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"The Real and Financial Effects of Credit Ratings: Evidence from Moody's Adjustments"

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Boston College

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Kisgen is at Boston College Carroll School of Management and may be reached at kisgen@bc.edu. This paper has benefited from the insightful comments of David Chapman, Jonathan Reuter, Philip Strahan, and seminar participants at Boston College, The Pennsylvania State University, the University of Florida, and the University of Missouri.

Credit rating agencies have a central role in financial markets. Many rules and regulations on bond investment rely on credit ratings to determine the permissibility of investment and capital charges for investments in bonds, and many firm contracts and bond covenants include triggers based on credit ratings. The SEC and Congress have recently been trying to moderate the influence of rating agencies on financial markets by stripping some regulations of ratings references, imposing greater disclosure requirements on rating agencies, and considering alternatives to rating agencies for use in bank and other regulations. The Dodd-Frank bill in particular has several provisions related directly to ratings, including removing the special exemption in Regulation FD for credit rating agencies, and a provision commissioning a study to find alternatives to the credit rating issuer-pay model. To understand the merits and consequences of these decisions, one key factor to consider is the direct influence ratings agencies have on corporate investment and financing behavior.

In this paper, I test the hypothesis that the firm value function has material discontinuities at different credit rating levels because of the many contracts and regulations based directly on ratings. To examine this, I use a database that shows adjustments a rating agency (Moody's Investor Services) makes to leverage to determine its ratings. Rating agencies rely significantly on financial ratios for determining credit ratings, and one of the most significant of those ratios is leverage. To calculate leverage for evaluating a corporation, Moody's begins with GAAP reported leverage but then makes adjustments along at least eight dimensions to calculate a new leverage for its ratings determination (e.g., underfunded pensions, hybrid securities, etc.). Some of these adjustments are objective and others are subjective and based on taste. Further, at various points in time, Moody's has changed the methodology for determining its adjusted

leverage. I make use of changes in Moody's adjustments to GAAP leverage to examine the direct influence rating agencies have on corporate behavior.

I use two types of empirical designs to examine the influence of rating agency behavior on corporate decisions. The first uses the full sample of firms in panel data tests that rely on first differences and interactions for identification. The second looks at a subsample of firms that is directly affected by changes in Moody's methodologies in a particular year, and thus relies on a natural experiment for identification. The first test has the advantage of a larger sample with arguably broader implications, whereas the second has cleaner identification, albeit on a smaller sample.

I first find that changes to Moody's adjustments to leverage affect firm financing and investment behavior. When Moody's increases a firm's adjustment to leverage in a year, that firm is more likely to reduce net debt issuance and have lower asset growth the following year. For example, consider a BBB-rated firm whose Moody's adjusted leverage in 2005 is 55% and GAAP leverage is 50%. If in 2006 Moody's adjusted leverage changes to 60% and GAAP leverage remains 50%, I find that the firm is subsequently more likely to reduce leverage and grow more slowly. If the firm is concerned about maintaining its BBB rating, the change in adjusted leverage pushes the firm closer to a Moody's downgrade, so the firm responds by reducing debt and growing more slowly to counteract this adjustment. If the rating level were irrelevant to the firm, no adjustments would be made since GAAP leverage did not change.

For this initial test to provide convincing identification of a causal relationship between a firm's rating status and its financial and real decisions, the changes made to Moody's adjustments must be due to methodology changes or due to other subjective factors, such as taste or political pressure, that are exogenous to changes in firm fundamentals. While some

component of the changes in adjustments is for these exogenous-to-the-firm reasons, another component likely reflects accurate new characterizations of a firm's financial distress, which leaves legitimate concerns about a causal relationship. To further distinguish between these two competing explanations for the full sample tests, I rely on the observation that all firms should not care about their rating status equally. In particular, firms near the investment grade/speculative grade boundary should care most about their ratings, since many regulations that are based on ratings are most severe at that distinction. Also, firms with ratings specific triggers in their bond covenants should care more about their rating level. If the changes Moody's makes to adjusted leverage only correlate with a firm's distress status, the changes should affect firms uniformly; however, if firms are concerned specifically about their rating status, these subsets of firms should care more about Moody's adjustment changes.

Defining a firm as near the investment grade boundary as one with a rating of BBB, BBB-, BB+ or BB, I test whether this subset of firms reacts more to changes in Moody's adjustments to leverage.[1] I find that these firms do react more to changes in adjustments, and the economic magnitudes of these reactions are also large. For example, for every 1% increase in Moody's adjusted leverage for a firm, firms near the investment grade boundary on average respond by issuing 0.6% less debt the following year. For many of the tests, the reaction to Moody's adjustments is entirely concentrated among firms near the investment grade/speculative grade boundary. Firms that are not near this distinction do not modify behavior based on Moody's changes to their adjusted leverage. I similarly examine the incremental impact of Moody's behavior on firms with bond covenants containing ratings specific triggers (for example, some covenants require a step up in coupon payments if a firm's credit rating falls to a certain level). I find that these firms also react more to changes in adjustments that Moody's

[1] Results are insensitive to alternate definitions of nearness to the investment grade boundary.

makes to leverage. These results indicate that firms react to Moody's adjusted leverage specifically due to its ratings impact, not due to a spurious correlation with an omitted distress variable. Moody's behavior directly affects real and financial corporate activity.

The second empirical approach of the paper makes use of Moody's methodology changes directly. In February 2006, Moody's changed its treatment of adjustments made in three categories: underfunded pensions, operating leases, and hybrid securities. The changes in adjusted leverage caused by these methodology changes represent shocks to a firm's ratings status that are exogenous to the firm's financial condition. Since these changes occur independent of changes in a firm's default status, they provide a natural experiment for identifying the causal impact of rating agency behavior on firm capital structure and investment decisions.

I begin by conducting the previous panel data tests for the cross-section of firms in 2006 only (evaluating corporate behavior for firms in 2007 based on changes in Moody's adjustments to leverage in 2006). I find that firms react to changes in Moody's adjustments to leverage in 2006, and again this reaction is concentrated among firms near the investment grade/speculative grade boundary or with rating triggers. Given the methodology changes of this year, changes to adjustments to leverage made by Moody's are more likely due to methodology changes than changes in distress compared with other years. The confirmation of results for this year adds further evidence of a direct ratings effect.

Finally, I examine a subset of firms within 2006 that are most likely to be affected by the methodology change: firms with underfunded pensions. Firms with underfunded pensions benefit from the methodology change in 2006, such that firms with underfunded pensions receive a smaller increase in adjusted leverage in 2006 than they did in 2005. I first confirm that this

group of firms does in fact receive favorable changes in adjustments in 2006. Indeed, firms with underfunded pensions are twice as likely to receive a significant decrease in adjusted leverage from Moody's in 2006 as they are in other years. I then test whether firms with underfunded pensions that receive a significant reduction in adjustments to their leverage are more likely to issue debt or grow more quickly. I find that firms with underfunded pensions in 2006 that receive favorable shocks due to decreases in their adjustments to leverage from Moody's are subsequently more likely to issue debt and grow assets at a greater rate in 2007. Firms with a large favorable shock issue approximately 6% more debt as a percentage of capital the following year and grow assets 9% more than firms that did not receive a favorable shock. Since these favorable changes to adjusted leverage were due to a methodology change and not changes in any firm fundamentals, this final result shows clearly that ratings agencies have a direct impact on corporate investment and financing decisions.

This paper is related to previous work examining the influence of credit ratings on corporate behavior. Kisgen (2006) finds that firms near a rating change issue less debt than firms not near a rating change, indicating firms attempt to avoid downgrades and obtain upgrades. Kisgen (2006) relies on the discontinuity in the firm value function as a result of ratings changes for identification. Kisgen (2009) finds that if a firm receives a downgrade, they issue less debt and more equity to try to regain their previous rating. This paper differs from those two previous papers by using a natural experiment to obtain plausibly exogenous variation to a firm's rating status. This paper also identifies real effects of ratings, whereas those previous papers focus on financing decisions only, and this paper is also the first to examine ratings triggers specifically as a rationale for firm ratings concerns. Faulkender and Petersen (2006) and Sufi (2009) both examine ratings influence on capital structure decisions, but they argue that

firms that have a rating in general have more leverage due to market segmentation. This paper examines the influence of rating levels on the firm value function, not the impact of having a rating versus not having a rating.

