect of the downgrade is again statistically significant, and the magnitude of the effect of the downgrade is larger. In both cases, firms that are downgraded reduce market leverage by over 2.0% compared to other firms. This evidence indicates that downgrades affect subsequent leverage behavior, allowing for partial adjustment toward a target leverage level.

The upgrade variable is not significant in any of the tests of columns 2 and 3 in Table 3. Consistent with CR-CS, an upgrade does not affect subsequent leverage decisions once other capital structure factors are considered. Furthermore, an $F$-test for whether the effect of a downgrade is greater than that of an upgrade confirms that the downgrade effect is stronger than that of the upgrade. The null that $\Phi_1 = -\Phi_2$ is rejected at 1% for the tests in columns 2–4 in favor of $\Phi_1 > -\Phi_2$, consistent with CR-CS and inconsistent with changes in ratings only proxying for other changes in the firm (such as changes to expected future distress costs).

Table 3 also reports results replicating the specification of FR (2006) on three subsamples of firms: those downgraded, upgraded, or with no rating change. These tests effectively test equation (5), but I report the (technically identical) results on subsamples of firms for ease of presentation. These results are reported in columns 5–7 of Table 3. The adjustment speeds for firms that are upgraded or that had no rating change are not significantly different from the overall adjustment speed reported in column 1. However, firms that are downgraded adjust significantly faster toward their target leverage than other firms. Conditional on a downgrade, the adjustment toward target leverage (63.1%) is nearly twice that for firms overall, and it is statistically significantly different from firms overall (at the 5% level of significance). This provides further evidence that downgrades significantly affect a firm's capital structure behavior. A downgrade accelerates a firm's move back toward its target leverage level.

Results of regressions of equation (6) are given in Table 4. Separate tests of equation (6) are conducted using changes in book and market levels of leverage, with assets in NetDIss defined corresponding to the measure used for the change in leverage explanatory variable. Control variables include leverage, sales, profitability, M/B ratio, and $z$-score. All of these control variables are included as both lagged changes and levels of the variable.[12] Since the dependent variable

[12]Leverage is defined as in Fama and French (2002) as: (liabilities plus preferred stock minus deferred taxes and investment tax credit)/(book assets or market value of the firm). Change in leverage is equal to the lagged year over year change in leverage; for example, if the firm increased leverage from 50% at time $t-2$ to 55% at $t-1$, this variable takes a value of 5%. Sales is defined as ln(Sales (Compustat data item 12)), profitability is earnings before interest, taxes, depreciation, and amortization

