Information Asymmetry and Firms' Credit Market Access: Evidence from Moody's Credit Rating Format Refinement*

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Abstract

I exploit Moody's 1982 credit rating refinement to examine the impact of more refined rating information on firms' credit market access, financing decisions, and investment policies. First, I decompose the information content of the rating refinement into predictable and unpredictable components. While firms' ex ante cost of borrowing can partially predict the direction of refinement changes, firms with rating refinement upgrades as a result of additional rating gradations still experience a significant decrease in their ex post cost of borrowing compared to firms with rating refinement downgrades. The former subsequently also issue more debt and rely more on debt financing over equity than the latter. These effects remain both economically and statistically significant even when controlling for the heterogeneity in firms' ex ante cost of borrowing. Lastly, rating refinement is associated with more capital investments, less cash accumulation, and faster asset growth for the upgraded firms than the downgraded firms. These findings suggest that third-party rating agencies help to reduce credit market information asymmetry through disclosure of new information and thereby significantly affect firms' credit market access as well as their real outcomes.

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I. Introduction

Information asymmetry lies at the heart of explanations for why economic outcomes such as investment decisions may be inefficient (Stiglitz and Weiss (1981), Myers and Majluf (1984), and Diamond (1991a)). A large industry of financial intermediaries such as banks, credit rating agencies, and advisory financial service providers, exists on the pretext of partially resolving the adverse effect of information asymmetry (Leland and Pyle (1977), Diamond (1984, 1991b), Fama (1985), and Carey, Post, and Sharpe (1998)). However, the effectiveness of such financial intermediaries in mitigating information asymmetry remains an under-explored issue empirically. In this paper, I examine Moody's credit rating format refinement in 1982 to study the effects of information asymmetry on firms' credit market access, financing decisions, and investment policies.

Moody's decision to offer more refined information on firms' credit quality provides an unexpected and plausibly exogenous release of information that helps to identify the causal effect of information asymmetry on firms' real outcomes. Existing empirical studies on the impact of information asymmetry have been limited largely due to the difficulty of finding appropriate proxies for the change in the levels of information asymmetry. Most corporate finance studies have focused on using relevant firm characteristics such as size, tangibility, and institutional ownership, as well as the dispersion in firms' analyst forecasts, to measure the degree of information asymmetry, which are undoubtedly correlated with firms' unobservable investment opportunities and thereby making it difficult to establish the causal effect of information asymmetry on firms' real outcomes.[1] To bridge this gap, this paper focuses on Moody's 1982 rating format refinement. The refinement offers a promising empirical setting to

[1] For a comprehensive list of proxies used to assess the degree of information asymmetry, see Bharath et al. (2006).

study the effects of information asymmetry given that it represents an exogenous shock to the availability of more refined information about firms' credit quality.

Prior to April 1982, Moody's Investors Service (Moody's) used nine broad rating classes to assign firms' credit worthiness. Starting on April 26, 1982, however, Moody's began reporting ratings using a more refined rating gradation by attaching numerical modifiers to its broad rating classes. Within the same rating class, Moody's assigned rating modifiers of "1," "2," and "3" to represent sub-ratings of best, average, and worst credit quality. The rating refinement effectively increased the number of possible corporate credit rating categories from nine to 19 (Moody's Investors Service (1982a)). Moody's statement accompanying the rating refinement indicates that the refined rating assignments were based on the same information that Moody's used for its previously coarse rating assignments. Therefore, the new rating assignments after the refinement are not accompanied by any fundamental change in issuing firms' risk profiles, but are merely results of a new reporting system based on a strictly finer gradation than before. Moreover, this rating refinement seems unlikely to have been anticipated. It was not preceded by any announcement and was carried out simultaneously for all bonds that were followed by Moody's on the same day. These special features of Moody's 1982 rating refinement assure the exogenous nature of the rating refinement changes, thus allowing me to identify the causal effect of the availability of additional information (via a credit rating format refinement) on firms' subsequent financing and investment policies.

I first document the information content of Moody's rating refinement by examining the predictability of the refinement changes and their impact on firms' subsequent cost of borrowing. Firms' ex ante bond yields can partially predict the direction of the rating refinement changes based on firms' yield spreads and residual bond yields. However, despite their predictable

component, the refinement changes lead to significant changes in firms' borrowing costs. Following the rating refinement, firms that receive higher refined ratings than their previously coarse ratings experience a 20 basis point drop in their corporate bond yields, compared to firms that receive lower refined ratings. The significant difference in the change of firms' borrowing costs is robust to various measures of yield spreads. This finding suggests that the refinement helps to reduce credit market information asymmetry by revealing new information about firms' credit quality; it therefore allows creditors to better identify firm types – firms with good credit quality (higher refined ratings) gain access to a cheaper source of capital whereas firms with poor credit quality (lower refined ratings) are limited to a more costly source of capital.

Changes in firms' access to credit markets are reflected in their capital structure decisions following the rating refinement. A higher refined rating allows firms to issue significantly more long-term debt, approximately two percent of their lagged assets, than a lower refined rating in the one-year period subsequent to the rating refinement. This gap increases to five percent of the lagged assets when the long-term debt net of cash is considered. The better credit market access facilitated by the higher refined rating also leads these firms to issue less equity and rely more on debt financing. The increase in their reliance on the long-term debt financing by the firms with higher refined ratings is consistent with the predictions based on Diamond's (1991) debt maturity model, in which firms who were previously under-rated switch to long-term debt financing after their true credit quality is realized.

Different credit market access resulting from Moody's 1982 rating refinement is also significantly related to firms' investment decisions. Firms with higher refined ratings than their previously coarse ratings subsequently make more capital investments, accumulate less cash, and have faster asset growth. The increase in these firms' investment activities are partially financed

by their debt issuance and partially by their cash balance, which leads to a decrease in their cash accumulation. Firms with lower refined ratings, on the other hand, make fewer investments and accumulate more cash. This is consistent with the intuition offered by Almeida, Campello, and Weisbach (2004), who find that firms with limited capital market access have a greater propensity to save cash out of cash flows in anticipation of future investments. These findings illustrate that credit market imperfections such as information asymmetry significantly limit firms' credit market access and affect their financing and investment decisions. An improvement in transparency via third-party credit rating refinements allows greater credit market access and more capital investments for firms that were under-rated in the previous coarse rating format.

The empirical findings documented in this paper should be interpreted as effects of an unanticipated one-time reclassification of firms' credit ratings instead of normal rating changes that reoccur over time. Moody's rating refinement captures the real impact of reducing credit market information asymmetry by revealing firms' true credit quality as well as permanently removing a certain level of information asymmetry through an introduction of a more precise rating scale for future rating assignments. Consequently, the observed effects on firms' real outcomes not only reflect firms' updated credit information but also capture their accelerated financing and investment decisions due to an improvement in credit market transparency.

This paper makes several contributions to existing finance research. First, it adds to a growing list of empirical literature on information asymmetry and firms' capital constraints that focus on the importance of financial intermediaries (Hoshi, Kashyap, and Scharfstein (1990), Petersen and Rajan (1994), and Berger and Udell (1995)). It also contributes to a limited number of papers that study firms' capital structure reactions to changes in credit resource supply (Faulkender and Petersen (2005) and Sufi (2006)). Unlike previous studies that recognize and

attempt to mitigate the potentially endogenous effect of credit ratings on firms' access to credit using instrumental variables, this paper has the advantage of using an exogenous change in firms' credit ratings to identify its causal effect on firms' financing and investment decisions. Moreover, this paper focuses on the change in firms' credit market access through a price channel that is driven by firms' cost of borrowing. Although the empirical setting of Moody's 1982 credit rating refinement has been previously used to document the announcement effects in firms' stock and bond returns in Kliger and Sarig (2000), this paper is the first to document the predictability of the direction of rating refinement changes and their effects on firms' cost of borrowing using various robust measures of yield spreads. This paper is also the first to use the refinement to identify the real impact of information asymmetry that captures both the information effect as well as the timing acceleration effect in firms' real outcomes when information asymmetry is permanently reduced. Lastly, this paper supplements the studies of capital structure and credit rating literature (Graham and Harvey (2001) and Kisgen (2006)) by providing basic evidence as to why firms should care about their credit ratings – better ratings allow them to have better capital market access, both in terms of the cost of borrowing and the amount of debt issued, which in turn has significant impact on firms' real outcomes.

The rest of this paper is organized as follows. Section II discusses the institutional details of Moody's 1982 rating refinement and the relevant theoretical framework, followed by a description of the data in Section III. Section IV presents empirical analyses of the effects of rating refinement changes on firms' credit market access and real outcomes. Section V reports results from a variety of robustness checks and counterfactual analyses that support the interpretation of a causal effect of rating refinement on firm's real outcomes, followed by a brief overview of related literature in Section VI. Section VII concludes the paper.

II. Information Asymmetry and Credit Market Access

A. Credit Ratings and Rating Refinement

Credit ratings are important assessments of firms' underlying credit risk that are certified by rating agencies such as Moody's and Standard and Poor's (S&P). Without such certification or some means of reliably transmitting relevant credit information, firms who want to borrow from public debt and loan markets may not be able to do so. For example, in the presence of information asymmetry, investors would not only face adverse selection problems, but would also incur high costs from credit analysis and monitoring. Thus, without any certification of a firm's risk profile, investors would be reluctant to lend money to the firm (Sufi (2006)). Credit ratings may also contain information on firms' credit quality beyond other publicly available information. For instance, firms may be reluctant to release information to the market that would compromise their strategic programs, in particular with regard to competitors. Credit ratings in comparison allow them to incorporate inside information without disclosing specific details to the public at large.[2] Indeed, during the rating process, corporations often provide rating agencies with detailed inside information such as five-year forecasts, pro-forma statements, and other internal reports. Moreover, credit rating agencies are specialized financial intermediaries in the information gathering and evaluation process and thereby could provide more reliable measures of a firm's credit worthiness. In addition to providing credit information to investors, credit ratings are also a part of government regulations on financial institutions and other intermediaries. Since 1936 and 1989, banks, and Savings and Loans, respectively, have been prohibited from investing in junk bonds. More recently, Congress has established the "AA" or "Aa" rating as the cutoff in determining the eligibility of mortgage-related securities and foreign

[2] Publicly revealing inside information might benefit competitors or subject insiders to lawsuits should the projections not materialize, whereas rating agencies can incorporate privately disclosed information into the ratings that they assign without fully revealing it.

bonds as collateral for margin lending; and the National Association of Insurance Commissioners has adopted capital rules that give the most favorable capital charge to bonds rated "A" or above (Cantor and Packer (1995)).

Prior to 1982, Moody's assessed and reported firms' creditworthiness using nine broad rating classes ranging from an "Aaa" rating that forecasts virtually no default risk for the foreseeable future to a "C" rating that indicates a state of default. On April 26, 1982, Moody's switched to a more refined rating reporting system by introducing numerical modifiers to their formerly coarse rating classes.[3] More specifically, within each of the selected broad rating classes, Moody's assigned rating modifiers of "1," "2," and "3" to represent sub-ratings of best, average, and worst credit quality. A detailed comparison of Moody's pre- and post-refinement rating categories can be found in Table I.

[TABLE I]

The special mechanics of the refinement process is the key feature that allows this paper to identify the causal effect of a reduction in credit market information asymmetry on firms' subsequent financing and investment decisions. First, and most importantly, Moody's 1982 credit rating refinement was not correlated with changes in firms' underlying risk profiles, but was implemented for the sole purpose of improving information disclosure. In the announcement accompanying the rating refinement, Moody's emphasizes that "*the numerical modifiers are only refinements of the defined categories. The relative positions of all of Moody's corporate bond rating symbols, and their definitions, remain unchanged as do all procedures for bond rating*" and it believes that "*more precise rating gradations provide investors with a better assessment of corporate credit quality*" (Moody's Investors Service (1982a, 1982b)). Second, Moody's 1982

[3] In the special editions of *Bond Record* and *Bond Survey* published on April 26, 1982, Moody's refined its ratings by adding modifiers to rating classes Aa, A, Baa, Ba, and B.

rating refinement seems unlikely to have been anticipated because it was not preceded by any public announcement and was carried out simultaneously for all bonds that were followed by Moody's on the same day.[4] The exogenous nature of Moody's 1982 rating refinement assures that the identification assumption for the causal effect is met.

B. Theoretical Consideration

As described in the institutional details above, no firm level event triggered Moody's 1982 rating refinement. The rating agency had the same information before and after the refinement. However, the rating refinement could convey new information to the investors and cause them to reassess borrowing firms' default risk if the finer ratings contained information that could not be obtained otherwise. Prior to the rating refinement, firms are considered to be of similar credit quality within a given rating class and are expected to receive a modifier of "2" after the rating refinement.[5] Thus, if a firm stays in the same rating class as before (i.e. a within rating class refinement), a modifier assignment of "1" and "3" would represent, respectively, an upgrade and a downgrade from the firm's original credit rating. Additional rating gradations may also realign Moody's previous rating scale, which could lead to cross rating class refinements. For example, in addition to its potential within rating class refinements of "A1," "A2," and "A3," a formerly "A" rated firm could also have a cross rating class refinement of either "Aa3" (an upgrade) or "Baa1" (a downgrade).[6] More precise ratings of borrowers' credit quality would in turn lower the level of information asymmetry by allowing investors to better identify and assess borrowers' risk profiles.

[4] The refinement announcement was only reported a day after Moody's implemented the newly refined rating format, in the *Wall Street Journal*'s April 27, 1982 issue.

[5] The implicit assumption here is that investors learn about firms' credit risk exclusively from Moody's credit ratings.