This paper also relates to papers examining how ratings affect a firm's cost of capital. Kliger and Sarig (1999) show that an exogenous change in ratings modifiers affects bond yields. Kisgen and Strahan (2010) show that an exogenous change in rating agency regulatory status influences bond yields. Jorion, Liu and Shi (2005) find that equity prices react more to bond rating changes after Regulation FD was passed, which gave ratings agencies an informational advantage over other market participants. Kraft (2011) shows that Moody's adjustments to financial statements are correlated with bond yields. These papers are complementary to this work as these other papers establish that ratings affect a firm's cost of capital. This paper shows that since rating agencies have the power to affect a firm's cost of capital, firm managers make capital structure and investment decisions based on Moody's ratings behavior even when that behavior is independent of changes to the firm's financial condition.

I. How Do Credit Rating Levels Affect Firm Value?

In 2010, Ford Motor Company began a campaign to reduce leverage significantly. One of Ford's stated goals for this campaign was to regain its investment grade credit rating (Ford was first downgraded to speculative grade by Standard and Poor's in May of 2005). Executive Chairman of Ford Motor Bill Ford said that Ford, "could reach its target of an investment grade rating more quickly than some outside observer might have thought" (*Reuters*, 2010), and the *Wall Street Journal* reported that "Ford Chief Executive Alan Mulally and Chief Financial

Officer Lewis Booth are on a drive to get back the auto maker's investment-grade credit rating, which it lost in 2005" (*Wall Street Journal*, 2010). Ford's own website has a section describing "The Importance of an Investment Grade Rating to Ford", in which they list the advantages of an investment grade rating to the firm including obtaining a lower cost access to liquidity from banks and investors, and being able to invest in new products and plants.[2] Below I provide in detail how credit ratings affect firm value either through their impact on a firm's cost of capital or through changes directly to the firm's cash flows.

A. Regulations Based on Ratings

Many investment rules and regulations are based on a bond's credit rating. In 1936, the U.S. Treasury Department determined that banks could not invest in securities that are "distinctly and predominantly speculative" according to a "designated standard" which must be "supported by not less than two rating manuals." In 1989, Savings and Loans were prohibited from investing in junk bonds such that they could not hold any junk bonds by 1994. In 1993, the Basle Committee on Bank Supervision proposed that internationally active commercial banks dealing in securities should hold extra capital against their non investment-grade bond inventories. In 1982, the SEC allowed less detailed disclosure requirements for issuers of investment grade securities relative to non-investment grade. In 1951, the National Association of Insurance Commissioners (NAIC) established the Securities Valuation Office (SVO) to assign risk ratings to bonds held in the investment portfolios of insurance companies for capital requirements largely determined using credit ratings.

[2] See http://media.ford.com/images/10031/Importance_of_an_Investment_Grade_Credit_Rating.pdf

Several additional institutions are affected by regulations based on ratings. SEC Rule 2a-7 states that money market mutual funds are required to limit investments in bonds rated less than A+, and commercial paper rated less than A1. A1-rated commercial paper also has more favorable firm liquidity requirements than lower rated paper. In 1975, the SEC adopted Rule 15c3-1 that set forth broker-dealer haircut requirements that were a function of the credit ratings of those securities. Many trustees use credit ratings to give guidelines to fund managers as well. Pension funds also often place limits on the amount of a portfolio that can be invested in junk bonds, and in 1988 the Department of Labor instituted a regulation permitting pension fund investment in asset-backed securities only rated A or better. Investment grade bond mutual funds can only hold up to 5% of assets in non-investment grade bonds but must sell any security if it falls below a B rating. The Eurobond and Asset Backed Securities markets often require a certain rating for a firm to participate in that market. California state regulations prohibit California-incorporated insurance companies from investing in bonds rated below single-A.

If the supply of debt capital from investors is infinitely elastic at the correct rate of interest and bonds are perfectly liquid, regulatory restrictions for certain investors on bond investment should not affect a firm's cost of capital. However, if the supply of capital is not infinitely elastic, regulations which affect the cost to investors of investing in a particular bond class or restrictions placed on investors in certain bonds may affect a firm's cost of capital and materially affect a firm's financing and investment decisions. Kisgen and Strahan (2011) use a natural experiment to test whether ratings-based regulations affect a firm's cost of capital, and they find that ratings-based regulations alone lead to a 39 basis point increase in a firm's cost of debt for every notch worse in rating level.

B. Ratings Triggers

Firms may be concerned about credit ratings due to triggers based on ratings in bond covenants, such as a step-up in coupon rate due to a downgrade or a required repurchase of bonds. Also, mergers can have contingencies based on the ratings levels of the firms involved. One example of the potential seriousness of ratings triggers is Enron, who 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 rating triggers or other contingent calls on liquidity, whereby 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. Bhanot and Mello (2006) also examine rating triggers, and they find that in the month of November 2003 among all listed bonds for S&P 500 companies, 42 bond issues have rating triggers from 17 companies. I examine ratings triggers in subsequent empirical tests.

C. Other Ratings Impact

Credit rating levels may impose material costs or benefits to the firm for several additional reasons, including their impact on supplier contracts, labor concerns, or merely from the signaling power of a rating. I briefly discuss these below.

Credit ratings may materially affect relationships with third parties, including the employees of the firm, suppliers to the firm, financial counterparties, or customers of the firm.

For example, firms entering into long-term supply contracts may require certain credit ratings from their counterparty, and entering into swap arrangements may require a certain rating. Employees may demand higher compensation to work at a firm with worse ratings. Management's own maximization of utility may make credit ratings material. For example, if a manager wishes to change jobs, it may be a disadvantage to come from a junk bond rated firm. Negative credit rating developments may also have negative consequences for a financial manager with regard to his job security or compensation.

Credit ratings may also provide information on the quality of a firm beyond publicly available information. Rating agencies receive significant sensitive information from firms that is not public. Credit agencies might also specialize in the information gathering and evaluating process and thereby provide more reliable measures of the 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. Boot, Milbourn and Schmeits (2003) argue that, "rating agencies could be seen as information-processing agencies that may speed up the dissemination of information to financial markets." A credit rating can therefore act as a signal of overall firm quality, whereby firms are 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 creating discontinuities at each rating level.

Finally, at certain credit rating levels (e.g., junk bond levels) 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 would therefore incur additional costs from having that credit rating

(they may have to forgo positive NPV projects due to their inability to finance projects at those times, for example).

II. Moody's Global Standard Adjustments

In determining ratings, Moody's and other rating agencies rely on financial ratios, such as leverage or interest coverage ratios. Moody's Investor Services maintains "Global Standard Adjustments" (GSA) that outline adjustments that analysts should make in analyzing financial statements and calculating these ratios. The objective of these adjustments is to "better reflect the underlying economics of transactions and events and to improve the comparability of financial statements". These adjusted financial statements, and the ratios calculated using them, are then the primary basis on which credit ratings are determined. The adjustments are made across eight broad categories: underfunded defined benefit pensions, operating leases, capitalized interest, employee stock compensation, hybrid securities, securitizations, inventory on a LIFO cost basis, and unusual and non-recurring items. For example, Moody's expenses stock-based compensation and revalues LIFO inventory on a FIFO basis. Some of the adjustments are standardized with detailed worksheets, while other adjustments are non-standardized and at the discretion of the analyst. As one would expect, these adjusted ratios have been show to be correlated with ratings beyond GAAP financial ratios (Kraft (2011)).