TABLE 4

Capital Structure Decisions Following Credit Rating Changes

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 book (columns 1, 3, 5, and 7) or market (columns 2, 4, 6, and 8) assets on credit rating dummy variables and on various explanatory variables. DOWNGRADE and UPGRADE are dummy variables with a value of 1 if the firm was downgraded or upgraded the previous year, respectively. "Fixed Effects" refers to the inclusion of dummy variables for each firm in the sample. "Industry Effects" refers to the inclusion of dummy variables for industry (2-digit SIC code) interacted with every year. Errors are clustered by firm. The sample is all nonfinancial Compustat firms from 1987 to 2003 with a credit rating for 3 consecutive years and 3 years of nonmissing data for computing the variables. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Base Specification | | | | Firm Fixed Effects | | Industry Effects by Year | |
|---|---|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| $DOWNGRADE_{t-1}$ | –0.0402*** | –0.0331*** | –0.0184*** | –0.0190*** | –0.0303*** | –0.0287*** | –0.0150*** | –0.0163*** |
| | (0.0036) | (0.0027) | (0.0041) | (0.0027) | (0.0048) | (0.0032) | (0.0048) | (0.0032) |
| $UPGRADE_{t-1}$ | 0.0117** | 0.0090*** | 0.0074* | 0.0063** | 0.0089* | 0.0077** | 0.0065 | 0.0047 |
| | (0.0051) | (0.0035) | (0.0051) | (0.0036) | (0.0055) | (0.0038) | (0.0054) | (0.0037) |
| $Leverage(Bk)_{t-1}$ | | | –0.0160 | | | | –0.0136 | |
| | | | (0.0131) | | | | (0.0085) | |
| $\Delta Leverage(Bk)_{t-1}$ | | | –0.0355 | | –0.1193*** | | –0.0415** | |
| | | | (0.0261) | | (0.0180) | | (0.0182) | |
| $Leverage(Mkt)_{t-1}$ | | | | –0.0411*** | | | | –0.0369*** |
| | | | | (0.0081) | | | | (0.0081) |
| $\Delta Leverage(Mkt)_{t-1}$ | | | | –0.0007 | | –0.0439*** | | –0.0133 |
| | | | | (0.0160) | | (0.0114) | | (0.0132) |
| $ln(Sales)_{t-1}$ | | | –0.0062*** | –0.0037*** | | | –0.0076*** | –0.0047*** |
| | | | (0.0018) | (0.0009) | | | (0.0015) | (0.0010) |
| $\Delta Sales_{t-1}$ | | | 0.0337*** | 0.0308*** | 0.0100 | 0.0110** | 0.0163** | 0.0180*** |
| | | | (0.0111) | (0.0075) | (0.0072) | (0.0049) | (0.0068) | (0.0047) |
| $EBITDA_{t-1}$ | | | 0.1989*** | 0.0970*** | | | 0.1617*** | 0.0722*** |
| | | | (0.0445) | (0.0206) | | | (0.0267) | (0.0197) |
| $\Delta EBITDA_{t-1}$ | | | 0.0112 | –0.0108 | 0.1169*** | 0.0324 | 0.0425 | 0.0058 |
| | | | (0.0580) | (0.0301) | (0.0356) | (0.0243) | (0.0386) | (0.0263) |
| $M/B_{t-1}$ | | | 0.0054** | –0.0062*** | | | 0.0049** | –0.0042*** |
| | | | (0.0026) | (0.0012) | | | (0.0020) | (0.0015) |
| $\Delta M/B_{t-1}$ | | | –0.0047* | 0.0057*** | –0.0001 | –0.0008 | –0.0046** | 0.0035** |
| | | | (0.0024) | (0.0012) | (0.0008) | (0.0005) | (0.0020) | (0.0015) |
| $z\text{-Score}_{t-1}$ | | | 0.0048** | 0.0017* | | | 0.0091*** | 0.0030** |
| | | | (0.0020) | (0.0010) | | | (0.0022) | (0.0015) |
| $\Delta z\text{-Score}_{t-1}$ | | | 0.0004 | 0.0037 | 0.0007 | 0.0076*** | –0.0025 | 0.0022 |
| | | | (0.0796) | (0.0023) | (0.0042) | (0.0025) | (0.0041) | (0.0026) |
| $RatingLevel_{t-1}$ | | | –0.0019*** | –0.0009** | | | –0.0022*** | –0.0011** |
| | | | (0.0006) | (0.0004) | | | (0.0007) | (0.0005) |
| Intercept | 0.0269*** | 0.0169*** | 0.0553*** | 0.0652*** | | | 0.1016 | 0.0955* |
| | (0.0017) | (0.0012) | (0.0148) | (0.0101) | | | (0.0796) | (0.0541) |
| $\Phi_1 > -\Phi_2$ ($p$-value) | 0.0001 | 0.0001 | 0.0641 | 0.0054 | 0.0027 | 0.0001 | 0.1289 | 0.0137 |
| $N$ | 11,372 | 11,372 | 11,372 | 11,372 | 10,984 | 10,984 | 11,372 | 11,372 |
| $R^2$ | 0.8 | 1.2 | 3.7 | 3.4 | 21.1 | 21.5 | 12.5 | 14.1 |

measures changes to leverage, arguably the control variables should be measured as changes (see Graham (1996), for example); however, several previous tests of capital structure behavior use levels as explanatory variables (e.g., Hovakimian et al. (2001), MacKie-Mason (1990)), so I include both levels and changes in an

(EBITDA) (item 13) divided by assets (item 6), M/B is (market equity (item 25 × item 199) plus total liabilities (item 181) plus preferred stock (item 10 or, if unavailable, item 56) minus deferred taxes and investment tax credit (item 35) minus convertible debt (item 79))/(book assets (item 6)), and $z$-score is (3.3 × pretax income (item 170) plus 1.4 × retained earnings (item 36) plus 1.2 × working capital (item 4 minus item 5))/book assets (item 6).

effort to be thorough. These control variables are chosen based on factors that have been shown to be consistently predictive for capital structure behavior in previous papers, with an emphasis on those that measure distress costs (MacKie-Mason (1990), Rajan and Zingales (1995), and Fama and French (2002)). I also include as a control the lagged level of a cardinalized value of the firm's credit rating level (AAA = 1, AA+ = 2, AA = 3, etc.) to further control for any distress costs.