[6] If the formerly "A" rated firm is near the boundary between rating class "A" and "Aa," a combination of additional rating gradations and a rating scale realignment could result in a new refined rating of either "A1" or "Aa3" for the firm. Similarly, if the same firm is near the boundary between rating class "A" and "Baa," it could have a refined rating of either "A3" or "Baa1" following the refinement.

Consider the following simple theoretical framework inspired by Diamond's (1991) debt maturity model. Assume there are two types of borrowers, the good type and the bad type (as defined by their expected investment returns), in the same coarse rating category prior to the rating refinement. In the presence of information asymmetry, investors cannot successfully distinguish them. If borrowers decide to finance their investment projects through debt, they would face a pooled cost of borrowing that reflects investors' expectations across all possible firm types. After the rating refinement, borrowers would only have to pay borrowing costs according to their true types, as investors would then be able to better identify firms' credit quality; however, the borrowers would also incur costs from delaying their investment projects. As a result, firms' borrowing decisions are determined by the tradeoff between their future borrowing costs and delaying costs (Tang (2006)). Prior to the rating refinement, firms with good credit quality may or may not issue more debt than firms with inferior credit quality. When delaying costs are high, all firms would finance the investment projects immediately. When delaying costs are low, firms who feel under-rated would not issue debt but would rather wait for a rating upgrade. After the rating refinement, however, the upgraded firms would be able to enjoy the cheaper cost of borrowing and therefore would be able to issue more debt and rely more on debt financing than their counterparts. By revealing firms' true credit quality and reducing credit market information asymmetry through a more refined rating scale, the rating refinement helps to accelerate firms' financing and investment decisions that were previously postponed. When short-term debt financing is available (as in the original debt maturity model), firms who feel under-rated may issue short-term debt in anticipation of lower future borrowing costs. Once their true ratings are realized through rating upgrades, these firms would finance their investment projects through long-term debt instead. In summary, a reduction in information

asymmetry affects firms' credit market access through a price channel that reflects the change in the firms' credit resource supply. More precise ratings allow investors to better assess borrowers' credit risk and accelerate borrowers' financing and investment decisions in that firms with good credit quality (higher refined ratings) gain access to a cheaper source of capital whereas firms with poor credit quality (lower refined ratings) are limited to a more costly source of capital.

III. Data

This study employs Moody's senior rating database that contains historical credit ratings of firms in Moody's coverage universe. The credit ratings provided by this database are Moody's notional firm-level ratings – issuers' estimated senior credit ratings. The advantage of working with issuer-level data is that it allows me to compare credit ratings across issuers while controlling for differences attributable to seniority and security. One drawback of the database, however, is that a small portion of the firms have undergone name changes since 1982 due to mergers, acquisitions, and restructuring. Therefore, to ensure an accurate list of the firms at the time of Moody's rating refinement, I also use the April 26, 1982 issue of *Moody's Bond Record*, which lists the bond universe that was affected by the refinement. In addition, corporate and treasury bond yield data are obtained from the Lehman Brothers Fixed Income Database (LBFID), which consists of monthly pricing information on the bonds that comprise the Lehman Brothers Bond Indices.[7] Lastly, relevant firm characteristics and information on existing S&P ratings are obtained from COMPUSTAT quarterly database and S&P's March 1982 issue of *Bond Guide*, respectively.

The initial data sample includes rating refinements for 1,193 firms. From this total, 363, 391, and 439 are observations of firms that are assigned modifiers "1," "2," and "3,"

[7] For a detailed description of the LBFID, see Warga (1997).

respectively.[8] To learn about their cost of borrowing, I study the yield-to-maturity on these firms' existing public bonds reported by LBFID. Based on Moody's historical name file, along with Moody's April 26, 1982 issue of *Bond Record*, I use a name-matching algorithm and manual name-checking procedure to match borrowers in Moody's database to their bond yield information recorded by LBFID. Firms are included in the analysis if they had at least one bond issue that was covered by LBFID in the month of March and April of 1982. Firms with only callable bonds, except for those with a price below 90 percent of par, in which case they are considered as virtually non-callable, are excluded from the analysis.[9] In addition, firms can have more than one bond outstanding in any given month. To avoid including multiple observations with similar information, for each issuing firm, one bond is drawn randomly to be included in the analysis.[10] The final sample for the analysis on the cost of borrowing includes 704 firms with corresponding yield-to-maturity information.

To obtain relevant firm characteristics, I employ a similar name-matching algorithm and manual name-checking procedure mentioned earlier to match borrowers in Moody's database to their firm attributes provided by the COMPUSTAT quarterly database. Given that Moody's refinement took place on April 26, 1982, the use of annual COMPUSTAT data could lead to measurement error due to a timing mismatch. As a result, all analyses of the firms' financing and investment outcomes presented in the paper are based on the firms' yearly results constructed from quarterly COMPUSTAT data. Moreover, I require each observation to have data items 5, 8,

[8] As per discussion in the empirical methodology, a modifier of "1" does not necessarily mean an upgrade and similarly, a modifier of "3" does not necessarily mean a downgrade.

[9] I also perform the analysis excluding firms with callable bonds priced above 80 percent of par and obtain virtually identical results. However, when callable bonds are excluded entirely, I obtain similar but less significant estimates due to a much smaller sub-sample as callable bonds account for more than 60 percent of the total number of bonds covered in LBFID during this time period.

[10] The results obtained in this paper are robust to different methods of picking the corresponding bond issuance for the issuing firms. For example, choosing the most recently issued bond or using all the bonds in the sample and performing the analyses using weighted regressions do not alter my results.

14, 21, 36, 42, 44, 45, 51, 52, 58, 59, and 61 available from 1980 to 1983, which are necessary for the construction of key firm attributes described below. This results in a data sample of 376 observations. Lastly, when I merge the sample with available bond yield data from LBFID, 266 refinements (including 218 within rating class refinement changes and 48 cross rating class refinement changes) remain. This constitutes my final data sample.[11]

Core financial variables are calculated and defined as follows. To examine firms' financing decisions, this paper looks at six different measures of debt and equity issuance including issuances of long-term debt (item 51), short-term debt (item 45), total debt (item 45 plus item 51), long-term debt net of cash (item 51 minus item 36), total debt net of cash (item 45 plus item 51 minus item 36), and common equity (item 59 minus item 58), all scaled by the previous year's total assets (item 44). To control for firm characteristics that could affect firms' financing decisions, this paper examines firms' size, market-to-book ratio, profitability, and asset tangibility. Firm size is defined as the log of the market value of total assets, which is total assets minus the book value of equity plus the market value of equity. The book value of equity is defined as the book value of common equity (item 59) plus deferred tax (item 52). The market value of equity is defined as common shares outstanding (item 61) multiplied by the share price (item 14). The market-to-book ratio, which also represents Tobin's Q, is calculated as total assets minus the book value of equity plus the market value of equity, all divided by total assets. Firms' profitability is their operating income before depreciation (item 21) divided by total assets and their asset tangibility is defined as tangible assets (item 42) divided by total assets. Lastly, when analyzing firms' investment policies, the paper looks at three measures of real outcomes: firms' capital expenditures, cash accumulation, and asset growth. Given that the capital expenditure

[11] Out of the sample time period, seven firms had made acquisitions valued over $100 million and one firm has been acquired (SDC Platinum Merger and Acquisitions database). The exclusion of these firms does not affect my results.

figures (item 90) are not available until 1985, I constructed the variable using the change in firms' property, plant, and equipment (item 42) plus depreciation (item 5). Cash accumulation and asset growth are defined as the change in cash and cash equivalent (item 36) and the change in assets, each scaled by lagged total assets. In order to reduce the influence of outliers, I follow the literature and winsorize these variables at the 1st and 99th percentile.

[TABLE II]

Table II presents the summary statistics for the 266 firms in the final matched sample. The average firm in the sample has over four billion dollars in assets, a leverage ratio of 0.33, and a market-to-book ratio of 0.93. The average firm also issues up to four percent of its lagged assets in long-term debt and roughly two percent of its lagged assets in equity for the one-year period prior to the rating refinement. In terms of other real outcomes, the average firm spends approximately 12% of its book value of assets in capital expenditures, experiences relatively no change in cash and cash equivalents, and has an asset growth rate of 12%. After the rating refinement, firms on average issue more equity and less long-term debt. They also invest less, hold more cash, and have slower asset growth than before.

[FIGURE 1, 2]

Figures 1 and 2 plot firms' cumulative financing and investment decisions, respectively, in the four quarters before and after Moody's rating refinement. Ex ante, firms that receive upgrades from the rating refinement have similar levels of total debt issuance as firms that experience downgrades. Ex post, however, the former on average issue more debt, approximately three percent of firms' lagged assets, than the latter. When cash is netted out of the debt issuance, the disparity in firms' debt issuance is even more significant. Similar patterns are observed in firms' long-term debt issuance. The short-term debt issuance on the other hand does not exhibit

drastic differences among upgraded and downgraded firms both pre- and post- rating refinement. In contrast, firms with positive rating refinement changes issue a similar amount of equity than those with negative refinement changes prior to the rating refinement. Afterwards, however, the former on average issue less equity, approximately two percent of firms' lagged assets, than the latter. Preliminary evidence suggests that firms' capital structure decisions are similar before Moody's 1982 rating refinement. After the refinement, firms that were upgraded issue more debt and less equity than their downgraded counterparts. Figure 2 shows that firms that experience positive rating refinement changes have similar capital expenditures and cash accumulation, as well as higher asset growth, than those that experience negative rating changes ex ante. Ex post, the former make more investments, hold less cash on their balance sheets, and continue to have faster asset growth than the latter. In short, Figures 1 and 2 illustrate that rating upgrades have favorable effects on firms' credit market access and real outcomes.

IV. Empirical Results

The empirical analyses of this paper analyze the relation between the credit rating refinement and firms' credit market access, both in terms of firms' borrowing costs and their capital structure decisions, as well as the effects of the rating refinement on firms' other real outcomes such as capital investments, cash accumulation, and asset growth.

A. Credit Rating Refinement and Firms' Cost of Borrowing

I first examine the information content of Moody's 1982 rating format refinement by analyzing the relation between firms' cost of borrowing and their rating refinement changes. Suppose rating changes resulting from the refinement do not reveal any new information. The direction of these rating changes may be predictable since firms' credit risk is already incorporated and reflected through their ex ante borrowing costs. More importantly, these rating

changes should not have any impact on firms' borrowing costs following the refinement. One way to test the predictability of the direction of rating refinement changes is to compare the average ex ante cost of borrowing among firms within the same coarse rating category that experience upgrades, no change, and downgrades, respectively. If the direction of the rating refinement changes is predictable, one would expect firms' average ex ante cost of borrowing to increase monotonically and to differ significantly across groups with different rating refinement changes. However, comparing firms' cost of borrowing using their bond yields directly could be potentially problematic as bond yields could differ due to bond specific characteristics such as seniority, duration, maturity, and convexity.[12] Thus, to account for the difference in firms' bond yields that are attributed to bond specific characteristics, this paper uses four different measures of yield spreads to proxy for firms' cost of borrowing one month prior to the refinement.

The first two methods measure firms' yield spreads as the difference between firms' corporate bond yields and their comparable treasury bond yields. In particular, the yield spreads are calculated off the equal-duration treasury bonds and equal-time-to-maturity treasury bonds, respectively.[13] The third measure of yield spreads is calculated as the difference between firms' corporate bond yields and the median bond yields of their corresponding (coarse) rating categories. Unlike the first two methods that take into account parallel shifts in firms' bond yields due to the change in the interest rate term structure, the third method considers potential non-parallel shifts in firms' bond yields. Lastly, I also estimate the yield spreads as the residual yields from regressing firms' bond yields against a set of control variables such as seniority,

[12] The bond yield information used for each firm in the analyses throughout this paper is the yield-to-maturity on a bond drawn randomly from all of its traded bonds recorded by LBFID. As mentioned in the data description, the results presented in this paper are robust to different methods of picking the relevant bond issuance for a given firm or choosing different cutoffs for callable bonds.

[13] This is consistent with the estimation methodology used in Hand et al. (1992), Kliger and Sarig (2000), and Cremers, Nair, and Wei (2004).

maturity, duration, convexity, and (coarse) rating class. Doing so allows me to separate out the part of the bond yields attributed to bond-specific characteristics and to obtain the remaining component of the bond yields, the residual yields, which reflect information about firms' underlying credit risk. The analyses using all four methods yield similar results. For reporting purposes, only the results obtained from using the first method, which calculates yield spreads off equal-duration treasury bonds, is presented here in this paper.

[TABLE III]

Panel A in Table III shows that the average yield spreads are not statistically different across sub-rating groups for rating classes "Aa" and "A," which suggests that yield spreads are unlikely to predict the directions of refinement changes for those two rating classes. In contrast, average yield spreads for rating classes "Baa" and "Ba" increase monotonically across sub-rating groups and are statistically different from each other, which suggests that the yield spreads are more relevant in the prediction of rating refinement changes for firms in the lower rating classes. To confirm the predictability of the rating refinement changes, an ordered probit model is used to examine whether firms' yield spreads can successfully predict the direction of rating refinement changes for each rating class. Regression results presented in Panel B of Table III show that yield spreads can predict rating refinement changes for rating classes "Aa," "Baa," and "Ba," but not "A." The direction of approximately one-half to two-thirds of the rating changes are predictable for rating classes "Aa," "Baa," and "Ba," whereas the direction of only one-third of rating changes are predictable for rating class "A."[14] These results suggest that part of the information contained in rating refinement changes has already been priced in firms' cost of borrowing prior to the rating refinement.