In this paper I make use of Moody's adjustments to leverage for identification of a causal relationship between Moody's ratings and corporate behavior. While some of these adjustments are sensible modifications to accurately measure a firm's default probability, some of the adjustments are subjective and unique to Moody's. Kraft (2011) documents that in some cases

the adjustments Moody's makes are not correlated with bond yields, suggesting that financial market participants do not always agree that Moody's adjustments are accurate depictions of default probabilities. Analysts also have significant discretion in several adjustments, and Moody's recognizes that some adjustments are in "highly judgmental areas" (Moody's (2006)). Further, over time Moody's has made changes to its methodology on several of these adjustments which change a firm's rating status but are not reflective of any changes to the firm. These changes in particular are exogenous to the firm and therefore represent a natural experiment to evaluate the impact ratings agencies have on firm behavior. I detail three such changes made in February 2006 below.

A. Pensions

Prior to 2006, Moody's adjusted a firm's balance sheet to include the full amount of underfunded pensions as debt in calculating leverage for its ratings. This adjustment increased leverage for any firm with an underfunded pension. In February 2006, Moody's added an incremental adjustment related to unfunded defined benefit pension plans, which simulates pre-funding of a firm's gross pension obligation. In doing so, Moody's assumes that the company will maintain its existing debt and equity mix in funding future pension obligations. As a result, for unfunded pensions, Moody's no longer counts the entire deficit as debt but instead adjusts the company's balance sheet for an equity credit depending on the firm's current capital structure, reducing the amount of obligation that would otherwise be reclassified to debt. Interest expense on the income statement is also affected by the lower amount of reclassified debt.

B. Operating Leases

Accounting standards treat an operating lease as an expense, even though companies are contractually obligated for lease payments and a failure to make a lease payment often triggers events of default. Moody's brings operating leases onto the balance sheet as debt to try to simulate financial statements as if the company had bought and depreciated the leased asset. In February of 2006, Moody's changed its methodology for this adjustment from a modified present value method to a multiple of the most recent year's rent expense to determine the adjustment. However, if this value is less than the present value they use the present value, so this adjustment can only increase debt.

C. Hybrid Securities

Financial statements classify hybrid securities (e.g., convertible debt or preferred stock) as 100% equity, debt or as a minority interest, even though these securities often have both equity and debt like characteristics. Moody's splits any hybrids into debt and equity with weights assigned according to the hybrids' placement on Moody's debt-equity continuum classification scheme. So Moody's evaluates these securities and places them in baskets, such that each basket classification has its own debt and equity percentage (e.g., Basket "D" securities are treated as 25% Debt, 75% Equity). The balance sheet is then adjusted accordingly, as is the income statement. Prior to February 2006, the fixed charge coverage ratios were only adjusted for "low grade" issuers. For "high-grade corporate issuers", the entire fixed charge was included

in coverage ratios. In February 2006, Moody's changed this so that ratios for all firms would be calculated both with and without hybrid coupons and dividends.

D. Concurrent Events in 2006

Some of the tests of the paper rely on these changes in 2006 for identification. With any test relying on events at a particular point in time, one must be concerned about potential contemporaneous events that might compromise the interpretation of the results. In 2006, two other events occurred that pose that risk. I briefly discuss both here.

First, in August of 2006, the Pension Protection Act was signed into law by George W. Bush. This legislation requires companies who have underfunded pensions to pay higher premiums into the Pension Benefit Guaranty Corporation (PBGC), and also tightens actuarial assumptions and methods that would generally increase sponsor funding of plans. While this act could affect pension behavior generally, there are several reasons that this particular act should not compromise the interpretation of the results of this paper that rely on firms with underfunded pensions. First, the new funding rules of the Act do not go into effect until the 2008 plan year. So to the extent companies react, they would do so over time. Second, the tests of the paper relying on pensions are cross-sectional, conditioning on firms having underfunded pensions, and examining changes to Moody's adjustments. Third, the direction of influence from this Act would be the opposite of the findings of this paper. If a firm responds to the Act by funding their pension more fully which in turn leads to a positive change in adjustment from Moody's, that would presumably lead to lower growth or an increase in debt issuance, if it had any effect on

subsequent corporate behavior. Finally, to rule out any remaining concern, I control for changes in the amount of underfunded pensions for a firm in tests relying on underfunded pensions.

The other potential contaminating event in 2006 was the Federal Accounting Standards Board issuance of SFAS 158, which changes the accounting for underfunded pensions. SFAS 158 requires firms to record as a liability the underfunded status of Defined Benefit plans. In effect, this new rule closes the gap between the adjustment Moody's makes to leverage and what is reported as GAAP leverage. This rule change should also not compromise the interpretation of the results of the paper. First, the new standard was not announced until September of 2006, and was not effective until December of 2008. Second, if firms with underfunded pensions reacted to this, the impact would affect all firms with underfunded pensions, whereas the tests of the paper that rely on underfunded pensions compare firms with large changes in Moody's adjustments to those without large changes, conditional on having a significantly underfunded pension.

Finally, one might also wonder what Moody's main competitor, Standard and Poor's (S&P), did during the same time period. S&P also makes adjustments to GAAP accounting variables when determining ratings (although the data used for this study is not available to the same extent from S&P). Although S&P makes adjustments to financials of a firm for unfunded pensions, I find no evidence that S&P made any changes in its methodology in 2006 or any years surrounding 2006. For example, in a note published by S&P in 2008 describing the adjustments they make with respect to pensions, they state "because we have long reflected an issuer's full postretirement liability by virtue of our adjustments to leverage and capitalization ratios, the adoption of [SFAS No. 158 in 2006] has no direct ratings implications". Although this quote

refers to the accounting change at the time, the inference is that S&P made no methodology changes around 2006.

III. Empirical Design

To derive adjustments to financial statements, I collect reported and adjusted balance sheet and income statements for 2003 to 2009 from Moody's *Financial Metrics* database. For each firm year, I calculate the firm's reported GAAP leverage (GLev), and its Moody's adjusted leverage (MLev), and the difference I denote $Madj_{t,i} = MLev_{t,i} - GLev_{t,i}$. Since I want to identify Moody's adjustments that are based on methodology changes or changes in taste or political pressure, I then first difference this variable: $\Delta Madj_{t,i} = Madj_{t,i} - Madj_{t-1,i}$. Moody's adjustments that are based on more accurate depictions of financial distress are likely to have a significant time invariant component that this first differencing will remove. Changes in Moody's adjustments due to methodology changes however will continue to be identified. I merge this data with Compustat to access other financial statement data for the firm. A starting point to identify the impact of Moody's adjustments on corporate behavior is as follows:

(1) $NetDebtIss_{t,i} = \alpha + \beta * \Delta Madj_{t-1,i} + \theta Z_{t-1,i} + y_t + \varepsilon_{t,i}$

(2) $NetEquityIss_{t,i} = \alpha + \beta * \Delta Madj_{t-1,i} + \theta Z_{t-1,i} + y_t + \varepsilon_{t,i}$

(3) $AssetGrowth_{t,i} = \alpha + \beta * \Delta Madj_{t-1,i} + \theta Z_{t-1,i} + y_t + \varepsilon_{t,i}$

(4) $PP\&EGrowth_{t,i} = \alpha + \beta * \Delta Madj_{t-1,i} + \theta Z_{t-1,i} + y_t + \varepsilon_{t,i}$

NetDebtIss is debt issuances minus debt reductions divided by assets, *NetEquityIss* is equity issuances minus share repurchases divided by assets, *AssetGrowth* is Assets at time t divided by assets at time t-1, minus 1, and *PP&EGrowth* is PP&E at time t divided by PP&E at time t-1, minus 1. Z represents the set of control variables, including asset growth and changes in profitability, market-to-book, tangibility of assets, and leverage. Control variables are measured as changes in the variables since the dependent variables are either flows (e.g., debt issuance) or changes (e.g., asset growth). y_t represents time fixed effects.

The null hypothesis in all of these tests is that $\beta=0$, implying changes in Moody's adjustments to leverage do not affect corporate behavior. However, if the firm value function has significant discontinuities at different ratings levels, firms will care about their rating status as determined by Moody's adjustments. This implies that a firm that has an increase in Moody's adjustments to leverage will subsequently issue less debt and more equity, and grow more slowly as measured by total assets or PP&E. For example, if Moody's changes the adjustments to leverage positively for a firm (by reducing its adjusted leverage) that is targeting a BBB rating, the firm would determine that it has more slack in its capital structure than it previous thought. That firm might respond by issuing more debt and using the proceeds to expand more rapidly, knowing that it could now do so without jeopardizing its BBB rating. So when the dependent variable is NetDebtIss, for example, this implies $\beta<0$.