Tests of equation (6) without control variables are shown in columns 1 and 2 of Table 4. These tests indicate a significant relationship between changes in rating and subsequent leverage decisions. For the book measure, a firm that has been downgraded issues over 4.0% less net debt relative to net equity than other firms, and a firm that has been upgraded issues approximately 1.0% more debt relative to equity than other firms. The results are significant at 1% and 5%, respectively. The significant downgrade and upgrade results without control variables can be interpreted as consistent with both credit rating effects and distress or target leverage effects. However, the null that $\Phi_1 = -\Phi_2$ is rejected at 1% for the tests in columns 1 and 2 in favor of $\Phi_1 > -\Phi_2$, consistent with CR-CS and inconsistent with ratings only proxying for distress concerns.

Columns 3 and 4 of Table 4 show results using the full set of changes and levels of firm characteristics as control variables. In these regressions, the coefficient on DOWNGRADE remains economically and statistically significant. Firms that have been downgraded issue approximately 2% less net debt relative to equity in both cases, and the coefficient is statistically significant at 1% in both cases. Consistent with CR-CS, downgraded firms undertake capital structure behavior to attempt to regain their previous rating after controlling for changes in leverage and other firm characteristics. After controlling for these changes in the firm, the statistical significance of the upgrade coefficient is reduced. In all four of the base specifications the effect of the downgrade is larger than the effect of the upgrade, and $F$-tests confirm a statistically significant difference at 1% in three out of four specifications.

I also examine the predictive capability of the downgrade variable relative to changes in leverage, profitability, and $z$-score. In separate regressions of NetDIss on each of the four individual variables, the coefficient on the explanatory variable has the sign predicted by theory and is significant at 1% (results not reported). Regressions with only the downgrade variable, however, have the highest $R^2$, twice that of the next best regression. Regressions with the downgrade variable also have the lowest root mean squared error. Lastly, in regressions with all four explanatory variables, only the downgrade variable remains statistically significant at 1%. The downgrade variable is a better predictor of capital structure behavior than changes to leverage, profitability, or $z$-score.[13]

[13]To evaluate the robustness of the coefficients and standard errors, I conduct a number of statistical robustness checks that are not reported (see Petersen (2009) for an excellent review and evaluation of current panel data econometric approaches). The reported results calculate standard errors clustered by firm as suggested by Rogers (1993) and Arellano (1987), but I also calculate White's (1980) standard errors, random effects, and $t$-statistics using the approach suggested by Fama and MacBeth (1973). I also include year dummy variables. The results are similar given any of these approaches.

A downgrade is not an exogenous event, so interpreting the relationship between a downgrade in one year and subsequent leverage reduction the next year as causal may be spurious if some unobserved variable explains both the downgrade in one year and the leverage reduction the subsequent year (reverse causality can also be a concern, but in this instance the likelihood is low, since it is unlikely that a firm would be downgraded because it was going to reduce leverage the next period). Measuring the rating change the year prior to the capital structure decision while including other changes in the firm as controls reduces this possibility but does not eliminate it. Therefore, I explore a number of additional specifications and tests to examine this issue further. While no one test provides definitive evidence of causality, taken together the tests help understand which story is most consistent with the main empirical results documented in the paper.

Columns 5–8 of Table 4 present results of tests with firm fixed effects and industry effects by year. The firm fixed effects control for any unobserved effects for a particular firm. With the firm fixed effects tests, I exclude firm-level control variables, since the firm effect together with changes in those variables fully subsume these firm-level effects. The coefficient on the downgrade variable remains significantly negative in this specification. The robustness of the downgrade effect to the inclusion of fixed firm effects indicates that the behavior following downgrades is not due only to variation across firms. If some unobserved factor leads a firm to, for example, regularly reduce debt and also receive downgrades, the firm fixed effect will capture this. This test, however, implicitly assumes that the unobserved effect is time invariant. I therefore also conduct tests that include industry dummy variables that vary with each year. I create dummy variables for each 2-digit SIC code and interact them with each year, creating approximately 1,000 new dummy variables (the number is lower than the maximum possible, since not every 2-digit SIC code is represented every year). These dummy variables capture time-variant effects by industry. If, for example, a particular industry receives an exogenous shock to product demand that leads firms in the industry to be downgraded and subsequently reduce leverage, these control variables will capture that effect. Therefore, any effects that remain after including these controls must not be caused by shocks to the industry. The downgrade variable remains economically and statistically significant in this additional specification as well. The robustness of the downgrade effect to both of these specifications reduces the likelihood that an unobserved effect explains the results.