[14] The number of predictable rating refinement changes is calculated based on the most likely outcomes predicted by the ordered probit regression based on firms' ex ante yield spreads.

Next, the potential importance of any new information revealed through Moody's rating refinement is examined through its effect on firms' subsequent cost of borrowing. In particular, I measure the change in firms' yield spreads in response to rating changes due to the refinement. Panel A of Table IV shows that without any control variables, a rating upgrade resulting from the rating refinement, on average, leads to a seven basis point or a half percent reduction in a firm's borrowing cost whereas a rating downgrade results in a 13 basis point or 0.7 percent increase over the same time period. The difference across the sub-rating groups is both economically and statistically significant. A more formal analysis of the effects of rating refinement changes on firms' subsequent borrowing costs is presented in Panel B. In particular, Panel B looks at the following specification:

$$\Delta YieldSpread_{i,t} = \beta_0 + \beta_1 * Upgrade_i + \beta_2 * NoChange_i + \gamma_1 * A_{i,t-1} + \gamma_2 * Baa_{i,t-1} + \gamma_3 * Ba_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Where $\Delta YieldSpread_{i,t}$ is the subsequent change in firm *i*'s yield spreads following the rating refinement; *Upgrade* and *NoChange* are dummy variables that indicate whether firm *i* received an upgrade or no change from Moody's rating refinement; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firm *i*'s original rating classes.

[TABLE IV]

In the absence of any control variables, a refinement rating upgrade leads to a 20 basis points reduction in firms' borrowing costs over a refinement downgrade. This effect remains both economically and statistically significant even when controlling for rating class fixed effects and lagged change in yield spreads. Similar results are observed when the relative change in firms' cost of borrowing is considered. Ceteris paribus, a rating upgrade causes an additional one percent reduction in firms' post-refinement yield spreads relative to their pre-refinement yields, over a rating downgrade. As for a "no change" rating refinement, it does not produce bond yield

changes that are statistically different from that of a rating downgrade, regardless of whether the absolute level or the relative percentage is used to measure the change in firms' cost of borrowing. Panel C of Table IV presents the effects of rating refinement changes on gross bond yields as well as on the yield spreads calculated using all four methods. An upgrade resulting from the rating refinement leads to a significant reduction in firms' borrowing costs than a downgrade. Depending on the method chosen, firms with rating upgrades on average experience a 15 to 30 basis point drop in their cost of borrowing relative to their counterparts with rating downgrades. The significant difference in the change of firms' cost of borrowing offers strong evidence on the information content of the rating refinement that despite some predictable component, rating refinement changes do reveal new information about firms' credit quality, which are priced into firms' subsequent cost of borrowing accordingly.

The effects documented in Table IV however could be potentially underestimated. The yield spreads presented in the analysis are calculated using equilibrium bond yields that take into account firms' debt capacity for future issuance. For example, the cost of borrowing could drop significantly for a firm with a favorable rating refinement change. However, if investors anticipate the same firm to raise more debt in the future, the real reduction in the firm's cost of borrowing is then offset by an increase in the firm's expected bankruptcy costs.[15] Consequently, the observed change in firms' yield spreads might be an underestimation of the true impact of the rating refinement changes. More discussion on this topic will follow in Section V.

B. Credit Rating Refinement and Firms' Financing Decisions

This section focuses on the effect of credit rating refinement on firms' financing decisions. Specifically, the analysis looks at the cross-sectional variations in firms' financing

[15] This implicitly assumes that the firm can issue new debt with the same seniority as its existing ones and that the new debt would increase the firm's expected bankruptcy costs.

choices between debt and equity subsequent to Moody's rating refinement through a first differencing specification. The advantage of using a first differencing model is similar to that of the fixed effect model in that it eliminates the unobserved firm-specific effects. To control for variations in firms' preference for debt financing, the regression analysis includes the changes of certain firm characteristics such as size, market-to-book ratio, profitability, and asset tangibility which have been shown to determine firms' leverage in previous studies. Size has been used to proxy firms' expected bankruptcy cost and is expected to be positively correlated with firms' debt issuance (Graham, Lemmon, and Schallheim (1998) and Hovakimian, Opler, and Titman (2001), and Diamond (1991b)). The market-to-book ratio has been used as a proxy for growth opportunities and is expected to be positively correlated with firms' external financing (Baker and Wurgler (2002)). The effect of profitability on leverage however, is less clear since it can either be used as a proxy for internal cash available for investment funding or taxable income to be shielded (Donaldson (1961), Myers (1984), and Leary (2006)). Similarly, the effect of asset tangibility is unclear as it can either proxy for the severity of the information asymmetry, collateral available for firms' external financing, or demand for future investments (Titman and Wessels (1988) and Rajan and Zingales (1995)).

The empirical analysis also takes into account the availability of firms' credit quality information through non-Moody resources. In particular, to isolate the effects of Moody's 1982 rating refinement, I use firms' ex ante yield spreads to control for information (regarding firms' credit quality that is reflected in their existing cost of borrowing) available prior to the rating refinement. Lastly, firms' lagged financing choices and rating class fixed effects are included in the regression specification in order to address any potential selection bias in the sample. That is, the paper examines the following specifications:

$$\Delta FinancingDecision_{i,t} = \beta_0 + \beta_1 * Upgrade_{i,t} + \beta_2 * NoChange_{i,t} + \beta_3 * YieldSpread_{i,t-1} + \delta' \Delta X_{i,t-1} + \gamma_1 * A_{i,t-1} + \gamma_2 * Baa_{i,t-1} + \gamma_3 * Ba_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

where, $\Delta FinancingDecision_{i,t}$ is the subsequent change in firm *i*'s financing decisions in the one-year period following Moody's 1982 rating refinement, and is measured using several different proxies of firms' debt and equity issuance; *Upgrade* and *NoChange* are dummy variables that indicate whether firm *i* received an upgrade or no change from Moody's rating refinement; $\Delta X_{i,t-1}$ is the change in a group of control variables that include firm characteristics such as size, market-to-book ratio, profitability, and tangibility, as well as firms' previous financing choices, in the one-year period prior to Moody's rating refinement; $YieldSpread_{i,t-1}$ is firm *i*'s ex ante yield spreads; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firm *i*'s original rating classes.

[TABLE V]

In the absence of any control variables as shown in regression (1) of Panel A in Table V, a rating upgrade from Moody's rating refinement leads to a 2.4 percent (of lagged total assets) increase in firms' subsequent long-term debt issuance relative to a rating downgrade. This effect is reduced slightly but remains statistically significant when rating class fixed effects and lagged changes to firm characteristics, such as size, market-to-book ratio, profitability, and tangibility are included. Regression (2) in the same panel shows that the change in firms' subsequent debt issuance is positively correlated to the change in their market-to-book ratios and profitability, and negatively correlated to changes in size and tangibility. The relation between the lagged change in firms' characteristics and their subsequent long-term debt issuance mostly disappears when the lagged change in long-term debt issuance is included (as in regression (3)). The significant effect of a rating refinement upgrade on firms' subsequent long-term debt issuance remains largely unchanged when their ex ante yield spreads are included in regressions (4) to (6)

of Table V. With a full set of control variables, ceteris paribus, a rating refinement upgrade leads to a two percent increase in firms' subsequent long-term debt issuance over its previous debt issuance, relative to a rating downgrade. This discrepancy in firms' long-term debt issuance, reinforced by their difference in cash accumulation, leads to even more significant divergence in the net long-term debt issuance among firms with different rating refinement outcomes. Panel B shows that a rating upgrade from Moody's rating refinement leads to a five percent (of lagged total assets) increase in firms' subsequent long-term debt issuance net of the change in cash and cash equivalents relative to a rating downgrade. The result remains significant and statistically robust to different control variables. Moreover, Panel C shows that firms that receive a rating upgrade on average tend to issue less short-term debt than their counterparts with a rating downgrade. Although the effect lacks statistical significance, it is nonetheless consistent with the prediction of Diamond's (1991) debt maturity model that under-rated firms will substitute short-term borrowing for long-term debt issuance prior to their rating updates and issue long-term debt afterwards. The statistical insignificance here could be attributed to the fact that firms' credit quality may not be truly realized after the rating refinement (i.e. firms might still feel under-rated even after their rating updates).[16] A combination of an increase in the long-term debt issuance and a decline in the short-term debt issuance yields a marginal increase in the total debt issuance for the upgraded firms (as presented in Panel D). However, when cash is considered, Panel E shows that firms with rating upgrades issue up to four percent (of lagged assets) more net total debt issuance than those with rating downgrades in the one-year period following the refinement.

In addition to analyzing the effect of rating refinement changes on firms' debt issuance, this paper also looks at their effects on firms' equity issuance and overall capital market access

[16] The original debt maturity model is a two-period model that assumes full credit quality realization in the second period. In an empirical setting, it may take multiple time periods for the under-rated firms to fully realize their true ratings and cause the substitution between short-term and long-term debt financing to take place gradually.

following the refinement. Table VI summarizes the effects of Moody's refinement rating changes on firms' subsequent equity issuance, while a summary of firms' subsequent total external financing and their reliance on debt financing is presented in Table VII.

[TABLE VI, VII]

Regression (2) in Table VI shows that a rating refinement upgrade reduces firms' subsequent equity issuance roughly by more than one percent of their lagged total assets over a downgrade when controlling for lagged changes in relevant firm characteristics. Regression (3) also suggests that the increase in firms' subsequent equity issuance is positively correlated with the changes in market-to-book ratio and negatively correlated with the changes in asset tangibility and their equity issuance for the previous year. When firms' ex ante yield spreads are included in the regression analysis to proxy for available credit quality information prior to the rating refinement, the results remain largely unchanged – an upgrade from Moody's rating refinement reduces a firm's subsequent equity issuance by roughly two percent of the lagged total assets over a downgrade. When examining firms' subsequent debt financing, equity issuance, and the change in cash and cash equivalents as a whole, a rating refinement upgrade only increases a firm's overall external financing marginally over a downgrade, but it does cause the firm to rely heavily on debt financing. This substitution between debt and equity is consistent with the notion that the rating refinement only reveals information about one localized part of cash flow distribution that is useful in valuing firms' debt. A drop in the cost of debt does not necessary imply a decline in firms' cost of equity.

C. Credit Rating Refinement and Firms' Other Real Outcomes

Lastly, I extend the analysis further to include the effects of rating changes on firms' real outcomes such as capital investments, cash accumulation, and asset growth. Since companies are

not required to report quarterly statements of cash flow until 1985, the measure for firms' investments is constructed using the change in firms' tangible assets and depreciation.

[TABLE VIII]

Table VIII shows that while controlling for previous change in investments, firms that receive an upgrade from the rating refinement subsequently make significantly more investments, approximately three percent of lagged total assets more, than firms that receive a downgrade. They also rely less on cash resources as they have roughly two percent less cash accumulation than their counterparts.[17] These results remain both economically and statistically significant when taking into account firms' ex ante yield spreads and rating class fixed effects. Firms with rating upgrades also experience approximately five percent faster asset growth subsequently, relative to those with downgrades. However, the effect is reduced and becomes only weakly statistically significant when ex ante yield spreads and rating class fixed effects are included in the regression.

The empirical finding of upgraded firms having more capital investments and less cash accumulation following the rating refinement is consistent with the intuition offered by Almeida, Campello, and Weisbach (2004) that financially constrained firms should have a stronger propensity to save cash out of cash flows. Firms that are downgraded resulting from the rating refinement subsequently have limited credit market access, which creates incentives for them to actively increase their cash holdings by cutting back on their investment activities. Firms with rating refinement upgrades on the other hand have better credit market access and hence have less incentive to accumulate cash. As a result, by financing through long-term debt issuance and cash balance, they are able to make more investments following the rating refinement.

[17] This result holds true even for firms that did not raise any external finance after the rating refinement (not reported).

V. Discussions and Robustness Checks

A. Within Rating Class Refinement Only

Analyses shown thus far have focused on all rating refinements including both within rating class refinement changes and cross rating class refinement changes. However, one might be concerned that cross rating class refinement changes may be potentially related to firms' fundamental changes other than just the realignment of the rating scale. Consequently, I also examine the effect of rating refinements for firms who experience within rating class refinement changes only.

[TABLE IX]

Table IX shows that all previously documented effects of more refined rating information hold and become even more statistically significant when limiting the rating refinement changes to within the rating class only. Panel A presents the effects of within rating class refinement changes on firms' cost of borrowing following the refinement. On average, the upgraded firms experience a 15 to 25 basis point reduction in their cost of borrowing over the downgraded firms. The former also issue more long-term debt and less equity, make more investments, save less cash, and experience greater asset growth than the latter.