The identifying assumption of this test is that changes in Moody's adjustments are made due to changes in methodology reasons or due to subjective changes or political pressure. Any change that Moody's makes that is not directly correlated with a change in default status for the firm provides identification of a causal relationship. However, some portion of changes in adjustments is likely due to reasonable new characterizations of a firm's default status. To better

identify the causal relationship, I therefore examine the incremental impact of changes in Moody's adjustments on those firms that should care most about their ratings level: firms near the investment grade boundary and firms with credit rating triggers in their bond covenants. For the first interaction, I define a dummy variable, IG/SG, equal to 1 if the firm has a rating of BBB, BBB-, BB+, or BB. This dummy variable captures a significant number of firms that are near the investment grade boundary, while excluding significant numbers of firms with ratings both worse than this distinction as well as better than this distinction.[3] For the second interaction, I identify firms with credit rating triggers in their bond covenants using corporate loan and bond information from Thompson Reuters LPC's DealScan database. I match the DealScan data to the sample in which the firm is identified as the issuer and the year falls between the issue date and scheduled maturity date.[4] DealScan's performance pricing file provides detail on potential bond pricing adjustments that may be triggered due to changes in certain financial criteria, including the firm's credit rating. In a typical example, the firm might pay a coupon of 50 basis points over LIBOR for an A- credit rating, but this spread would increase to 60 basis points should the firm be downgraded to a BBB+ credit rating. Using DealScan's performance pricing information, I create an indicator variable to identify firms subject to any debt pricing adjustment tied to changes in credit ratings, denoted RCC. Using these two interaction variables, I conduct the following tests:

$$(5) \quad DepVar_{t,i} = \alpha + \beta_1 * \Delta Madj_{t-1,i} + \beta_2 * IG/SG_{t-1,i} + \beta_3 * IG/SG_{t-1,i} * \Delta Madj_{t-1,i} + \theta Z_{t-1,i} + y_t + \varepsilon_{t,i}$$

$$(6) \quad DepVar_{t,i} = \alpha + \beta_1 * \Delta Madj_{t-1,i} + \beta_2 * RCC_{t-1,i} + \beta_3 * RCC_{t-1,i} * \Delta Madj_{t-1,i} + \theta Z_{t-1,i} + y_t + \varepsilon_{t,i}$$

[3] Results using this measure are unchanged if I define IG/SG as BBB- and BB+ or as BBB and BBB-.
[4] In matching firms in Compustat with issuers in DealScan, I benefited from the Dealscan-Compustat link file compiled by Michael Roberts (Chava, Roberts, and Sudheer (2008)).

$DepVar_{t,i}$ here denotes the same dependent variables from the previous specification. The coefficient of most interest in these tests is β_3, which identifies the incremental importance of changes in Moody's adjustments to firms near the investment grade boundary or with a ratings contingent covenant. If changes to Moody's adjustments merely identify changes in distress generally, the investment grade and ratings trigger distinctions should not be relevant, as firms should react to changes in distress regardless of where they are on the rating spectrum or whether they have ratings triggers. However, if firms near the investment grade boundary and firms with ratings triggers react more to ratings adjustments, this provides evidence that the change in behavior is ratings specific. The tests also control for this variable by itself to absorb any direct differences among this group of firms and the sample as a whole. The coefficient on β_1 captures the reaction to Moody's adjustments in general, so this is the specification for which results are reported. I also report some results for this equation with the dependent variable measured in first differences, for example:

$$(7)\ \Delta NetDebtIss_{t,i}=\alpha+\beta_1*\Delta Madj_{t-1,i}+\beta_2*IG/SG_{t-1,i}+\beta_3*IG/SG_{t-1,i}*\Delta Madj_{t-1,i}+\theta Z_{t-1,i}+y_t+\varepsilon_{t,i}$$

An alternate way to obtain identification of a direct causal impact of ratings is to examine those firms most affected by direct changes in methodology by Moody's. While this approach has the disadvantage of reducing the number of observations, it has the advantage of offering an arguably cleaner test of a causal relationship. In February of 2006, Moody's changed its methodology with respect to three categories, the most significant of which is its treatment of underfunded pensions. This change had the effect of improving the rating status of firms with underfunded pensions by reducing the increases in adjusted leverage due to the amount of

underfunded pensions. Since this occurred without any changes to the firm itself, this represents an exogenous change to a firm's rating status, holding distress constant.

One way to make use of this change would be through an instrumental variable approach. This approach would consist of a first stage regression of changes in Moody's adjusted leverage on a dummy variable indicating if a firm has underfunded pensions, and the second stage would regress the outcome variables on the fitted value from the first stage. This approach however is equivalent to running a regression of the outcome variables on a dummy variable for a firm having underfunded pensions, so the second stage would compare behavior generally for firms with underfunded pensions to those without. But firms with underfunded pensions are different from other firms in several ways, only one of which would be the difference in treatment by Moody's that year. Any results using this strategy would therefore be potentially confounded by other explanations related to firms with underfunded pensions. So I instead implement an empirical design that isolates the direct impact of Moody's adjustments to those firms, conditional on having an underfunded pension. I achieve this by constructing an additional variable, *BigΔAdj*, which is a dummy variable set equal to 1 if a firm has a significant reduction in Moody's adjusted leverage (significant is defined as 2% of assets) in 2006. Not all firms with underfunded pensions receive a significant reduction in adjusted leverage in 2006 since the adjustment also depends on the size of the firm's underfunded pension and its leverage. Additionally, some firms with underfunded pensions could have other changes to their adjusted leverage which offset the favorable change caused by the methodology change. So I examine the impact of having a significant reduction in adjusted leverage, conditional on having an underfunded pension, using the following regression:

(8) $DepVar_i = \alpha + \beta_1 * BigAdj_i * UF_i + \beta_2 UF_i + \theta K_i + \varepsilon_i$

The sample for these tests consists of all firms in 2006, with the dependent variable measured in 2007. This regression isolates the impact of the methodology change while controlling for having an underfunded pension with the dummy variable UF. UF is a dummy variable equal to 1 if a firm has an underfunded pension that is more than 2% of total assets. The coefficient β_1 identifies the impact of a significant reduction in adjusted leverage due to the methodology change. The null hypothesis is that β_1 equals zero, indicating no impact of these changes, whereas if the ratings adjustments are important, firms that receive a reduction in leverage will grow more quickly and issue more debt and less equity.

The set of control variables K includes all the control variables in Z from the previous tests, but adds two additional controls. I control for the change in a firm's amount of underfunded pensions, in case other events cause significant funding behavior that is also correlated with any financing and investment behavior. I also control for the level of leverage for a firm, since leverage will be correlated with the amount of the change in Moody's adjusted leverage due to the underfunded pension methodology change. This regression also deliberately excludes the variable *BigAdj* on its own. The implication of the hypothesis tested here is not that there is an incrementally larger effect for firms with a significant reduction in their adjusted leverage. The implication is that firms with underfunded pensions that received a significant reduction in their adjusted leverage alter their behavior compare to firms in general.

IV. Empirical Results

A. Summary Statistics

Table 1 provides summary statistics for Moody's adjustments to leverage. Since the empirical tests of the paper rely on lagged changes in Moody's variables, the data for the analysis ranges from 2005-2009. The average adjustment to leverage for a firm in the sample is an increase of 8.1%. Although Moody's adjustments could lead to a leverage decrease for a firm, almost all firms receive a positive adjustment, with a range of 0.1% to 19.5% for the 10th through 90th percentile. Panel A also shows the distribution for the change in Moody's adjustments. As one would expect if the changes in Moody's adjustments are due to methodology changes or changes in taste, the average and median for the change are essentially zero. There is a range of changes however, from -3.5% to 3.4% for the 10th through 90th percentile, indicating enough variation to conduct meaningful analysis.