The upgrade variable is no longer statistically significantly different from 0 in either of the industry by year tests. This result is also consistent with CR-CS and with the results presented in Table 3. Firms do not attempt to reverse an upgrade, after controlling for changes in leverage and the firm's financial condition, because the upgrade, when considered by itself, brings discrete benefits to the firm. Conditional on other changes to the firm, a manager does not have an incentive to reverse an upgrade, and this is confirmed by these results. This lack of symmetry is inconsistent with the alternate explanation that firms react to changes in credit ratings because they proxy for changes in financial distress costs. If firms are reacting to changes in distress costs as represented by changes in ratings, firms that are upgraded should issue more debt relative to equity than

other firms, as they have lower distress costs. The remainder of the paper focuses on trying to understand further the robust results for downgrades.

## IV. The Impact of a Downgrade on Capital Structure Decisions

Having established in the previous section that credit rating downgrades are associated with subsequent leverage reductions, in this section I conduct additional tests to help understand how and why the downgrade may affect subsequent leverage reduction.

### A. Logit Tests on Capital Issuance and Reduction Decisions

Table 5 reports results from logit regressions evaluating separately the decision to issue or reduce debt or equity. An issuance or reduction is again defined as greater than 5% of total assets (as in Table 2). The explanatory variables are the same as those in equation (6), and the implications for the DOWNGRADE and UPGRADE variables are the same. These tests investigate the specific mechanisms by which any rating effects manifest into changes in capital structure.

These tests indicate that a downgrade predicts a lower probability of debt issuance, a higher probability of debt reduction, and a lower probability of an equity reduction. These results indicate that firms do not reduce leverage by just one channel following a downgrade. Any alternate story must explain all three of these channels. For example, one alternate story is that firms may be reluctant to issue debt following a downgrade because of a higher cost of debt, but a higher cost of debt does not imply that a firm would also be more likely to reduce debt (since the rate for existing debt is already determined) and less likely to reduce equity. The evidence is, however, consistent with firms reducing leverage to regain a minimum target rating level. Further, the downgrade variable is again a greater predictor of capital structure choice than changes in profitability, bankruptcy probability, or leverage, using measures of observed fit or log-likelihood statistics.

### B. Tests at Individual Ratings

Testing effects at individual ratings provides an additional test of CR-CS distinct from alternate explanations for the credit rating results, since other explanations imply uniform reactions to changes in credit rating, whereas CR-CS suggests that some rating changes may be more significant. I test individual rating effects in two ways. I conduct tests at each rating level, comparing firms downgraded to each rating to a control group of firms with the same rating that were not downgraded. Since the control group has the same rating as the downgraded firm, they should have similar financial distress concerns and costs of debt. Second, I test the effects of particular ratings by incorporating dummy variables for a specific change in rating directly into the regressions of equation (6). In these tests, I examine the incremental impact of specific rating changes, including the investment grade to speculative grade change, the change from B to CCC, and changes that directly affect commercial paper access.