B. Real Effect of Rating Refinement Changes on Firms' Cost of Borrowing

[TABLE X]

As mentioned in the previous section, the change in firms' cost of borrowing following the rating refinement could potentially be underestimated. It could be interpreted as a net result of the effect of rating refinement changes offset by the effect of leverage changes. For example, a rating refinement upgrade lowers firms' cost of borrowing significantly by revealing their true credit quality; at the same time, it also increases these firms' debt capacity by allowing them to

issue more in the future, which in turn increases their expected cost of financial distress and thereby their cost of borrowing.[18] Thus, the true effect of a rating refinement upgrade on firms' cost of borrowing is masked by the offsetting effect resulting from the increase in firms' leverage. To uncover the real effect of rating refinement changes, one therefore must first estimate the effect of leverage on firms' cost of borrowing (in the absence of any change in firms' credit market access). This however imposes significant empirical difficulty as the leverage and firms' cost of borrowing are endogenously determined. As a result, this paper only attempts to offer some basic ideas regarding the true magnitude of the effect of rating refinement on firms' cost of borrowing. I estimate the effect of an increase in firms' leverage using two popular credit score models, namely Altman's Z-Score and Ohlson's O-Score, which are calculated by applying estimated coefficients on selected accounting variables (Altman (1968) and Ohlson (1980)).[19] Consistent with previous studies, once firms' credit scores are calculated, they are then converted into default probabilities using a logistic cumulative distribution function (Hillegeist et al (2004)).[20] This simple approach allows me to crudely estimate the marginal effect of an increase in leverage on firms' default probability while holding other firm attributes (and their credit market access) constant. Panel B of Table X shows that when applying estimated credit score coefficients to the average firm in Moody's coverage universe, a two percent of total assets increase in the firm's long-term debt issuance increases its default probability by 11.4 or 12.4 percent over the benchmark under the Z-Score and O-Score,

[18] Again, the implicit assumption is that firms are able to issue more debt with the same or higher seniority as their existing debt.

[19] The Altman and Ohlson coefficients were estimated using firm data between 1946 and 1965 and between 1970 and 1976, respectively. They are summarized in Panel A of Table X.

[20] The specific logistic cumulative distribution function used is $DefaultProb = \frac{e^{Score}}{1 + e^{Score}}$. While this transformation is not strictly correct for the Z-Score, which was estimated using multiple discriminant analysis (MDA), McFadden (1976) shows that the MDA and logit approaches are closely related under normality assumptions.

respectively. Using a linear approximation, this increase in the firm's default probability roughly translates into a 20 basis points increase in its cost of borrowing. A five-percent of total assets increase in a firm's long-term debt issuance, on the other hand, increases its default probability by roughly 30 percent over the benchmark and its yield spreads by 50 to 70 basis points. Similar results are observed when the average non-bankrupt firms in Altman and Ohlson's original studies are analyzed. The estimated effect of leverage on firms' cost of borrowing documented in Table X suggests that the true effect of rating refinement changes is much more significant: a rating upgrade could potentially lead to a 35 to 90 basis point reduction in their borrowing costs.

C. Effects of Rating Refinement Changes on the Levels of Firm's Real Outcomes

The core analysis of this paper focuses on how firms' financing and investment decisions change before and after the rating refinement and how these changes are different among firms that experience different rating updates based on the rating refinement. However, it may be worthwhile to investigate the level of firms' real outcomes after the rating refinement because it would help to validate the results and provide basic intuition about the impact of refinement rating changes using an absolute measure instead of a relative measure. The regression specification used here is still the first differencing approach, as these levels of firms' real outcomes can also be viewed as the changes in other firm attributes. For example, firms' debt issuance can be expressed as the change in firms' leverage; similarly, firms' investments can be seen as the changes in their PP&E's, cash accumulation as the change in cash and cash equivalents, and asset growth as the change in firms' total assets. Table XI shows that after Moody's 1982 rating refinement, upgraded firms have significantly higher levels of debt issuance, capital investments, and asset growth, and lower levels of equity issuance and cash accumulation.

[TABLE XI]

D. S&P Benchmark

[TABLE XII]

Given that S&P has gradually refined its ratings since 1973, one might be concerned that Moody's refinement is merely a duplication of S&P's refinement and does not contain any additional information.[21] Though this seems unlikely as earlier evidence suggests that Moody's refinement still affects firms' financing and investment decisions even after controlling for information embedded in the market bond yields, I perform the robustness check by re-examining the effects of rating refinement changes conditional on firms' existing S&P ratings. Based on firms' existing S&P ratings, Panel A of Table XII shows that the effects of Moody's rating refinement are even more pronounced. Firms with rating upgrades issue significantly more debt after the rating refinement than before, relative to those with rating downgrades. Regressions (4) to (6) in Panel A also indicate that on average, the former issue less equity than the latter (though the effect lacks statistical significance in the absence of lagged equity issuance). In addition, conditional on their existing S&P ratings, firms that are upgraded based on Moody's rating refinement make more investment, accumulate less cash, and have faster asset growth (Panel B of Table XII). In summary, the effects of Moody's 1982 credit rating refinement on firms' financing and investment decisions are robust conditional on various measures of pre-existing available information.

E. New Information vs. Omitted Variables

Another concern related to observed causal relationship between firms' rating refinement changes and their real outcomes is the issue of omitted variables. One might argue that

[21] S&P implemented the sub-rating categories for rating classes AA, A, BBB, and BB from 1973 to 1978 and then for rating classes B and CCC in 1983. S&P divided its originally broad rating class into three sub-rating categories using "+" and "-" signs.

refinement changes are not channels to disseminate new information, they are merely correlated with firms' unobservable credit risk that firms would still display similar financing patterns even without the rating refinement changes. To address this concern, this paper offers the following tests. First, it examines whether firms would have similar financing decisions in the absence of Moody's rating refinement. If the omitted variable concern holds, then firms with high credit quality should resemble the financing decisions of those that experience rating refinement upgrades following the refinement. Using firms' ex post rating refinement changes and historical yield spreads, I identify groups of firms that are likely to be upgraded, not changed, or downgraded if the rating refinement were to occur earlier (one year prior to the real refinement). Panel A of Table XIII shows that one year prior to the rating refinement, firms that are later upgraded have similar debt issuance but marginally more equity issuance compared to those that are eventually downgraded. Sorting on their ex ante yield spreads, Panel B shows that firms that are likely to be upgraded do not exhibit different financing patterns than those that are likely to be downgraded. The evidence suggests that in the absence of Moody's 1982 rating refinement, firms of different credit quality do not resemble the financing decisions of those that experience rating refinement changes. It is only after the rating refinement, that firms start to deviate according to their prospective sub-rating groups, which is counterfactual to the predictions based on the omitted variable concern.

[Table XIII]

[Figure 3]

Moreover, this paper also documents the change in the degree of cross-sectional variation in firms' financing decisions before and after Moody's rating refinement. The left panel of Figure 3 indicates that there is an increase in the level of heterogeneity among firms' debt and

equity issuances after the refinement, as fewer issuances are concentrated around the mean and more issuances are moved toward the tails of the distribution. A test of variance indicates a significant change in the distributions of debt and equity issuances for firms that experienced the rating refinement. The opposite is observed in the distributions of debt and equity issuances for non-Moody firms (as depicted in the right panel of Figure 3). The non-Moody firms do not experience a significant change in the distributions of their debt issuance but they do experience less dispersion in their equity issuance post-Moody's rating refinement. The increase in the degree of cross-sectional variation in firms' financing decisions is primarily found among firms that Moody's refined. Again, this is consistent with the information hypothesis under which the rating refinement changes can significantly affect firms' real outcomes.

Related to omitted variable concern, given that the rating refinement takes place in the middle of the month while yield spreads are only calculated at the end of the previous month, one might worry that the rating refinement changes are correlated with the changes in firms' unobservable investment opportunities during the month. To address this concern, I offer the following counterfactual evidence. First, it is difficult to believe that all firms experience changes in their fundamental risk at exactly the same time (in the month of refinement). Second, credit rating changes are infrequent and asymmetric. Out of 704 firms identified in LBFID, only 168 firms experience rating changes in the one-year period following the refinement (with 45 upgrades and 123 downgrades).[22] Lastly, these rating changes do not lead to significant changes in firms' cost of borrowing. The average change in the yield spreads for upgraded firms is not statistically different from downgraded firms, which suggests a regular one-notch rating change does not affect firms' cost of borrowing significantly. The evidence presented here shows that

[22] For the 168 firms who experience rating changes, the average number of rating changes is 1.1 times and the maximum number of changes is four times for a given firm.

the effects of rating refinement changes cannot result from changes in firms' underlying fundamentals alone. The rating refinement does provide new information to the market.

F. Alternative Explanations

Advocates of alternative explanations may consider the fact that a two percent of assets difference in firms' debt issuance is only associated with a 20 basis point gap in firms' borrowing costs as strong counterfactual evidence against the information explanation. This however could be misleading. Price and quantity are simultaneously determined and earlier analysis in this paper has shown that the change in firms' cost of borrowing could potentially be significantly underestimated. Thus, it is not obvious that the change in pricing is relatively small compared to the change in quantity. Moreover, the seemingly small change in firms' borrowing costs is not surprising. Sufi (2006) finds that firms issue more debt as a result of an increasing number of lenders without any change in firms' cost of borrowing. As a result, I find the evidence documented in this paper to be consistent with a simple neoclassical information based hypothesis under which rating refinement changes reveal new information about firms' credit quality and thereby lead to changes in firms' cost of borrowing and real outcomes such as their financing and investment decisions.

However, the information based hypothesis might not constitute the only explanation. For example, the changes in price and quantity could result from investors' and/or managers' focus on credit ratings. While the former could be driven by regulatory requirements and investors' higher-order beliefs, the latter is related to managers' overreaction to ratings. As mentioned in the institutional background earlier, certain rating cutoffs imposed by government regulations could cause changes in investor demand for firms' fixed income securities. Boot, Milbourn and Schmeits (2006) show that credit ratings can help to fix the desirable equilibrium and lead to

price impact as a coordinating mechanism. A model of higher-order beliefs also concludes that the availability of public information could exercise a disproportionate influence in pricing assets (Allen, Morris, and Shin (2006)). In comparison, a model of managers' overreaction to rating changes is less obvious. For example, it may be reasonable to assume that when firms experience rating refinement downgrades, managers might be concerned with the future cost of borrowing and decide to reduce firms' debt issuance aggressively. However, it is harder to imagine how managers would be overconfident and start to issue debt aggressively upon rating refinement upgrades. Moreover, Kisgen (2006) argues that firms would reduce debt issuance in anticipation of better credit market access when they are near potential rating changes regardless of downgrades and upgrades. Consequently, under the model of managers' excessive focus on firms' credit ratings, it is not clear if one should expect a symmetric or asymmetric reaction in firms' credit market access when faced with rating refinement changes.

VI. Related Literature

This paper is closely related to studies of information asymmetry and capital constraints (Diamond (1984, 1991a, 1991b), Hoshi, Kashyap, and Scharfstein (1990), Petersen and Rajan (1994), and Berger and Udell (1995)). While these previous studies mainly focus on the importance of firms' lending choices, i.e., relationship lending versus at-arms-length borrowing, this paper studies the effectiveness of third-party rating agencies in mitigating firms' capital constraints resulting from credit market information asymmetry. It also contributes to a limited number of papers on the importance of credit resource supply in determining firms' capital structure decisions. Faulkender and Petersen (2005) report that firms that have access to the public bond markets as measured by having a debt rating, have significantly more leverage. Confirming credit market supply frictions are an important determinant of corporate capital

structure, Leary (2006) shows that firms' leverage corresponds positively with credit market liquidity. Similarly, Sufi (2006) finds that firms increase their use of debt after the introduction of bank loan ratings due to an increase in the number of uninformed lenders. Complementary to these studies, this paper focuses on the ability of credit rating agencies to improve credit availability to borrowers with pre-existing credit ratings. More importantly, it provides evidence on the price channel through which credit ratings could facilitate a reallocation of capital resources and in turn affect firms' financing and investment decisions. In addition, this paper can be viewed as a supplement to the studies of capital structure and credit rating literature. Kisgen (2006) suggests that firms might manage their financing decisions in anticipation of future credit rating changes. Graham and Harvey's (2001) survey finds that 57.1 percent of CFOs consider credit rating to be important or very important when considering debt issuance. The empirical findings on firms' credit market access documented in this paper provide basic insights on why firms should care about credit ratings when considering their capital structure decisions.

Lastly, this paper helps to strengthen the claim that credit ratings do convey important information that investors cannot obtain from public sources. Academic literature has vigorously debated the importance of information revealed by credit ratings but with inconclusive evidence. While Kaplan and Urwitz (1979), Altman and Katz (1976), and others find that credit ratings are predictable to a high degree of accuracy, Hand, Holthausen, and Leftwich (1992), Goh and Ederington (1993) and others report mixed results with regards to security-price reactions to credit rating changes. In particular, Kliger and Sarig (2000) observe limited bond price reaction to the Moody's 1982 rating refinement.[23] This study introduces a new approach to examine whether rating information is valuable by quantifying the real impact of a shock to the

[23] Kliger and Sarig (2000) find on average a positive correlation between bond returns and rating changes; but the correlation lacks robustness and statistical significance.

availability of more refined information on firms' borrowing costs and their subsequent financing and investment decisions.

VII. Conclusion

This paper has shown that credit market information asymmetry can significantly affect firms' financing and investment decisions. When a shock to the availability of more refined credit information occurs (via Moody's 1982 rating refinement), investors are able to better identify firms' credit quality according to the new information revealed. As a result, firms that are upgraded due to the refinement enjoy better credit market access through a lower cost of borrowing and a greater amount of debt issuance compared to firms that are downgraded. In addition, the introduction of more refined rating gradations permanently reduces the level of credit market information asymmetry, which allows firms to accelerate their financing and investment decisions immediately following the refinement. Firms with rating refinement upgrades experience up to a three percent of their lagged assets increase in capital investments through more long-term debt issuance and less cash accumulation than firms with rating downgrades.