Panel B of Table 1 shows the averages for each rating category, as well as the number of firm years for each rating category. Moody's adjustments to leverage appear to be a bit larger for firms at the high end of the rating spectrum, however the sample for those rating categories are small. From a Moody's rating of A1 down to B3, the variation in adjustments to leverage is narrow, from 6.6% to 10.0%, with no clear correlation with the level of the rating. The same is true for the change in adjustments to leverage, which for ratings A1 down to B3 ranges from -0.4% to 1.1%. The distribution of firm years for the sample is also fairly well distributed across rating categories, with between 100 and 400 firm years in 11 rating categories. As mentioned

however, the top 3-4 rating categories are sparsely represented, which simply reflects the limited number of firms with those ratings in general.

Table 2 shows additional summary statistics, in this case for each year of the sample. Panel A shows that the average adjustment to leverage by Moody's has been fairly constant over time, with a slight downward trend from 9.7% in 2005 to 6.4% in 2009. This trend is perhaps partially explained by the methodology changes of 2006, however the trend continues beyond that year. The business cycle also does not appear to impact changes to Moody's adjustments. Panel B shows the percentage of firms with a significant downward change in adjusted leverage for firms in general, and then for firms with significant underfunded pensions. The methodology changes of 2006 should lead to more firms experiencing reductions in their adjusted leverage, especially for firms with significant underfunded pensions. These statistics confirm this, as 26.6% of firms in 2006 experience a downward adjustment compared with only 14.0% of firms in other years, and 38.2% of firms with underfunded pensions experience a downward adjustment in 2006 compared with 17.8% for firms with underfunded pensions in other years. These statistics confirm the validity of the experiment conducted in the empirical tests which rely on methodology changes in 2006 for exogenous changes in a firm's rating status.

Panel C of Table 2 provides summary statistics for firms in the sample with respect to their balance sheets and financing decisions. Firms generally issue modest amounts of net debt and reduce modest amounts of net equity on average in a year, although that tendency reverses in 2009. Growth rates in assets significantly decrease in 2008 and 2009, and cash balances increase in 2009. These statistics are consistent with the common narrative of corporate reactions to the severe downturn of 2007-2008. Although this downturn represents a significant event within the sample, the cross-sectional nature of the tests alleviates concerns that overall macro forces

contaminate the sample. Further, these summary statistics suggest the tests conducted examining the impact of changes in 2006 on behavior in 2007 occur before corporations generally take significant actions in response to the downturn. All panel data tests include year dummy variables as well.

B. Full Sample Tests

In Table 3, I test whether changes in Moody's adjustments to a firm's leverage affect firm financing decisions, and whether firms near the investment grade/speculative grade boundary incrementally adjust financing decisions more than other firms due to changes that Moody's makes to their leverage. These tests are panel data tests for the years 2005-2009. The dependent variables are net debt or equity issuance divided by total assets. These variables are flows, and are roughly equivalent to a change in debt or equity levels, and represent active decisions by management to either issue new debt or pay down existing debt (or issue equity or repurchase equity). Control variables in these regressions include lagged changes in size, profitability, market-to-book, tangibility, and leverage. Year dummy variables are also included in all regressions, and standard errors are clustered at the firm level.

The negative and significant coefficient on $\Delta Madj$ in the first column indicates that if Moody's increases its adjustment to a firm's leverage, the firm is less likely to issue debt the next year and more likely to pay down debt. This result suggests that firms care about Moody's adjustments to leverage. The negative and significant coefficient on the Moody's adjustment variable interacted with the dummy variable for a firm that is near the investment grade/speculative grade boundary indicates that firm's near the investment grade/speculative

grade boundary care significantly more about Moody's adjustments than other firms. Ratings-based regulations and triggers are concentrated around the investment grade speculative grade boundary, so this result is evidence that the relationship between changes in Moody's adjustments and debt decisions is ratings related, and not due to an omitted distress variable. If changes to Moody's adjustments only reflect changes in distress, then all firms should react to Moody's adjustments equally. Since the results are concentrated among firms who care most about their ratings level, this relationship is more likely due to rating concerns.

The next column shows the relationship for net equity issuance, which includes active decisions by management to issue new equity or repurchase equity. The debt issuance and equity issuance variables combined capture changes to leverage from one year to the next, excluding changes to leverage caused by retained earnings. In the test of equity issuance, the coefficient on the change in Moody's adjustment variable is not significant. However, the coefficient on the change in Moody's adjustments interacted with IG/SG is positive and significant, indicating that firms near the investment grade boundary that receive an increase in adjustments to leverage by Moody's are more likely to issue equity the next year. This result is consistent with the hypothesis that the firm value function has significant discontinuities at ratings levels, as firms react directly to changes in their rating status. For example, an increase in adjustment pushes firms closer to a downgrade and firms react to this by issuing more equity to counteract the adjustment.

The third and fourth columns of Table 3 evaluate a more strenuous test of a relationship between Moody's adjustments and leverage. Here the dependent variable is the change in net debt or equity issuance, which effectively measures a second derivative on the time series of leverage. This design will correct for any potential spurious relationship found in the previous

tests if net debt or equity issuance is persistent for firms over time. Although the change in leverage control variable of the previous tests would account for this concern to some extent, this specification addresses the concern directly. In this specification, some results are no longer statistically significant, but the key results of the negative relationship between changes in Moody's adjustments and debt issuance among firms near the investment grade/speculative grade boundary remains both economically and statistically significant. For every 1% increase in Moody's adjustments to leverage for a firm near investment grade boundary, a firm on average decreases net debt issuance by 0.6% the following year. This economically and statistically significant robust result indicates firms near the investment grade boundary adjust financial decisions based on the adjustments Moody's makes to their leverage.

Table 4 shows similar tests but for real effects. The dependent variables in this case are percentage changes in assets and percentage changes in property, plant and equipment (PP&E). Once again, in all these tests I control for changes in leverage, profitability, tangibility of assets, market-to-book ratio, size and also year effects. The first column shows results for changes in assets. In this test, changes to Moody's adjustments to leverage are associated with lower growth rates the subsequent year for all firms. The relationship is also significantly stronger for firms near the investment grade boundary. For firms in this category, the adjustment is approximately one-for-one, such that an increase in Moody's adjusted leverage of 1% is associated with a 1% lower asset growth rate. The coefficient is also significant at the 1% level.

The second column of Table 4 shows a similar test but with changes in PP&E. In this test, no relationship is found for firms in general between changes in Moody's adjusted leverage and subsequent changes in PP&E. However, for firms near the investment grade boundary, the relationship is again economically and statistically significant. This test indicates that firms

generally do not seem to care about changes to Moody's adjusted leverage when making investment decisions, but for firms near the investment grade boundary, changes that Moody's makes to leverage are material for investment decisions. These results indicate Moody's has the power to affect a firm's investment decisions.

Columns 3 and 4 examine the same relationship, but here the dependent variable is calculated in first differences, so this acts as a further check against the risk of spurious results caused by persistence of the dependent variable (but note for this to be an issue, firms in the sample would need to have persistent growth rates as well as persistent changes to their changes in adjusted leverage. Further, clustering by firm theoretically should fix this, but this test is a more conservative approach to correcting for this concern). With this more strenuous specification, as in the financing decision tests, several of the results are no longer significant. However, the coefficient on changes in Moody's adjustments for firms near the investment grade boundary remains economically and statistically significant for changes in assets. These robust results indicate that firms near the investment grade boundary adjust their growth rates due specifically to Moody's actions.

In Table 5, I conduct similar tests, but now I examine the incremental impact for firms that have bond covenants with ratings triggers.[5] Firms with ratings triggers should care more about Moody's adjustments to their financial ratios, relative to other firms, since changes in ratings have a direct impact on the firm's overall value. Consistent with the main hypothesis of the paper, I find that firms with ratings-based triggers react significantly more in their financing and investment decisions to Moody's behavior than other firms. In particular, in response to increases in Moody's adjustments to a firm's leverage, a firm with ratings-based triggers

[5] To conserve space, I do not tabulate results using the dependent variable first differenced, but the results are similar to the ones shown in Table 5.

significantly reduces debt issuances subsequently. Once again, this evidence indicates that Moody's has the power to directly impact a company's decisions.