TABLE 5

Capital Structure Decisions Following Downgrades: Logistic Tests

Coefficients and standard errors from logistic regressions of binary variables indicating debt or equity issuance or reduction on credit rating dummy variables and various explanatory variables. Issuance and reduction are defined as a net issuance or reduction greater than 5% of beginning of year assets. DOWNGRADE is a dummy variable with a value of 1 if the firm was downgraded the previous year. The sample is all nonfinancial Compustat firms from 1987 to 2003 with a credit rating for 3 consecutive years and 3 years of nonmissing data for computing the variables. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Dependent Variable | | | |
|---|---|---|---|---|
| Variable | Reduce Debt | Issue Debt | Reduce Equity | Issue Equity |
| $DOWNGRADE_{t-1}$ | 0.5005*** | –0.4572*** | –0.3420** | –0.0599 |
| | (0.0731) | (0.0792) | (0.1677) | (0.1232) |
| $Leverage(Bk)_{t-1}$ | 0.7873*** | –0.0876 | –0.5832 | 0.0898 |
| | (0.1307) | (0.1155) | (0.2259) | (0.1765) |
| $\Delta Leverage(Bk)_{t-1}$ | 0.1795 | –0.1600 | 1.7056*** | –0.4214 |
| | (0.2794) | (0.2640) | (0.5407) | (0.3688) |
| $ln(Sales)_{t-1}$ | 0.0475** | –0.1383*** | 0.0780** | –0.1942*** |
| | (0.0240) | (0.0196) | (0.0379) | (0.0351) |
| $\Delta Sales_{t-1}$ | –0.6563*** | 1.1020*** | –1.3228*** | 0.6982*** |
| | (0.1122) | (0.1019) | (0.1976) | (0.1363) |
| $EBITDA_{t-1}$ | 2.2380*** | 2.2405*** | 8.9336*** | –1.2147** |
| | (0.4536) | (0.3951) | (0.6974) | (0.6163) |
| $\Delta EBITDA_{t-1}$ | –1.3061** | –0.8045 | –0.1622 | –0.8319 |
| | (0.5948) | (0.5764) | (1.0164) | (0.7788) |
| $M/B_{t-1}$ | –0.0761* | 0.0600** | 0.2334*** | 0.1122*** |
| | (0.0433) | (0.0250) | (0.0350) | (0.0374) |
| $\Delta M/B_{t-1}$ | –0.0250 | –0.0523** | –0.2186*** | –0.0977*** |
| | (0.0515) | (0.0255) | (0.0352) | (0.0374) |
| $z\text{-}Score_{t-1}$ | 0.0217 | 0.0383 | 0.2405*** | –0.1534*** |
| | (0.0284) | (0.0247) | (0.0415) | (0.0454) |
| $\Delta z\text{-}Score_{t-1}$ | –0.0207 | –0.0597 | 0.5951*** | 0.0990 |
| | (0.0635) | (0.0617) | (0.1110) | (0.0826) |
| $RatingLevel_{t-1}$ | 0.1469*** | 0.0090 | –0.0398** | 0.0833*** |
| | (0.0108) | (0.0083) | (0.0157) | (0.0151) |
| Intercept | –4.3225*** | –0.6927*** | –4.7731*** | –2.1813*** |
| | (0.2515) | (0.1909) | (0.3761) | (0.3421) |
| *N* | 11,372 | 11,372 | 11,372 | 11,372 |

### 1. Individual Rating Tests

Table 6 presents the results by individual rating. Regressions of equation (6) are conducted on separate samples of firms downgraded to each particular rating level with a control group of firms that already have that credit rating. Although control variables are less important in this context, since the firms are matched by rating, I continue to control for levels and changes in leverage, size, *z*-score, M/B, and profitability.

The results in Table 6 indicate that firms receiving downgrades to particular ratings attempt to move back to their previous rating. The coefficients are significant at 5% in 6 out of 18 ratings categories (the results shown use market measures of leverage—tests with book measures are similar). The results are economically significant by rating as well, with firms that have been downgraded issuing over 1% less net debt than equity versus other firms in the same rating category for 13 out of 18 ratings. The results are stronger around certain ratings, while at other ratings the effect of a downgrade is not significant. The null hypothesis that the

TABLE 6

Capital Structure Decisions Following a Downgrade by Individual Rating

Coefficients and standard errors, in percentages, on DOWNGRADE, a dummy variable indicating the firm was downgraded the previous period, in regressions of net debt minus net equity divided by market assets on DOWNGRADE and various control variables. Control variables are changes and levels of leverage, EBITDA, sales, *z*-score, and M/B. The sample for each rating category is all nonfinancial Compustat firms with the indicated rating at time *t* from 1987 to 2003 with a credit rating for 3 consecutive years and 3 years of nonmissing data for computing the variables. *, **, and *** below the coefficient denote significance at the 10%, 5%, and 1% levels, respectively.