The results of this paper point to several interesting areas of future research. First, this study can serve as a benchmark for future studies of regular changes in credit ratings and firms' credit market access. Second, this paper can serve as a starting point for research on the interaction between credit ratings and firms' leverage decisions. Having concluded that better credit ratings lead to better capital market access, both in terms of the cost of borrowing and the amount of debt issued, it would be interesting to investigate the role of credit ratings in determining firms' optimal capital structure. Third, firms with lower refined ratings are found to have less subsequent investments and more cash accumulation, suggesting that these firms may

have been previously over-investing. Thus, in addition to their certification and information importance, credit ratings can also be explored for their role as a corporate governance device. Lastly, given that Moody's 1982 rating refinement increased the number of gradations available on the rating scale, a change in firms' investment opportunities may or may not trigger the same level of rating changes before and after the refinement. Hence, it would be interesting to explore whether the availability of more refined credit information could facilitate more efficient economics outcomes.

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Figure 1. Effects of rating refinement changes on firm's financing decisions. The graphs below show firms' cumulative financing decisions in the four quarters pre- and post- Moody's 1982 rating refinement (denoted as quarter "0" in the graphs). All graphs are re-centered at quarter "0." *Total Debt Issuance* is defined as the issuance of long-term debt plus short-term debt; *Net Total Debt Issuance* is defined as total debt issuance net of the change in cash and cash equivalents; *Long-Term Debt Issuance* is defined as the issuance of long-term debt; *Net Long-Term Debt Issuance* is defined as the issuance of long-term debt net of the change in cash and cash equivalents; *Short-Term Debt Issuance* is defined as the issuance of short-term debt; and *Equity Issuance* is defined as the issuance of equity. All variables are scaled by the lagged total assets.

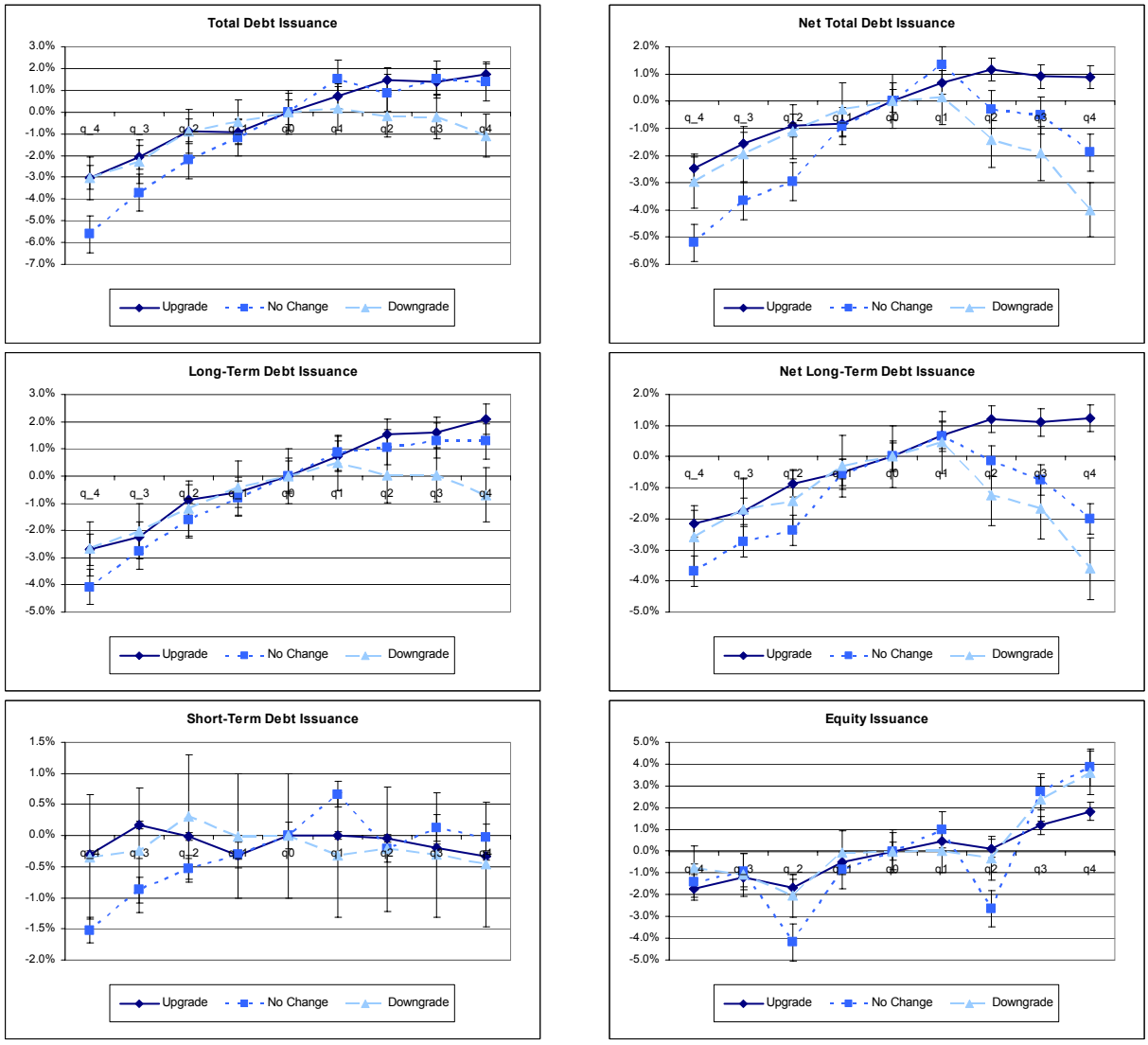
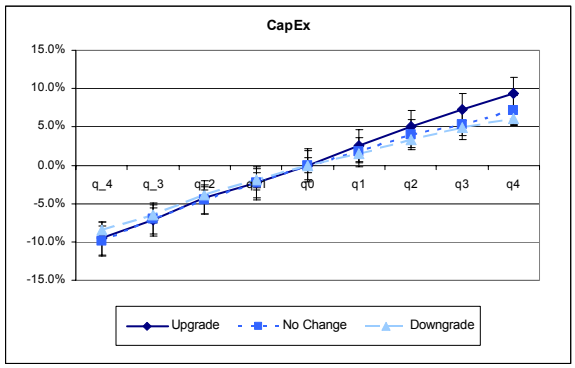
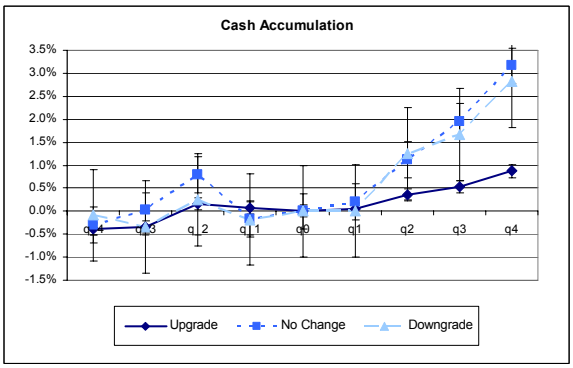


Figure 2. Effects of rating refinement changes on firm's investment decisions. The graphs below show firms' cumulative investment decisions in the four quarters pre- and post- Moody's 1982 rating refinement (denoted as quarter "0" in the graphs). All graphs are re-centered at quarter "0." *CapEx* is the capital expenditure calculated as the change in PP&E plus depreciation; *Cash Accumulation* is defined as the change in cash and cash equivalents; and *Asset Growth* is calculated as the change in total assets. All variables are scaled by lagged total assets.





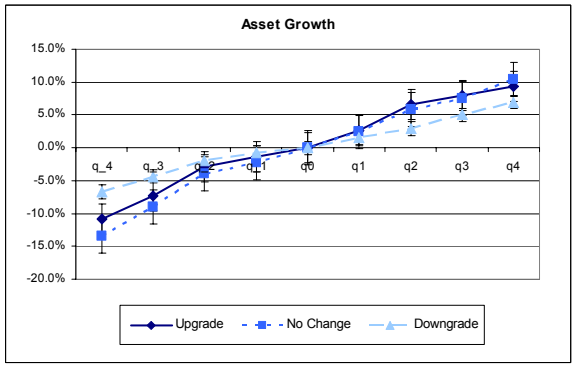


Figure 3. Probability density graphs of firms' financing decisions before and after Moody's rating refinement. Kernel density estimation is performed using the Epanechnikov kernel with optimal bandwidth based on the formula of Silverman (1986). The panel on the left shows the kernel density graphs of the debt and equity issuance for firms from Moody's coverage universe only. The panel on the right shows kernel density graphs of the debt and equity issuance for all COMPUSTAT firms excluding firms from Moody's coverage universe. All financing variables are scaled by the lagged total assets.

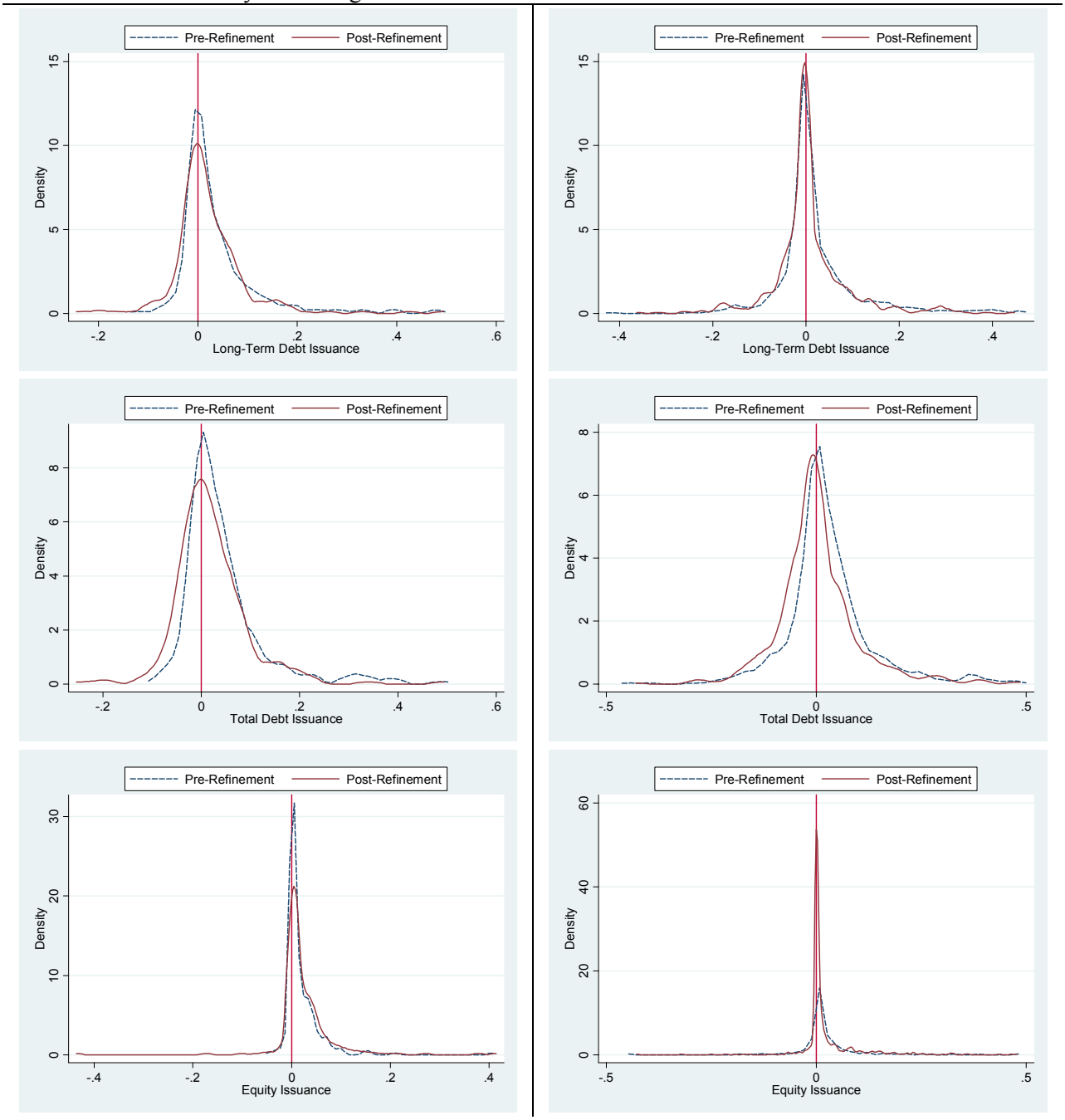


Table I

Moody's 1982 Rating Format Refinement

This table presents the details of Moody's 1982 rating refinement. On April 26, 1982, Moody's refined its previously coarse rating classes by adding modifiers to rating classes Aa, A, Baa, Ba, and B. Modifiers "1," "2," and "3" represent sub-ratings of highest, average, and worst credit quality, respectively.