C. 2006 Methodology Change Tests

The remaining tests of the paper concentrate on changes in Moody's adjustments made in 2006 only. As mentioned previously, in February of 2006 Moody's made changes to its adjustment methodologies in three categories. Since these changes affect Moody's adjusted leverage but are not correlated with any changes in a firm's default status, focusing on this year allows for more confident statements of causality (but reduces the number of observations for the tests).

I begin by replicating the panel data tests of the previous section but for changes made in 2006 only. These tests regress measures of a firm's financing or investment behavior in 2007 on changes in Moody's adjustments made in 2006. The results of these tests are shown in Tables 6 and 7. The results for this year alone largely match the results of the full sample. Firms near the investment grade boundary significantly alter their financing and investment behavior based on changes in to Moody's adjustments in 2006 (in untabulated tests, I also confirm the results for firms with ratings based covenant triggers hold in 2006 alone as well). The economic significance of the results also remains large. Further, for the PP&E tests, the result remains robust for firms near the investment grade boundary whether the dependent variable is the percentage change in PP&E or the first difference of that percentage change. Since Moody's made several methodology changes in 2006, the changes to adjusted leverage in 2006 were more likely to be due to these changes than changes to a firm's distress status, so these results confirm

that firms are changing their financing and investment behavior specifically due to their change in rating status.

Finally, I conduct tests that examine the firms that are most likely to be affected by the methodology change in 2006: firms with underfunded pensions. The change in methodology for underfunded pensions in 2006 led to firms with underfunded pensions receiving a reduction in the adjustment to GAAP leverage from Moody's, all else equal. One issue with identifying the specific relationship between this change and firm financing and investment behavior is that firms with underfunded pensions generally are different from other firms, so they might make decisions that may be different from firms as a whole, regardless of changes made by Moody's. To control for behavior of firms with underfunded pensions overall, I recognize that even though this particular methodology change leads to a reduction in adjusted leverage, firms with underfunded pensions may also have other changes to adjustments that counteract this adjustment. Furthermore, not all firms are affected in the same way by this adjustment, due to its relationship with leverage and the amount of underfunded pensions. So, conditional on having a significant underfunded pension, I compare behavior for firms that receive positive Moody's adjustments to firms with no significant positive adjustments. By conditioning on having an underfunded pension, this test removes any direct effect of firms with underfunded pensions overall, but still isolates the impact of the methodology change on those firms specifically.[6] In these tests, I add two additional control variables. I control for the level of leverage, since that directly impacts the amount of the change in adjustment, and I want to be sure any result is not due to a leverage effect. I also control for changes in the level of underfunded pensions, to

[6] I run these tests using the full sample of firms in 2006, including firms with significant underfunded pensions and without, and condition by using an indicator variable for a significant underfunded pension. This approach is near equivalent to a test that uses only the subsample of firms with significant underfunded pensions and examines the impact of a large adjustment directly. Results using that approach as expected are nearly identical.

account for any general trends on how much firms are choosing to fund their pensions. The results of these tests are insensitive to the inclusion or exclusion of either or both of these new control variables.

Table 8 shows results from this test. The positive and significant coefficient on the first variable indicates that conditional on having an underfunded pension, a firm that receives a significant negative reduction in Moody's adjusted leverage is more likely to issue debt the following year. The change in methodology implemented by Moody's in 2006 improved the rating status for firms with underfunded pensions, and the firms most affected by that change respond by adding more debt to their capital structure. This test shows a direct causal impact from Moody's ratings behavior to a firm's financing decision. The negative coefficient on the dummy variable for a firm having an underfunded pension indicates that firms with underfunded pensions generally reduced leverage in 2007. The second column shows the same tests for equity issuance, and here the coefficient is insignificant, indicating net equity issuance is not affected by the methodology change.

The third and fourth columns of Table 8 examine whether real outcomes are affected by this change in methodology. The positive and significant coefficient on the first variable indicates that firms that receive a positive change in their rating status due to the change in methodology by Moody's increase asset and PP&E growth more the following year. The financial slack that the change in methodology provides a firm allows them to expand operations more significantly the following year. This result indicates that Moody's has the power to not only affect financing decisions of the firm, but also real outcomes of the firm. The results are also economically significant, as the coefficient implies that firms with underfunded pensions that received significant positive changes in their rating status grow approximately 9% more than

other firms the following year. Thus Moody's decisions have an economically important impact on a firm's financing and investment decisions.

V. Conclusions

Rating agencies have significant influence in financial markets, due not only to the information they may provide regarding the likelihood of default, but also given the integration of ratings into regulations and contracts. In this paper, I find that ratings-based regulations and bond covenant triggers have a significant impact on financial and real decisions of firms. When Moody's changes the adjustments it makes to GAAP leverage for determining its ratings, firms react in both their financing and investment decisions. If the change in adjustment results in an improvement in a firm's rating status, the firm is more likely to issue debt and more likely to grow assets the following year. This behavior is concentrated among the firms that care about ratings most: those near the investment grade boundary and those with ratings-based triggers in their bond covenants. The behavior is also shown for firms that are directly affected by a change in Moody's methodology for making those adjustments in February of 2006, which is exogenous to firm fundamentals. I conclude that rating agencies have the power to impact corporate behavior.

As regulators and legislators evaluate rating agencies, they should be aware of the impact ratings have on corporate behavior, and the perverse outcomes that this influence causes. Although removing ratings from all regulations and contracts seems like a simple solution to this issue, alternative measures of default probability would need to take the place of ratings, and many of these have their own issues. One idea that has been proposed is to use accounting data

in the place of ratings, but this then creates a greater incentive to manipulate those figures. Another idea is to use market data such as bond yields, but this creates an incentive for market participants to manipulate those markets, perhaps in a bear raid on the firm. The defining feature for any of these ideas that creates incentive problems is including major discontinuities in regulations or triggers based on a certain distinction, such as investment grade versus speculative grade. For any solution to mitigate perverse incentives, more continuous adjustments based on default probabilities should be considered.

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Table 1: Summary Statistics

Summary statistics for the full sample from 2005-2009. Panel A shows the mean, median, and distribution for Moody's adjustments to GAAP leverage and changes in Moody's adjustments to leverage. Panel B shows the average Moody's adjustment to leverage and changes in Moody's adjustments to leverage for each rating category, as well the number of firm years in the sample by rating.

Panel A: Moody's Leverage Adjustment Distribution

	Mean	Median	10th	25th	75th	90th
Moody's Adjustment	8.1%	5.6%	0.1%	2.2%	11.0%	19.5%
ΔMoody's Adjustment	-0.2%	0.0%	-3.5%	-1.1%	1.2%	3.4%

Panel B: Average Moody's Leverage Adjustment by Rating

	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1
Moody's Adjustment	13.3%	14.8%	13.0%	9.3%	7.2%	8.5%	8.2%	7.7%
ΔMoody's Adjustment	0.8%	-2.0%	-0.9%	0.1%	-0.2%	-0.4%	-0.2%	-0.4%
N	21	2	9	25	72	198	171	219
	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3
Moody's Adjustment	9.1%	9.1%	9.8%	10.0%	9.2%	6.6%	7.2%	8.2%
ΔMoody's Adjustment	-0.1%	0.3%	-0.2%	-0.1%	0.3%	0.2%	1.1%	0.2%
N	298	294	237	280	359	345	228	103

Table 2: Summary Statistics

Summary statistics by year. Panel A shows average GAAP leverage compared with Moody's final adjusted leverage. Panel B shows the % of the sample with large negative changes in Moody's adjusted leverage by year, as well as the % of large negative adjustments to leverage conditional on being a firm with a significantly underfunded pension. ΔMAdj is the change in Moody's adjustments to leverage. Panel C shows financial variables by year.