*Panel A. Investment Grade Ratings*

| AA+ | AA | AA– | A+ | A | A– | BBB+ | BBB | BBB– |
|---|---|---|---|---|---|---|---|---|
| 2.45 | 1.93 | –1.03 | 0.65 | –1.20** | –0.32 | –0.96* | –1.79*** | –1.73** |
| (1.15) | (1.15) | (0.80) | (0.94) | (0.67) | (0.65) | (0.64) | (0.68) | (0.96) |

*Panel B. Speculative Grade Ratings*

| BB+ | BB | BB– | B+ | B | B– | CCC+ | CCC | CCC– |
|---|---|---|---|---|---|---|---|---|
| –2.35*** | –4.08*** | –2.15* | –1.03 | –1.57 | –2.60 | –9.15** | –4.45* | –4.91 |
| (0.99) | (1.15) | (1.41) | (1.42) | (1.65) | (2.15) | (4.57) | (2.72) | (5.56) |

effects are equal at all ratings is rejected at 1%. This result implies that the effects are greater at certain rating levels, consistent with the implications of CR-CS.[14]

Table 6 indicates that firms target ratings around the change from investment grade to speculative grade (BBB− to BB+). A speculative grade rating prohibits some investor groups from investing in a firm's bonds (e.g., banks and pension funds) and increases capital charges for other investors. Ratings triggers are also most prevalent around the change in rating from investment grade to speculative grade, and disclosure requirements increase at this change in rating. In unreported tests, I also find that downgrades influence leverage decisions more for speculative grade firms during the time surrounding the indictment of Michael Milken and the subsequent collapse of Drexel Burnham Lambert (1989 and 1990).

The changes at higher ratings levels correspond to ratings that are significant for commercial paper, asset-backed securities, and interest rate swap market access. Money market funds must limit holdings of short-term bonds to short-term ratings that correspond to an A long-term rating or better, lending is permitted against mortgage-backed securities and foreign bonds rated AA or better, and pension funds are allowed to invest in asset-backed securities rated A or better (Cantor and Packer (1997)). California state regulations also prohibit California-incorporated insurance companies from investing in bonds rated below single-A (SEC (2003)).

Results are also strong around the B to CCC distinction. A minimum B rating has regulatory advantages and can be significant for third party relationships (e.g., a condition for GE to provide financing for a large jet order by US Airways

[14]These tests by rating might still reflect some distress effects if firms that are downgraded are downgraded again the next year and consequently have greater distress concerns than their control groups. To account for this, I also conduct the tests by rating with control firms based on the firm's rating at time *t*, at the end of the year when capital structure activity is taking place. The capital structure activity of firms that are downgraded is thereby compared against firms that have the same rating at the end of that year. The downgrade dummy variable is still lagged such that the regressions remain predictive. Results using this approach are very similar to those in Table 5, with limited exceptions (results not reported).

was that US Airways' credit rating not fall below B− (*Financial Times* (May 6, 2004))). Liquidity is also a significant concern around these ratings (Patel, Evans, and Burnett (1998)). This result is also consistent with anecdotal evidence of clustering at B rating levels (*Financial Times* (March 9, 2005)) and large increases in spreads from a change in rating from B− to CCC+.[15]

### 2. Incremental Impact of Certain Rating Levels

Table 7 presents tests of equation (6) with the inclusion of dummy variables that identify downgrades at specific rating levels (investment grade to speculative and B to CCC) and downgrades of commercial paper ratings (A1 to A2 and A2 to A3).[16] The coefficients on these dummy variables can be interpreted as incremental to the overall downgrade effect, since the general downgrade variable includes the specific rating downgrades, and over 90% of firms that have their commercial paper rating downgraded also receive long-term rating downgrades.

Results given in Table 7 indicate that firms whose credit rating is downgraded to speculative from investment grade issue incrementally less debt relative to equity than other downgraded firms. For the continuous dependent variable NetDIss (columns 1 and 2), a downgrade to speculative implies approximately 1.7% less debt issuance relative to equity as a percentage of assets compared to other downgraded firms, and the coefficient is significant at 5% for both specifications. In logit tests with binary dependent variables indicating debt issuance (column 5) or debt reduction (column 7), firms that are downgraded to speculative are incrementally less likely to issue debt and more likely to reduce debt, and the result for reducing debt is significant at 5%. Average marginal probabilities computed from the test of column 7 indicate that a downgrade increases the probability of a debt reduction in a given year by 5.5%, and a downgrade to speculative increases the probability an additional 4.6%. For any given year, a firm has a probability of reducing debt of approximately 14.8%, so these increases are economically meaningful. An odds ratio derived from the test of column 5 implies that a downgrade, after controlling for other factors, decreases the likelihood of a debt issuance by 28%.