Credit Risk	**Moody's Rating Categories**	
	Pre-Refinement	Post-Refinement
Investment Grade		
	Aaa	Aaa
	Aa	Aa1
		Aa2
		Aa3
	A	A1
		A2
		A3
	Baa	Baa1
		Baa2
		Baa3
Non-Investment Grade		
	Ba	Ba1
		Ba2
		Ba3
	B	B1
		B2
		B3
	Caa	Caa
	Ca	Ca
	C	C

Table II
Summary Statistics for the Matched Sample

This table reports the summary statistics of key firm characteristics for the 266 firms in the matched sample. *TotalAssets* is the book value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; *Leverage* is the book value of debt scaled by total assets; *Cash* is the cash and cash equivalents scaled by total assets; *Long-Term DebtIss* is firms' issuance of long term debt scaled by total assets; *Net Long-Term DebtIss* is firms' issuance of long-term debt net of change in cash and cash equivalents scaled by total assets; *EquityIss* is firms' equity issuance scaled by lagged total assets; *CapEx* is firms' capital expenditure, which is calculated as the change in firms' PP&E plus depreciation and scaled by lagged total assets; *CashAccumulation* is defined as the change in firms' cash and cash equivalents and scaled by lagged total assets; *AssetGrowth* is calculated as the change in firm's book value of total assets and scaled by lagged total assets. Time *t* is the time of the rating refinement. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

			Percentiles		
N = 266	**Mean**	**StDev**	**10th**	**50th**	**90th**
TotalAssets$_t$ ($M)	4,760	11,836	298	1,861	9,034
MV/BV$_t$	0.933	0.234	0.755	0.898	1.130
Profitability$_t$	0.123	0.067	0.019	0.123	0.196
Tangibility$_t$	0.539	0.284	0.021	0.593	0.875
Leverage$_t$	0.326	0.139	0.158	0.317	0.501
Cash$_t$	0.052	0.072	0.003	0.021	0.168
Long-Term DebtIss$_t$	0.045	0.100	-0.018	0.012	0.144
Net Long-Term DebtIss$_t$	0.046	0.106	-0.039	0.026	0.142
EquityIss$_t$	0.018	0.038	-0.001	0.005	0.050
CapEx$_t$	0.123	0.145	0.004	0.094	0.241
CashAccumulation$_t$	0.000	0.041	-0.044	-0.001	0.034
AssetGrowth$_t$	0.123	0.173	-0.005	0.086	0.259
ΔTotalAssets$_{t-1,t}$ ($M)	448	1,257	-4	118	845
ΔMV/BV$_{t-1,t}$	-0.119	0.223	-0.328	-0.044	0.031
ΔProfitability$_{t-1,t}$	-0.003	0.030	-0.040	-0.001	0.024
ΔTangibility$_{t,-1,t}$	0.007	0.040	-0.033	0.004	0.052
ΔLong-Term DebtIss$_{t-1,t}$	0.015	0.099	-0.080	0.000	0.125
ΔNet Long-Term DebtIss$_{t-1,t}$	0.025	0.114	-0.088	0.008	0.143
ΔEquityIss$_{t-1,t}$	-0.008	0.072	-0.054	0.000	0.031
ΔCapEx$_{t-1,t}$	-0.012	0.094	-0.071	-0.005	0.064
ΔCashAccumulation$_{t-1,t}$	-0.013	0.065	-0.089	-0.003	0.044
ΔAssetGrowth$_{t-1,t}$	-0.028	0.158	-0.167	-0.020	0.095
ΔLong-Term DebtIss$_{t,t+1}$	-0.014	0.083	-0.112	-0.003	0.066
ΔNet Long-Term DebtIss$_{t,t+1}$	-0.032	0.097	-0.147	-0.019	0.058
ΔEqIss$_{t,t+1}$	0.007	0.050	-0.027	0.001	0.043
ΔCapEx$_{t,t+1}$	-0.044	0.121	-0.164	-0.017	0.039
ΔCashAccumulation$_{t,t+1}$	0.014	0.056	-0.023	0.007	0.070
ΔAssetGrowth$_{t,t+1}$	-0.047	0.178	-0.223	-0.030	0.140

Table III
Predictability of Refinement Changes Using Yield Spreads

Panel A reports the results on the predictability of the direction of Moody's rating refinement changes for the 704 firms identified in Lehman Brother's Fixed Income Database (LBFID) based on the credit information embedded in firms' ex ante yield spreads. Ex ante yield spreads, $YieldSpread_{t-1}$, are measured as the difference between firms' corporate bond yields and equal-duration treasury bond yields, one month prior to Moody's April 1982 credit rating refinement. Corporate bond yield is the yield-to-maturity on a bond drawn randomly for a given firm based on the monthly pricing information provided by LBFID; treasury bond yield is the average yield on treasury bonds for a given duration. Panel B shows ordered probit regression results using rating refinement changes as dependent variable and firms' ex ante yield spreads as independent variable.

Panel A

Pre-Refinement Ratings	Post-Refinement Ratings	Rating Changes	No. of Observations	Yield $Spread_{t-1}$ (%, Mean)	Yield $Spread_{t-1}$ (%, SE)	Statistically Different from Upgrade
	Aa1 or Higher	Upgrade	26	0.95	0.15	-
Aa	Aa2	No Change	46	0.94	0.12	No
	Aa3 or Lower	Downgrade	47	1.29	0.13	No
	A1 or Higher	Upgrade	91	1.73	0.17	-
A	A2	No Change	96	1.51	0.12	No
	A3 or Lower	Downgrade	81	1.67	0.12	No
	Baa1 or Higher	Upgrade	95	2.07	0.12	-
Baa	Baa2	No Change	31	2.60	0.18	Yes
	Baa3 or Lower	Downgrade	58	3.21	0.21	Yes
	Ba1 or Higher	Upgrade	41	2.69	0.22	-
Ba	Ba2	No Change	27	3.89	0.21	Yes
	Ba3 or Lower	Downgrade	65	6.00	0.52	Yes
		Upgrade	253	1.94	0.09	-
Total		No Change	200	1.87	0.10	No
		Downgrade	251	3.08	0.19	Yes

Panel B

Ordered Probit Model with Refinement Rating Changes as Dependent Variables

Rating Class	Aa	A	Baa	Ba
$YieldSpread_{t-1}$	0.232*	-0.019	0.388***	0.590***
	(0.120)	(0.053)	(0.078)	(0.085)
With 1% increase in $YieldSpread_{t-1}$				
Prob (Upgrade)	-0.061	0.004	-0.232	-0.145
Prob (No Change)	-0.030	0.000	0.021	-0.066
Prob (Downgrade)	0.091	-0.003	0.211	0.211
Pseudo R^2	0.014	0.000	0.076	0.250
No. of Obs.	119	268	184	133
No. Predictable	54	98	115	92

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table IV
Effects of Rating Refinement Changes on Yield Spreads

Panel A presents the summary statistics on the change in firms' yield spreads (based on equal-duration treasury bonds) subsequent to Moody's rating refinement. YS_{t-1} and YS_t denote firms' yield spreads in the month of March and April, respectively. ΔYS_t is defined as $YS_t - YS_{t-1}$. Panel B reports regression results of the subsequent change in firms' yield spreads, both in levels (ΔYS_t) and relative percentage term ($\Delta YS_t / Yield_{t-1}$). *Upgrade* and *NoChange* are dummy variables representing rating upgrades and no changes resulting from the rating refinement, respectively; *A, Baa*, and *Ba* are dummy variables indicating firms' rating classes. Panel C presents summary results of changes in gross bond yields as well as changes in yields spreads calculated using four different measures including measuring yield spreads off equal-duration treasury bonds, equal-time-to-maturity treasury bonds, median bond yields of corresponding rating classes, and as residual bond yields.

Panel A

Pre-Refinement Ratings	Rating Changes	Avg YS_{t-1} (%)	ΔYS_t (%)	Relative to "No Change"	$\Delta YS_t / YS_{t-1}$	Relative to "No Change"
	Upgrade	0.95	-0.08	-0.28	-0.6%	-2.0%
		(0.15)	(0.05)		(0.4%)	
Aa	No Change	0.94	0.20	0.00	1.4%	0.0%
		(0.12)	(0.14)		(1.0%)	
	Downgrade	1.29	-0.03	-0.23	-0.1%	-1.6%
		(0.13)	(0.04)		(0.3%)	
	Upgrade	1.73	-0.11	-0.23	-0.8%	-1.8%
		(0.17)	(0.08)		(0.6%)	
A	No Change	1.51	0.11	0.00	1.1%	0.0%
		(0.12)	(0.06)		(0.6%)	
	Downgrade	1.67	0.16	0.05	1.2%	0.2%
		(0.12)	(0.05)		(0.4%)	
	Upgrade	2.07	-0.02	-0.09	-0.1%	-0.6%
		(0.12)	(0.04)		(0.2%)	
Baa	No Change	2.60	0.07	0.00	0.5%	0.0%
		(0.18)	(0.08)		(0.4%)	
	Downgrade	3.21	0.09	0.02	0.5%	0.0%
		(0.21)	(0.06)		(0.3%)	
	Upgrade	2.69	-0.05	-0.12	-0.3%	-0.7%
		(0.22)	(0.05)		(0.3%)	
Ba	No Change	3.89	0.07	0.00	0.4%	0.0%
		(0.21)	(0.05)		(0.3%)	
	Downgrade	6.00	0.23	0.16	0.7%	0.2%
		(0.52)	(0.21)		(0.5%)	
	Upgrade	1.94	-0.07	-0.19	-0.4%	-1.4%
		(0.09)	(0.03)		(0.2%)	
Total	No Change	1.87	0.12	0.00	1.0%	0.0%
		(0.10)	(0.05)		(0.4%)	
	Downgrade	3.08	0.13	0.01	0.7%	-0.3%
		(0.19)	(0.06)		(0.2%)	

Standard errors are in parentheses.

Table IV – *Continued*
Effects of Rating Refinement Changes on Yield Spreads
Panel B

	Dependent Variable: ΔYS_t			Dependent Variable: ΔYS_t / $Yield_{t-1}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade	-0.194***	-0.192***	-0.136**	-0.011***	-0.011***	-0.011***
	(0.066)	(0.067)	(0.067)	(0.004)	(0.004)	(0.004)
No Change	-0.007	0.001	0.042	0.003	0.003	0.003
	(0.070)	(0.071)	(0.070)	(0.004)	(0.004)	(0.004)
ΔYS_{t-1}			0.235***			
			(0.037)			
ΔYS_{t-1} / $Yield_{t-2}$						0.032
						(0.038)
A_{t-1}		0.026	0.006		0.003	0.002
		(0.082)	(0.081)		(0.005)	(0.005)
Baa_{t-1}		0.035	-0.017		0.002	0.001
		(0.089)	(0.088)		(0.005)	(0.005)
Ba_{t-1}		0.080	-0.009		0.001	0.000
		(0.094)	(0.094)		(0.005)	(0.005)
Constant	0.128***	0.090	0.080	0.007**	0.005	0.005
	(0.047)	(0.077)	(0.076)	(0.003)	(0.004)	(0.004)
No. of Obs.	704	704	704	704	704	704
R^2	0.02	0.02	0.07	0.02	0.02	0.02

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table IV – *Continued*
Effects of Rating Refinement Changes on Bond Yields
Panel C

Dependent Variable	$\Delta BondYield_t$		$\Delta YieldSpread_t$							
Methods			Equal-Duration Treasury Bonds		Equal-Time-To-Maturity Treasury Bonds		Median Bond Yield in the Corresponding Rating Class		Residual Bond Yields	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Upgrade	-0.151**	-0.149**	-0.194***	-0.192***	-0.301***	-0.302***	-0.152***	-0.149**	-0.143**	-0.142**
	(0.058)	(0.059)	(0.066)	(0.067)	(0.088)	(0.090)	(0.058)	(0.059)	(0.057)	(0.058)
No Change	-0.031	-0.035	-0.007	0.001	-0.134	-0.122	-0.028	-0.035	-0.041	-0.043
	(0.062)	(0.063)	(0.070)	(0.071)	(0.094)	(0.095)	(0.062)	(0.063)	(0.061)	(0.061)
A_{t-1}		0.109		0.026		0.146		0.095		0.116
		(0.073)		(0.082)		(0.109)		(0.072)		(0.071)
Baa_{t-1}		0.020		0.035		0.115		-0.007		0.040
		(0.079)		(0.089)		(0.119)		(0.079)		(0.077)
Ba_{t-1}		0.093		0.080		0.228*		0.065		0.112
		(0.083)		(0.094)		(0.126)		(0.083)		(0.081)
Constant	-0.253***	-0.317***	0.128***	0.090	0.107*	-0.025	0.080*	0.034	0.151***	0.075
	(0.041)	(0.068)	(0.047)	(0.077)	(0.063)	(0.102)	(0.041)	(0.068)	(0.040)	(0.067)
No. of Obs.	704	704	704	704	656	656	704	704	704	704
R^2	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.01

**Significant at 1%; **significant at the 5%; *significant at 10%.

Table V
Effects of Rating Refinement Changes on Firm's Debt Financing

This table reports effects of rating refinement changes on firms' subsequent debt issuance. Panel A, B, C, D and E present the effects of rating refinement on the change in firms' long-term debt issuance, net long-term debt issuance (long-term debt issuance net of the change in cash and cash equivalents), short-term debt, total debt, and net total debt issuance (total debt issuance net of the change in cash and cash equivalents), respectively. Panel C, D, and E have the same exact regression specification as those of Panel A and B, but only report the results on key variables of interests. All debt issuance are scaled by the lagged total assets. *Upgrade* and *No Change* are rating upgrades and no changes resulting from Moody's rating refinements, respectively; *YieldSpread* is the firms' ex ante yield spread based off equal-duration treasury yield; *Size* is calculated as the log of the market value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firms' original rating assignments. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Panel A