	2005	2006	2007	2008	2009
Panel A: Moody's Adjustments					
GAAP Leverage	40.9%	42.5%	44.1%	47.6%	46.8%
Moody's Adjusted Leverage	50.6%	51.2%	52.0%	55.7%	53.2%
Average Madj.	9.7%	8.7%	7.9%	8.1%	6.4%
Panel B: % of Firms with:					
ΔMAdj < -2%	15.3%	26.6%	18.4%	8.4%	13.9%
ΔMAdj < -2%| Underfunded Pension	21.5%	38.2%	24.2%	7.0%	18.7%
Panel C: Financial Variables					
Cash/Assets	10.0%	6.5%	8.4%	6.7%	10.2%
Net Debt Issuance/Total Capital	1.3%	1.4%	3.7%	2.4%	-1.5%
Net Equity Issuance/Total Capital	-0.9%	-1.3%	-2.7%	-1.1%	-0.4%
%ΔAssets	9.0%	7.7%	9.1%	2.1%	1.3%

Table 3: Capital Structure Behavior Following Changes in Moody's Leverage Adjustments

Coefficients and standard errors from pooled time series regressions. ΔMoodys Adjustment$_{t-1}$ refers to changes in the difference between Moody's adjusted book leverage and GAAP reported book leverage. Near Investment Grade/Speculative (IG/SG) is a dummy variable for firms that are rated BBB, BBB-, BB+ or BB. GAAP book leverage is book debt over book debt plus book equity. Profitability is EBITDA divided by total assets. Tangibility is PP&E dividend by total assets. Market to book is the market capitalization of equity divided by book value of equity. Asset growth is the percentage change in assets. Column headings indicate the dependent variables, each measured as of time t. Debt Issuance is debt issuances minus debt reductions divided by assets, and Equity Issuance is equity issuances minus share repurchases divided by assets. The sample includes years 2005-2009. Standard errors are calculated clustering errors by firm.

	Debt Issuance	Equity Issuance	ΔDebt Issuance	ΔEquity Issuance
ΔMoodys Adjustment$_{t-1}$	-0.0989	-0.0145	-0.0747	0.0015
	(0.0292)	(0.0189)	(0.0489)	(0.0272)
Near Investment Grade/Speculative$_{t-1}$	0.0001	-0.0125	0.0126	0.0041
	(0.0038)	(0.0025)	(0.0065)	(0.0036)
ΔMoodys Adjustment$_{t-1}$*Near IG/SG$_{t-1}$	-0.6638	0.1494	-0.5904	0.0833
	(0.0690)	(0.0448)	(0.1173)	(0.0640)
ΔGAAP book leverage$_{t-1}$	-0.1521	0.0008	-1.1500	0.2563
	(0.0209)	(0.0132)	(0.0341)	(0.0189)
ΔProfitability$_{t-1}$	0.0365	-0.1531	0.5007	-0.0149
	(0.0389)	(0.0253)	(0.0671)	(0.0365)
ΔTangibility$_{t-1}$	0.1833	-0.0048	0.5344	0.0384
	(0.0383)	(0.0247)	(0.0638)	(0.0358)
ΔM/B$_{t-1}$	-0.0016	0.0023	0.0492	-0.0022
	(0.0045)	(0.0029)	(0.0076)	(0.0042)
Asset growth$_{t-1}$	0.0079	0.0142	-0.3130	-0.0602
	(0.0052)	(0.0034)	(0.0072)	(0.0049)
R^2	0.09	0.05	0.64	0.10
N	2978	2978	2898	2902
Year Fixed Effects?			*Yes*	

Table 4: Investment Behavior Following Changes in Moody's Leverage Adjustments

Coefficients and standard errors from pooled time series regressions. ΔMoodys Adjustment$_{t-1}$ refers to changes in the difference between Moody's adjusted book leverage and GAAP reported book leverage. Near Investment Grade/Speculative (IG/SG) is a dummy variable for firms that are rated BBB, BBB-, BB+ or BB. GAAP book leverage is book debt over book debt plus book equity. Profitability is EBITDA divided by total assets. Tangibility is PP&E dividend by total assets. Market to book is the market capitalization of equity divided by book value of equity. Asset growth is the percentage change in assets. Column headings indicate the dependent variables, each measured as of time t. Asset growth is assets at time t divided by assets at time t-1, minus 1, and PP&E growth is PP&E at time t divided by PP&E at time t-1, minus 1. The sample includes years 2005-2009. Standard errors are calculated clustering errors by firm.

	Asset Growth	PPE Growth	ΔAsset Growth	ΔPPE Growth
ΔMoodys Adjustment$_{t-1}$	-0.1295	-0.0332	0.1747	0.5145
	(0.0532)	(0.0905)	(0.0953)	(0.2086)
Near Investment Grade/Speculative$_{t-1}$	-0.0073	-0.0123	0.0178	-0.0264
	(0.0070)	(0.0119)	(0.0125)	(0.0273)
ΔMoodys Adjustment$_{t-1}$*Near IG/SG$_{t-1}$	-0.9297	-0.5415	-0.9248	-0.3995
	(0.1259)	(0.2140)	(0.2254)	(0.4937)
ΔGAAP book leverage$_{t-1}$	-0.1493	-0.0336	-0.4177	-0.2422
	(0.0370)	(0.0629)	(0.0662)	(0.1450)
ΔProfitability$_{t-1}$	0.3571	0.8114	1.2943	1.4175
	(0.0711)	(0.1209)	(0.1273)	(0.2787)
ΔTangibility$_{t-1}$	0.1591	-0.0703	0.9665	-4.2590
	(0.0694)	0.1180	(0.1243)	(0.2722)
ΔM/B$_{t-1}$	0.0144	-0.0006	0.1486	0.1335
	(0.0082)	(0.0140)	(0.0147)	(0.0322)
Asset growth$_{t-1}$	0.0543	0.0669	-0.9456	-1.0011
	(0.0091)	(0.0167)	(0.0091)	(0.0339)
R^2	0.08	0.03	0.45	0.30
N	2978	2975	2978	2975
Year Fixed Effects?			*Yes*	

Table 5: Corporate Behavior Following Changes in Moody's Leverage Adjustments for Firms with Ratings-Contingent Bond Covenants

Coefficients and standard errors from pooled time series regressions. ΔMoodys Adjustment$_{t-1}$ refers to changes in the difference between Moody's adjusted book leverage and GAAP reported book leverage. RatingsContingentCovenant (RCC) indicates a firm has a bond covenant with a ratings specific trigger. GAAP book leverage is book debt over book debt plus book equity. Profitability is EBITDA divided by total assets. Tangibility is PP&E dividend by total assets. Market to book is the market capitalization of equity divided by book value of equity. Asset growth is the percentage change in assets. Column headings indicate the dependent variables, each measured as of time t. Asset growth is assets at time t divided by assets at time t-1, minus 1, and PP&E growth is PP&E at time t divided by PP&E at time t-1, minus 1. Debt Issuance is debt issuances minus debt reductions divided by assets, and Equity Issuance is equity issuances minus share repurchases divided by assets. The sample includes years 2005-2009. Standard errors are calculated clustering errors by firm.

	Debt Issuance	Equity Issuance	Asset Growth	PPE Growth
ΔMoodys Adjustment$_{t-1}$	-0.0992	-0.0032	-0.1072	0.0266
	(0.0320)	(0.0209)	(0.0558)	(0.1014)
RatingsContingentCovenant$_{t-1}$	0.0115	0.0028	0.0323	-0.0114
	(0.0080)	(0.0053)	(0.0140)	(0.0255)
ΔMoodys Adjustment$_{t-1}$*RCC$_{t-1}$	-0.7248	-0.0104	-0.6039	-0.4468
	(0.1791)	(0.1174)	(0.3127)	(0.5684)
ΔGAAP book leverage$_{t-1}$	-0.1481	-0.0117	-0.1951	0.0251
	(0.0211)	(0.0139)	(0.0369)	(0.0671)
ΔProfitability$_{t-1}$	0.0520	-0.0948	0.4570	1.0507
	(0.0428)	(0.0281)	(0.0747)	(0.1358)
ΔTangibility$_{t-1}$	0.1768	0.0421	0.2505	0.0137
	(0.0428)	(0.0266)	(0.0709)	(0.1289)
ΔM/B$_{t-1}$	0.0016	0.0031	0.0231	0.0136
	(0.0048)	(0.0032)	(0.0084)	(0.0153)
Asset growth$_{t-1}$	0.0082	0.0145	0.0546	0.0682
	(0.0053)	(0.0035)	(0.0092)	(0.0168)
R^2	0.05	0.03	0.07	0.03
N	2978	2978	2978	2975
Year Fixed Effects?			*Yes*	

Table 6: Capital Structure Behavior Following Changes in Moody's Leverage Adjustments (2006)

Coefficients and standard errors from cross-section regressions of 2007 dependent variables on explanatory variables in 2006. ΔMoodys Adjustment$_{t-1}$ refers to changes in the difference between Moody's adjusted book leverage and GAAP reported book leverage. Near Investment Grade/Speculative (IG/SG) is a dummy variable for firms that are rated BBB, BBB-, BB+ or BB. GAAP book leverage is book debt over book debt plus book equity. Profitability is EBITDA divided by total assets. Tangibility is PP&E dividend by total assets. Market to book is the market capitalization of equity divided by book value of equity. Asset growth is the percentage change in assets. The dependent variables are measured in 2007 and the explanatory variables are measured in 2006. Debt Issuance is debt issuances minus debt reductions divided by assets, and Equity Issuance is equity issuances minus share repurchases divided by assets.