Table 7 also indicates a strong incremental impact of a downgrade to CCC from B. In tests with the NetDIss dependent variable, a downgrade from B to CCC implies greater subsequent leverage reduction versus other downgraded firms, and both results are significant at 1%. Regarding the channel by which firms downgraded to CCC reduce leverage, columns 5 and 7 indicate that a downgrade to CCC implies that a subsequent issuance of debt is less likely (and significant at 5%) but there is no significant impact on the probability of debt reduction. This

[15]The size of the coefficients in the CCC category suggests that the overall results in Table 3 may be driven by CCC firms alone. Excluding CCC firms, however, from the regressions of equations (6) and (7) does not materially affect the results of Table 3. The CCC rating levels have a small number of firm years, as shown in Table 1, and thus do not significantly impact the overall results.

[16]In some cases a firm is downgraded from investment grade to a significantly worse rating within the speculative grade category, which may contaminate the results (in particular, if the firm is in default). For this reason, I specifically define a downgrade to speculative as a downgrade from BBB− or above (investment grade) to a rating of BB+ or BB (the two highest speculative grade ratings). The results do not materially change if the definition is changed to a downgrade to BB+, BB, or BB−.

TABLE 7

Incremental Effects of Interactions with Downgrades on Leverage Decisions

Coefficients and standard errors on credit rating dummy variables and interaction terms 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 book (columns 1 and 3) and market (columns 2 and 4) assets and logit regressions with a dependent variable indicating debt issuance or debt reduction (logit tests use book value measures of leverage). DOWNGRADE is a dummy variable with a value of 1 if the firm was downgraded the previous year; Down:IG/SG and Down:B/CCC are dummy variables indicating a downgrade to speculative grade or CCC, respectively; and DownCP:A2/A3 and DownCP:A1/A2 are dummy variables indicating a commercial paper rating downgrade to A3 or A2, respectively. The sample is all nonfinancial Compustat firms from 1987 to 2003 with a credit rating for 3 consecutive years and 3 years of nonmissing data for computing the variables. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Control variables are the same as in Table 3.

| | OLS Regressions | | | | Logit Regressions | | | |
|---|---|---|---|---|---|---|---|---|
| | Book | Market | Book | Market | Issue Debt | | Reduce Debt | |
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| $DOWNGRADE_{t-1}$ | –0.0145*** | –0.0150*** | –0.0199*** | –0.0237*** | –0.3986*** | –0.4905*** | 0.4617*** | 0.4893*** |
| | (0.0041) | (0.0028) | (0.0042) | (0.0031) | (0.0832) | (0.0847) | (0.0788) | (0.0767) |
| $Down:IG/SG_{t-1}$ | –0.0168** | –0.0167** | | | –0.2478 | | 0.3900** | |
| | (0.0088) | (0.0081) | | | (0.2649) | | (0.1870) | |
| $Down:B/CCC_{t-1}$ | –0.0638*** | –0.0647*** | | | –0.9101** | | –0.1015 | |
| | (0.0218) | (0.0178) | | | (0.4165) | | (0.2466) | |
| $DownCP:A2/A3_{t-1}$ | | | –0.0285** | –0.0234** | | –1.1050** | | 0.5191** |
| | | | (0.0127) | (0.0105) | | (0.5204) | | (0.2590) |
| $DownCP:A1/A2_{t-1}$ | | | 0.0235** | 0.0209*** | | 0.5702*** | | –0.2231 |
| | | | (0.0119) | (0.0065) | | (0.2071) | | (0.2360) |
| $CP\_Rating\_Flag_{t-1}$ | | | 0.0025 | 0.0008 | | –0.0715 | | 0.0544 |
| | | | (0.0033) | (0.0023) | | (0.0641) | | (0.0851) |
| Full set of controls? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 11,372 | 11,372 | 11,372 | 11,372 | 11,372 | 11,372 | 11,372 | 11,372 |
| $R^2$ | 3.1 | 3.1 | 3.1 | 2.9 | N/A | N/A | N/A | N/A |

contrasts with firms downgraded to speculative grade that have a lower probability of debt reduction but no significant change in probability of debt issuance. Both results are consistent with firms reducing leverage due to downgrades and provide additional evidence that the relationship is rating specific.