	Dependent Variable: ΔLong-Term DebtIss$_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	0.024**	0.021*	0.021*	0.022*	0.024*	0.023**
	(0.012)	(0.012)	(0.011)	(0.013)	(0.013)	(0.011)
No Change$_t$	0.012	0.018	0.023**	0.010	0.021	0.025**
	(0.013)	(0.012)	(0.011)	(0.013)	(0.013)	(0.011)
YieldSpread$_{t-1}$				-0.002	0.003	0.003
				(0.003)	(0.004)	(0.004)
ΔSize$_{t-1,t}$		-0.187***	-0.006		-0.189***	-0.008
		(0.037)	(0.042)		(0.037)	(0.042)
ΔMV/BV$_{t-1,t}$		0.147***	0.031		0.150***	0.034
		(0.027)	(0.029)		(0.027)	(0.030)
ΔProfitability$_{t-1,t}$		0.454***	0.15		0.454***	0.151
		(0.164)	(0.156)		(0.164)	(0.156)
ΔTangibility$_{t-1,t}$		-0.317**	-0.266**		-0.315**	-0.265**
		(0.126)	(0.115)		(0.126)	(0.115)
ΔLong-Term DebtIss$_{t-1,t}$			-0.409***			-0.409***
			(0.057)			(0.057)
Constant	-0.027***	0.005	-0.009	-0.021	0.000	-0.013
	(0.009)	(0.013)	(0.012)	(0.013)	(0.015)	(0.013)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266
R^2	0.02	0.19	0.33	0.02	0.19	0.33

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table V – *Continued*
Effects of Rating Refinement Changes on Firm's Debt Financing
Panel B

	Dependent Variable: ΔNet Long-Term Debtlss$_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	0.051***	0.044***	0.046***	0.042***	0.045***	0.047***
	(0.014)	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)
No Change$_t$	0.022	0.028**	0.032**	0.014	0.028**	0.033**
	(0.015)	(0.014)	(0.013)	(0.015)	(0.014)	(0.013)
YieldSpread$_{t-1}$				-0.008**	0.001	0.001
				(0.004)	(0.005)	(0.005)
ΔSize$_{t-1,t}$		-0.181***	-0.066		-0.182***	-0.066
		(0.041)	(0.044)		(0.041)	(0.044)
ΔMV/BV$_{t-1,t}$		0.145***	0.068**		0.146***	0.069**
		(0.030)	(0.032)		(0.031)	(0.032)
ΔProfitability$_{t-1,t}$		0.371**	0.115		0.371**	0.116
		(0.184)	(0.180)		(0.184)	(0.180)
ΔTangibility$_{t-1,t}$		-0.666***	-0.468***		-0.666***	-0.468***
		(0.141)	(0.138)		(0.141)	(0.138)
ΔNet Long-Term Debtlss$_{t-1,t}$			-0.301***			-0.300***
			(0.054)			(0.054)
Constant	-0.057***	-0.008	-0.02	-0.035**	-0.01	-0.022
	(0.010)	(0.015)	(0.014)	(0.015)	(0.016)	(0.016)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266
R^2	0.05	0.25	0.33	0.06	0.25	0.33

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table V – *Continued*
Effects of Rating Refinement Changes on Firm's Debt Financing

Panel C

	Dependent Variable: Δ Short-Term DebtIss$_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	-0.001	-0.003	-0.009	-0.006	-0.006	-0.010
	(0.008)	(0.008)	(0.007)	(0.008)	(0.009)	(0.007)
No Change$_t$	-0.007	-0.007	-0.008	-0.011	-0.009	-0.008
	(0.008)	(0.008)	(0.007)	(0.008)	(0.009)	(0.007)
YieldSpread$_{t-1}$				-0.004**	-0.002	-0.001
				(0.002)	(0.003)	(0.003)
No. of Obs.	266	266	266	266	266	266
R^2	0	0.03	0.29	0.02	0.04	0.29

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Panel D

	Dependent Variable: ΔTotal DebtIss$_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	0.024*	0.018	0.015	0.017	0.019	0.016
	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)
No Change$_t$	0.008	0.014	0.018	0.002	0.015	0.019
	(0.014)	(0.013)	(0.013)	(0.015)	(0.014)	(0.013)
YieldSpread$_{t-1}$				-0.006*	0.001	0.001
				(0.004)	(0.005)	(0.005)
No. of Obs.	266	266	266	266	266	266
R^2	0.01	0.21	0.25	0.02	0.21	0.25

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Panel E

	Dependent Variable: ΔNet Total DebtIss$_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	0.049***	0.040***	0.039***	0.036**	0.039***	0.039***
	(0.015)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
No Change$_t$	0.018	0.023	0.027*	0.007	0.023	0.027*
	(0.016)	(0.014)	(0.014)	(0.016)	(0.015)	(0.015)
YieldSpread$_{t-1}$				-0.012***	-0.001	0.000
				(0.004)	(0.005)	(0.005)
No. of Obs.	266	266	266	266	266	266
R^2	0.04	0.27	0.30	0.07	0.27	0.30

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table VI
Effects of Rating Refinement Changes on Firm's Equity Financing

This table reports effects of rating refinement changes on firms' subsequent equity issuance. *EquityIss* is defined as firms' equity issuance scaled by the lagged total assets; *Upgrade* and *No Change* are rating upgrades and no changes resulting from Moody's rating refinements, respectively; *YieldSpread* is the firms' ex ante yield spread based off equal-duration treasury yield; *Size* is calculated as the log of the market value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firms' original rating assignments. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

	Dependent Variable: $\Delta EquityIss_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Upgrade_t$	-0.009	-0.013*	-0.012*	-0.006	-0.016**	-0.016**
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
$No\ Change_t$	0.005	0.008	0.007	0.008	0.005	0.005
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$YieldSpread_{t-1}$				0.003	-0.004	-0.004
				(0.002)	(0.003)	(0.003)
$\Delta Size_{t-1,t}$		0.01	0.015		0.013	0.017
		(0.023)	(0.023)		(0.023)	(0.023)
$\Delta MV/BV_{t-1,t}$		0.028*	0.032*		0.025	0.028
		(0.017)	(0.017)		(0.017)	(0.017)
$\Delta Profitability_{t-1,t}$		-0.043	-0.047		-0.044	-0.048
		(0.103)	(0.103)		(0.103)	(0.103)
$\Delta Tangibility_{t-1,t}$		-0.162**	-0.154*		-0.164**	-0.156**
		(0.079)	(0.079)		(0.079)	(0.079)
$\Delta EquityIss_{t-1,t}$			-0.073*			-0.069
			(0.043)			(0.043)
Constant	0.009*	0.003	0.004	0.000	0.009	0.009
	(0.005)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266
R^2	0.01	0.12	0.13	0.02	0.13	0.14

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table VII
Effects of Rating Refinement Changes on Firm's Overall Capital Market Access

This table reports effects of rating refinement changes on firms' overall capital market access. *ΔNetTotalDebtIss* is defined as the change in firms' total debt issuance net of the change in cash and scaled by the lagged total assets; *ΔEquityIss* is defined as the change in firms' equity issuance and scaled by the lagged total assets; *Upgrade* and *No Change* are rating upgrades and no changes resulting from Moody's rating refinements, respectively; *YieldSpread* is the firms' ex ante yield spread based off equal-duration treasury yield; *Size* is calculated as the log of the market value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firms' original rating assignments. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Dependent Variable	ΔNet Total DebtIss$_{t,t+1}$ + ΔEquityIss$_{t,t+1}$						ΔNet Total DebtIss$_{t,t+1}$ - ΔEquityIss$_{t,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Upgrade$_t$	0.037**	0.025*	0.025	0.027*	0.021	0.021	0.059***	0.053***	0.053**	0.043**	0.057***	0.057**
	(0.016)	(0.015)	(0.021)	(0.017)	(0.016)	(0.028)	(0.017)	(0.017)	(0.011)	(0.018)	(0.018)	(0.011)
No Change$_t$	0.024	0.035**	0.035	0.015	0.032**	0.032	0.013	0.017	0.017	-0.001	0.019	0.019
	(0.017)	(0.015)	(0.020)	(0.018)	(0.016)	(0.026)	(0.019)	(0.017)	(0.016)	(0.019)	(0.018)	(0.015)
YieldSpread$_{t-1}$				-0.009*	-0.004	-0.004				-0.015***	0.004	0.004*
				(0.005)	(0.005)	(0.009)				(0.005)	(0.006)	(0.001)
ΔSize$_{t-1,t}$		-0.050	-0.050		-0.049	-0.049		-0.189***	-0.189		-0.192***	-0.192
		(0.051)	(0.050)		(0.051)	(0.051)		(0.055)	(0.091)		(0.056)	(0.092)
ΔMV/BV$_{t-1,t}$		0.129***	0.129**		0.126***	0.126***		0.119***	0.119		0.123***	0.123
		(0.035)	(0.023)		(0.035)	(0.020)		(0.042)	(0.062)		(0.042)	(0.062)
ΔProfitability$_{t-1,t}$		0.249	0.249		0.251	0.251		0.552**	0.552		0.553**	0.553
		(0.209)	(0.393)		(0.210)	(0.405)		(0.240)	(0.486)		(0.240)	(0.478)
ΔTangibility$_{t-1,t}$		-0.675***	-0.675**		-0.679***	-0.679**		-0.447**	-0.447**		-0.445**	-0.445**
		(0.160)	(0.174)		(0.160)	(0.172)		(0.182)	(0.118)		(0.182)	(0.121)
ΔNet Total DebtIss$_{t-1,t}$ +ΔEquityIss$_{t-1,t}$		-0.240***	-0.240***		-0.238***	-0.238***						
		(0.048)	(0.034)		(0.048)	(0.035)						
ΔNet Total DebtIss$_{t-1,t}$ -ΔEquityIss$_{t-1,t}$								-0.046	-0.046		-0.046	-0.046
								(0.052)	(0.056)		(0.052)	(0.056)
Constant	-0.052***	-0.004	-0.004	-0.027	0.002	0.002	-0.069***	-0.005	-0.005	-0.026	-0.011	-0.011
	(0.012)	(0.016)	(0.016)	(0.018)	(0.018)	(0.028)	(0.013)	(0.019)	(0.016)	(0.019)	(0.021)	(0.016)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266	266	266	266	266	266	266
R^2	0.02	0.32	0.32	0.03	0.32	0.32	0.05	0.22	0.22	0.08	0.22	0.22

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table VIII
Effects of Rating Refinement Changes on Firm's Investment Policies

This table reports effects of rating refinement changes on firms' capital expenditures, cash accumulation, and asset growth following the refinement. *CapEx* is firms' capital expenditure, which is calculated as the change in firms' net PP&E plus depreciation and scaled by lagged total assets; *CashAccumulation* is firms' cash accumulation, which is defined as the change in cash and cash equivalents, and scaled by lagged total assets; *AssetGrowth* is firms' asset growth rate, which is defined as the change in firms' total assets and scaled by the lagged total assets; other variables are defined as before. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Dependent Variable	**$\Delta CapEx_{t,t+1}$**			**$\Delta CashAccumulation_{t,t+1}$**			**$\Delta AssetGrowth_{t,t+1}$**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Upgrade_t$	0.050***	0.033*	0.022*	-0.021***	-0.020**	-0.018**	0.055**	0.036	0.029
	(0.016)	(0.017)	(0.013)	(0.007)	(0.008)	(0.008)	(0.025)	(0.027)	(0.023)
$No\ Change_t$	0.003	-0.010	-0.007	-0.011	-0.009	-0.01	0.033	0.019	0.025
	(0.017)	(0.018)	(0.013)	(0.008)	(0.008)	(0.008)	(0.027)	(0.028)	(0.024)
$YieldSpread_{t-1}$		-0.014**	-0.006		0.000	0.001		-0.019**	-0.006
		(0.006)	(0.005)		(0.003)	(0.003)		(0.009)	(0.008)
$\Delta Size_{t-1,t}$			-0.325***			-0.010			-0.506***
			(0.042)			(0.023)			(0.080)
$\Delta MV/BV_{t-1,t}$			0.334***			0.013			0.512***
			(0.029)			(0.018)			(0.053)
$\Delta Profitability_{t-1,t}$			-0.046			-0.027			0.327
			(0.175)			(0.106)			(0.307)
$\Delta Tangibility_{t-1,t}$			-0.777***			0.189***			-0.302
			(0.124)			(0.072)			(0.199)
$\Delta CapEx_{t-1,t}$	-0.515***	-0.570***	-0.237***						
	(0.074)	(0.072)	(0.065)						
$\Delta Cash\ Accumulation_{t-1,t}$				-0.397***	-0.389***	-0.345***			
				(0.047)	(0.047)	(0.050)			
$\Delta AssetGrowth_{t-1,t}$							-0.352***	-0.369***	-0.186***
							(0.068)	(0.067)	(0.069)
Constant	-0.070***	-0.021	0.023	0.020***	0.013	0.011	-0.087***	-0.027	0.026
	(0.012)	(0.020)	(0.016)	(0.005)	(0.009)	(0.009)	(0.019)	(0.032)	(0.027)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266	266	266	266
R^2	0.18	0.25	0.57	0.24	0.25	0.27	0.10	0.13	0.39

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table IX
Effects of Within Rating Class Refinement Changes

This table reports effects of within rating class refinement changes on firms' subsequent financing and investment decisions. Panel A presents summary results on firms' cost of borrowing after the rating refinement. Panel B and C present the effects of rating refinement on the change in firms' financing decisions and investment policies following the refinement. In Panel B and C, *YieldSpread* is the firms' ex ante yield spread based off equal-duration treasury yield. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Panel A