	Debt Issuance	Equity Issuance	ΔDebt Issuance	ΔEquity Issuance
ΔMoodys Adjustment$_{t-1}$	-0.1553	0.0478	-0.1234	-0.0220
	(0.0726)	(0.0454)	(0.1239)	(0.0692)
Near Investment Grade/Speculative$_{t-1}$	-0.0128	-0.0089	0.0088	0.0055
	(0.0099)	(0.0062)	(0.0169)	(0.0095)
ΔMoodys Adjustment$_{t-1}$*Near IG/SG$_{t-1}$	-1.1724	0.2865	-1.0852	0.1407
	(0.2320)	(0.1396)	(0.3121)	(0.2091)
ΔGAAP book leverage$_{t-1}$	-0.1680	-0.0046	-1.3950	0.4629
	(0.0494)	(0.0309)	(0.0843)	(0.0470)
ΔProfitability$_{t-1}$	-0.3724	-0.1451	0.0958	-0.0107
	(0.1300)	(0.0811)	(0.2212)	(0.1235)
ΔTangibility$_{t-1}$	0.4314	0.1156	0.339	-0.0435
	(0.1041)	(0.0651)	(0.1775)	(0.0991)
ΔM/B$_{t-1}$	0.0216	-0.024	0.0499	0.0130
	(0.0135)	(0.0084)	(0.0230)	(0.0129)
Asset growth$_{t-1}$	-0.0001	0.0192	-0.3828	-0.0713
	(0.0085)	(0.0075)	(0.0172)	(0.0115)
R^2	0.09	0.04	0.51	0.16
N	657	657	657	657

Table 7: Investment Behavior Following Changes in Moody's Leverage Adjustments (2006)

Coefficients and standard errors from cross-section regressions of 2007 dependent variables on explanatory variables in 2006. ΔMoodys Adjustment$_{t-1}$ refers to changes in the difference between Moody's adjusted book leverage and GAAP reported book leverage. Near Investment Grade/Speculative (IG/SG) is a dummy variable for firms that are rated BBB, BBB-, BB+ or BB. GAAP book leverage is book debt over book debt plus book equity. Profitability is EBITDA divided by total assets. Tangibility is PP&E dividend by total assets. Market to book is the market capitalization of equity divided by book value of equity. Asset growth is the percentage change in assets. The dependent variables are measured in 2007 and the explanatory variables are measured in 2006. Asset growth is assets at time t divided by assets at time t-1, minus 1, and PP&E growth is PP&E at time t divided by PP&E at time t-1, minus 1.

	Asset Growth	PPE Growth	ΔAsset Growth	ΔPPE Growth
ΔMoodys Adjustment$_{t-1}$	-0.1017	0.1129	0.0406	0.3126
	(0.1110)	(0.1236)	(0.1998)	(0.2403)
Near Investment Grade/Speculative$_{t-1}$	-0.0162	-0.0131	0.0385	0.0371
	(0.0152)	(0.0169)	(0.0273)	(0.0329)
ΔMoodys Adjustment$_{t-1}$*Near IG/SG$_{t-1}$	-1.5606	-1.0883	-1.5350	-1.3373
	(0.3410)	(0.3799)	(0.3304)	(0.5748)
ΔGAAP book leverage$_{t-1}$	-0.2811	-0.2988	-0.8074	-1.0593
	(0.0755)	(0.0841)	(0.1359)	(0.1634)
ΔProfitability$_{t-1}$	0.0915	0.0547	1.1557	0.0017
	(0.1981)	(0.2207)	(0.3567)	(0.4290)
ΔTangibility$_{t-1}$	0.3707	0.4856	0.2677	-4.3893
	(0.1590)	(0.1771)	(0.2863)	(0.3443)
ΔM/B$_{t-1}$	0.0088	-0.0314	0.1965	0.0893
	(0.0206)	(0.0230)	(0.0371)	(0.0447)
Asset growth$_{t-1}$	0.0610	0.0731	-0.9420	-0.8518
	(0.0183)	(0.0199)	(0.0182)	(0.0317)
R^2	0.07	0.06	0.86	0.67
N	657	657	657	657

Table 8: Firm Behavior Following Changes in Moody's Leverage Adjustments for Firms with Underfunded Pensions (2006)

Coefficients and standard errors from cross-section regressions of 2007 dependent variables on explanatory variables in 2006. $Big\Delta Adj_{t-1}$ refers to a decrease in Moody's adjustment to leverage of at least 2% in 2006. UF_{t-1} is dummy variable equal to 1 if a firm has an underfunded pension greater than 2% of assets as of 2006. Underfunded pension is the amount of underfunded pension divided by assets. GAAP book leverage is book debt over book debt plus book equity. Profitability is EBITDA divided by total assets. Tangibility is PP&E dividend by total assets. Market to book is the market capitalization of equity divided by book value of equity. Asset growth is the percentage change in assets. The sample is for adjustments made in 2006 only, when Moody's made several changes in adjustment methodology, with dependent variables in 2007. Debt Issuance is debt issuances minus debt reductions divided by assets, and Equity Issuance is equity issuances minus share repurchases divided by assets. Asset growth is assets at time t divided by assets at time t-1, minus 1, and PP&E growth is PP&E at time t divided by PP&E at time t-1, minus 1.

	Debt Issuance	Equity Issuance	Asset Growth	PPE Growth
$Big\Delta Adj_{t-1} * UF_{t-1}$	0.0585	-0.007	0.0911	0.1007
	(0.0245)	(0.0146)	(0.0370)	(0.0407)
UF_{t-1}	-0.0511	0.0010	-0.0692	-0.0766
	(0.0127)	(0.0076)	(0.0192)	(0.0211)
ΔUnderfunded Pension$_{t-1}$	0.1799	0.3470	0.5234	0.3201
	(0.2960)	(0.1768)	(0.4474)	(0.4920)
ΔGAAP book leverage$_{t-1}$	-0.1064	-0.0690	-0.2036	-0.3236
	(0.0498)	(0.0298)	(0.0753)	(0.0828)
GAAP book leverage$_{t-1}$	-0.0999	0.1324	-0.1273	-0.0415
	(0.0283)	(0.0169)	(0.0428)	(0.0471)
ΔProfitability$_{t-1}$	-0.2059	-0.0556	0.4024	0.2944
	(0.1330)	(0.0794)	(0.2001)	(0.2210)
ΔTangibility$_{t-1}$	0.3411	0.0944	0.2398	0.3360
	(0.1058)	(0.0632)	(0.1599)	(0.1759)
$\Delta M/B_{t-1}$	0.0311	-0.0319	0.0282	-0.0142
	(0.0133)	(0.0080)	(0.0201)	(0.0221)
Asset growth$_{t-1}$	0.0088	0.0156	0.0686	0.0711
	(0.0122)	(0.0071)	(0.0181)	(0.0197)
R^2	0.08	0.04	0.07	0.06
N	675	675	675	675