Table 7 also indicates an incremental impact of a change in commercial paper rating from A2 to A3. Many firms find commercial paper to be a valuable source of short-term capital (the size of the commercial paper market was $1.4 trillion as of 2004), and a downgrade to A3 significantly restricts a firm's access to the commercial paper market. The change from A1 to A2, however, is not incrementally significant, and in some cases is significant in the opposite direction predicted (although when considered with the downgrade variable, the coefficients together imply no significant capital structure activity for this change in rating).

## C. Tests at Individual Years

The results indicating that firms reduce leverage following downgrades could be driven by changes in the business cycle if more firms are downgraded during economic downturns and firms issue less debt during these same periods. Table 8 presents results of equation (6) for market value measures by year. The table indicates that the downgrade results are significant across individual years. The coefficient on downgrade is significant at 5% in 10 out of 17 years, and the coefficient is negative in every year but one. The magnitudes across years are also significant, with downgraded firms issuing over 1.5% more net equity than net debt in 12 out

of 17 years. These results confirm that the results of this paper are not due to business cycle effects.

TABLE 8

Impact of Credit Rating Changes on Capital Structure Decisions by Year

Coefficients and standard errors on the downgrade dummy variable 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 market assets on a constant, a dummy variable for if a firm was downgraded the period before, and control variables measured at the beginning of each year. The control variables (not shown) are the firm's credit rating level and changes and levels of the firm's market leverage, *z*-score, EBITDA/A, EBITDA divided by total assets, the M/B ratio, and ln(Sales), the natural log of total sales. The samples exclude firm years with missing values for any of the variables and financial firms. Errors are White's (1980) consistent standard errors. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| Variable | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|
| $DOWNGRADE_{t-1}$ | –0.0429** | –0.0002 | –0.0433*** | –0.0247*** | –0.0251*** | –0.0151** |
| | (0.0209) | (0.0160) | (0.0172) | (0.0103) | (0.0091) | (0.0096) |
| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
| $DOWNGRADE_{t-1}$ | –0.0269*** | –0.0044 | –0.0232** | –0.0163 | –0.0127 | 0.0016 |
| | (0.0095) | (0.0102) | (0.0118) | (0.0203) | (0.0139) | (0.0187) |
| | 1999 | 2000 | 2001 | 2002 | 2003 | |
| $DOWNGRADE_{t-1}$ | –0.0174 | –0.0207* | –0.0173** | –0.0143** | –0.0179*** | |
| | (0.0137) | (0.0129) | (0.0092) | (0.0084) | (0.0075) | |

The incentives to regain a target rating might still be strongest in years in which credit spreads are largest. To examine this relationship, I calculate the average spread between BBB and AAA bonds for the three months prior to each year (I also calculate the average for 12 months prior to the issuance year, with little change in results). The simple correlation between this spread and the coefficients reported in Table 8 is −0.58. The coefficient on an interaction term between the spread and downgrade variable is also negative and statistically significant when included in equation (6) of the paper (results not reported). These results suggest target credit rating behavior is larger when credit spreads are higher.

## V. Conclusions

Financial managers undertake capital structure behavior to target minimum credit rating levels over time. This behavior is due to specific concern for the benefits of higher ratings after considering target leverage behavior. Firms are more likely to reduce debt and less likely to issue debt following a downgrade, and they are also less likely to reduce equity after a downgrade. This ratings-related behavior is not only independent of target leverage behavior but also of distress concerns, market timing activity, and yearly business cycle effects. Further, capital structure decisions are more affected by whether the firm's credit rating was downgraded the previous year than by changes in leverage, profitability, or *z*-score.

Firms target minimum credit ratings at which regulations affect investment in a firm's bonds and at which commercial paper access is affected. Regulations based on ratings determine whether certain investor groups (e.g., banks and pension funds) can invest in the bonds, the capital charges that investors (e.g., insurance companies and broker-dealers) incur from holding the bonds, and listing and

disclosure requirements for the bonds. Several of these regulations relate particularly to the investment grade distinction and the B−/CCC+ distinction. Certain higher long-term bond ratings also correspond to commercial paper ratings that directly affect a firm's ability to issue commercial paper. Underscoring the importance of these factors, firms particularly target the investment grade credit rating level, a minimum B− rating, and a minimum A2 commercial paper rating.

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