Dependent Variable	$\Delta BondYield_t$		$\Delta YieldSpread_t$							
Methods			Equal-Duration Treasury Bonds		Equal-Time-To-Maturity Treasury Bonds		Median Bond Yield in the Corresponding Rating Class		Residual Bond Yields	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Upgrade	-0.142*	-0.135*	-0.201**	-0.199**	-0.262**	-0.262**	-0.158**	-0.135*	-0.137*	-0.132*
	(0.073)	(0.074)	(0.083)	(0.084)	(0.107)	(0.109)	(0.073)	(0.074)	(0.071)	(0.072)
No Change	-0.027	-0.033	-0.005	-0.001	-0.094	-0.093	-0.024	-0.033	-0.038	-0.042
	(0.070)	(0.071)	(0.080)	(0.081)	(0.103)	(0.103)	(0.070)	(0.071)	(0.069)	(0.069)
A_{t-1}		0.110		0.021		0.139		0.057		0.114
		(0.079)		(0.091)		(0.115)		(0.079)		(0.078)
Baa_{t-1}		0.005		0.027		0.108		-0.127		0.026
		(0.090)		(0.103)		(0.132)		(0.090)		(0.088)
Ba_{t-1}		0.136		0.103		0.225		0.118		0.160
		(0.101)		(0.116)		(0.149)		(0.101)		(0.099)
Constant	-0.257***	-0.323***	0.125**	0.093	0.066	-0.049	0.094*	0.079	0.148***	0.071
	(0.050)	(0.075)	(0.057)	(0.086)	(0.073)	(0.110)	(0.050)	(0.075)	(0.049)	(0.074)
No. of Obs.	571	571	571	571	533	533	571	571	571	571
R^2	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01

**Significant at 1%; **significant at the 5%; *significant at 10%.

Table IX – *Continued*
Effects of Within Rating Class Refinement Changes

Panel B

Dependent Variable	ΔLong-Term Debtlss$_{t,t+1}$			ΔNet Long-Term Debtlss$_{t,t+1}$			ΔEquitylss$_{t,t+1}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Upgrade$_t$	0.032**	0.032**	0.034***	0.053***	0.051***	0.056***	-0.013	-0.020**	-0.020**
	(0.014)	(0.013)	(0.012)	(0.016)	(0.015)	(0.014)	(0.009)	(0.009)	(0.009)
No Change$_t$	0.016	0.026**	0.032***	0.021	0.031**	0.039***	0.003	0.000	0.000
	(0.013)	(0.013)	(0.012)	(0.016)	(0.015)	(0.014)	(0.009)	(0.009)	(0.009)
YieldSpread$_{t-1}$		-0.001	0.000		-0.002	-0.001		-0.003	-0.003
		(0.005)	(0.004)		(0.005)	(0.005)		(0.003)	(0.003)
ΔSize$_{t-1,t}$		-0.194***	-0.032		-0.184***	-0.048		0.008	0.011
		(0.038)	(0.045)		(0.044)	(0.046)		(0.027)	(0.027)
ΔMV/BV$_{t-1,t}$		0.125***	0.028		0.121***	0.038		0.039*	0.039*
		(0.031)	(0.033)		(0.036)	(0.035)		(0.022)	(0.022)
ΔProfitability$_{t-1,t}$		0.622***	0.340*		0.586***	0.265		-0.185	-0.185
		(0.189)	(0.181)		(0.219)	(0.207)		(0.131)	(0.132)
ΔTangibility$_{t-1,t}$		-0.421***	-0.324**		-0.573***	-0.248		-0.311***	-0.306***
		(0.161)	(0.150)		(0.187)	(0.178)		(0.112)	(0.113)
ΔLong-Term Debtlss$_{t-1,t}$			-0.366***						
			(0.062)						
ΔNet Long-Term Debtlss$_{t-1,t}$						-0.370***			
						(0.058)			
ΔEquitylss$_{t-1,t}$									-0.029
									(0.046)
Constant	-0.031***	0.002	-0.012	-0.057***	-0.01	-0.026*	0.011*	0.013	0.012
	(0.010)	(0.015)	(0.014)	(0.011)	(0.017)	(0.016)	(0.007)	(0.010)	(0.010)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	218	218	218	218	218	218	218	218	218
R^2	0.03	0.23	0.34	0.05	0.24	0.37	0.02	0.17	0.17

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table IX – *Continued*
Effects of Within Rating Class Refinement Changes
Panel C

Dependent Variable	$\Delta CapEx_{t,t+1}$			$\Delta CashAccumulation_{t,t+1}$			$\Delta AssetGrowth_{t,t+1}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Upgrade_t$	0.044**	0.031*	0.025*	-0.019**	-0.019**	-0.018**	0.057*	0.04	0.038
	(0.019)	(0.019)	(0.015)	(0.008)	(0.008)	(0.008)	(0.029)	(0.030)	(0.026)
$No\ Change_t$	-0.002	-0.005	-0.003	-0.009	-0.009	-0.009	0.036	0.029	0.034
	(0.019)	(0.019)	(0.015)	(0.008)	(0.008)	(0.008)	(0.029)	(0.029)	(0.025)
$YieldSpread_{t-1}$		-0.018***	-0.005		0.000	0.000		-0.027**	-0.011
		(0.007)	(0.005)		(0.003)	(0.003)		(0.010)	(0.009)
$\Delta Size_{t-1,t}$			-0.316***			(0.005)			-0.490***
			(0.048)			(0.023)			(0.088)
$\Delta MV/BV_{t-1,t}$			0.331***			0.006			0.471***
			(0.036)			(0.019)			(0.062)
$\Delta Profitability_{t-1,t}$			(0.211)			(0.031)			0.403
			(0.216)			(0.116)			(0.368)
$\Delta Tangibility_{t-1,t}$			-0.964***			0.003			-0.613*
			(0.190)			(0.103)			(0.311)
$\Delta CapEx_{t-1,t}$	-0.462***	-0.531***	-0.293***						
	(0.087)	(0.083)	(0.076)						
$\Delta Cash\ Accumulation_{t-1,t}$				-0.447***	-0.436***	-0.432***			
				(0.045)	(0.045)	(0.049)			
$\Delta AssetGrowth_{t-1,t}$							-0.345***	-0.369***	-0.209***
							(0.073)	(0.072)	(0.077)
Constant	-0.066***	-0.017	0.021	0.018***	0.012	0.012	-0.090***	-0.022	0.026
	(0.014)	(0.021)	(0.017)	(0.006)	(0.009)	(0.009)	(0.022)	(0.033)	(0.029)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	218	218	218	218	218	218	218	218	218
R^2	0.14	0.26	0.54	0.33	0.36	0.36	0.10	0.15	0.37

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table X
Estimating the "True" Effect of Rating Refinement Changes Using Credit Score Models

Panel A summarizes the original coefficients used in the two credit score models. Panel B illustrates the marginal impact of an increase in firms' long-term debt issuance on firms' default probabilities and yield spreads. The effect is examined for both the average firm in Moody's 1982 credit rating refinement and the average firm in the original studies. The credit score for the former is calculated based on the annual COMPUSTAT data one year prior to the rating refinement. *DP* is the default probability calculated by converting credit scores through a logistic cumulative distribution function and *YS* is the yield spread calculated through a linear approximation based on the change in firms' default probabilities.

Panel A

Altman (1968) Model	***WC / TA***	***RE / TA***	***EBIT / TA***	***VE / TD***	***S / TA***				
Original Coefficients[a]	-1.20	-1.40	-3.30	-0.60	-0.999				
Ohlson (1980) Model	***Size***	***TL / TA***	***WC / TA***	***CL / CA***	***NI / TA***	***FFO / TL***	***INTWO***	***OENEG***	***CHIN***	***Constant***
Original Coeefficients	-0.41***	6.03***	-1.43**	0.08	-2.37**	-1.83***	0.285	-1.72***	-0.52***	-1.32

Source: Altman (1968) and Ohlson (1980).

Note: ***, **, * represent statistical significance at the 1%, 5%, and 10% level, respectively. WC/TA is working captial (data179) divided by total assets (data6); RE/TA is retained earnings (data36) divided by total assets; EBIT/TA is earnings before interest and taxes (data13) divided by total assets; VE/TD is market value of equity (data25*data199) divided by total debt (data9+data34); S/TA is sales (data12) dividied by total assets; Size is the ln(total assets/GDP price level index); TL/TA is total liabilities (data181) divided by total assets; CL/CA is current liabilities (data5) dvivided by current asset (data4); NI/TA is net income (data172) divided by total assets; FFO/TL is pre-tax income (data170) plus deprecisation and amortization (data14) divided by total liabilities; INTWO is an indicator variable equal to one if cumulative net income over the previous two years is negative, and zero otherwise; OENEG is an indicator variable equal to one if owners' equity is negative, and zero otherwise; CHIN is the scaled change in net income and is calculated as (NIt - NIt-1)/(|NIt| + |NIt-1|).

a. In Altman (1968), firms' default probability is decreasing with the Z-Score. Consistent with Hillegeist et al (2004), to make it comparable to Ohlson's O-Score, the signs of the original coefficients have been changed and all of the coefficients except S/TA have been multiplied by 100, so the Z-score is increasing in the default probability.

Panel B

Credit Score	**Benchmark**	**LTD Issuance increased by 2% * TA**				**LTD Issuance increased by 5% * TA**			
Model	**DP_0**	**DP_1**	**ΔDP_1**	**$\Delta DP_1/DP_0$**	**~ΔYS**	**DP_2**	**ΔDP_2**	**$\Delta DP_2/DP_0$**	**~ΔYS**
				Average Firm in Moody's 1982 Rating Refinement					
Z-Score	0.033	0.037	0.004	11.4%	21.3	0.042	0.009	26.8%	50.0
O-Score	0.028	0.032	0.004	12.4%	23.2	0.039	0.011	37.2%	69.6
				Average Non-Bankrupt Firm in the Original Studies [b]					
Z-Score	0.008	0.009	0.001	14.3%	26.8	0.010	0.003	34.3%	64.1
O-Score	0.008	0.009	0.001	12.7%	23.8	0.011	0.003	34.8%	65.1

b. The average non-bankrupt firms from Altman and Ohlson studies are from 1946 to 1965 and from 1970 to 1976, respectively.

Table XI
Effects of Rating Refinement Changes on Firm's Level of Issuance

Panel A reports effects of rating refinement changes on firms' debt and equity issuance. Δ*NetTotalDebt* is firms' issuance of total debt net of the change in cash and cash equivalents, scaled by the lagged total assets; Δ*Equity* is firms' equity issuance and scaled by the lagged total assets*; Upgrade* and *No Change* are rating upgrades and no changes resulting from Moody's rating refinements, respectively; *YieldSpread* is the firms' ex ante yield spread based off equal-duration treasury yield; *Size* is calculated as the log of the market value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firms' original rating assignments. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Panel A

Dependent Variable	**ΔNet Long-Term Debt$_{t,t+1}$**			**ΔEquity$_{t,t+1}$**		
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	0.033***	0.028**	0.030**	-0.003	-0.019*	-0.019*
	(0.011)	(0.013)	(0.013)	(0.010)	(0.011)	(0.011)
No Change$_t$	0.012	0.011	0.011	0.009	0.005	0.005
	(0.012)	(0.012)	(0.013)	(0.011)	(0.011)	(0.011)
YieldSpread$_{t-1}$		-0.004	-0.004		-0.003	-0.003
		(0.004)	(0.004)		(0.004)	(0.004)
ΔSize$_{t-1,t}$		0.113***	0.083*		0.112***	0.108***
		(0.037)	(0.046)		(0.032)	(0.034)
ΔMV/BV$_{t-1,t}$		-0.109***	-0.087**		0.000	0.002
		(0.027)	(0.034)		(0.024)	(0.025)
ΔProfitability$_{t-1,t}$		0.103	0.147		0.05	0.051
		(0.165)	(0.170)		(0.142)	(0.143)
ΔTangibility$_{t-1,t}$		-0.115	-0.161		-0.143	-0.143
		(0.126)	(0.134)		(0.109)	(0.109)
ΔNet Total Debt$_{t-1,t}$			0.070			
			(0.067)			
ΔEquity$_{t-1,t}$						0.041
						(0.149)
Constant	-0.01	-0.024	-0.022	0.027***	0.019	0.019
	(0.008)	(0.014)	(0.015)	(0.007)	(0.013)	(0.013)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266
R^2	0.03	0.12	0.12	0.00	0.14	0.14

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table XI – *Continued*

Effects of Rating Refinement Changes on Firm's Level of Real Outcomes

Panel B reports effects of rating refinement changes on firms' capital expenditures, cash accumulation, and asset growth. *CapEx* is firms' capital expenditure, which is calculated as change in firms' net PP&E plus depreciation and scaled by lagged total assets; *CashAccumulation* is firms' cash accumulation, which is defined as the change in cash and cash equivalents, and scaled by lagged total assets; *AssetGrowth* is firms' asset growth rate, which is defined as the change in firms' total assets and scaled by the lagged total assets; all other variables are defined as before. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Panel B

Dependent Variable	**$CapEx_{t+1}$**			**$CashAccumulation_{t+1}$**			**$AssetGrowth_{t+1}$**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Upgrade_t$	0.039***	0.031**	0.021*	-0.022**	-0.017*	-0.020**	0.044**	0.048**	0.015
	(0.011)	(0.012)	(0.012)	(0.009)	(0.010)	(0.010)	(0.022)	(0.024)	(0.024)
$No\ Change_t$	0.013	0.009	0.002	-0.006	-0.001	-0.003	0.044*	0.048*	0.033
	(0.012)	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)	(0.024)	(0.025)	(0.024)
$YieldSpread_{t-1}$		-0.007*	-0.008*		0.004	0.004		-0.001	-0.002
		(0.004)	(0.004)		(0.003)	(0.003)		(0.008)	(0.008)
$\Delta Size_{t-1,t}$			0.118***			0.046			0.326***
			(0.036)			(0.028)			(0.069)
$\Delta MV/BV_{t-1,t}$			-0.02			-0.021			-0.067
			(0.031)			(0.022)			(0.056)
$\Delta Profitability_{t-1,t}$			-0.131			0.089			0.062
			(0.161)			(0.131)			(0.308)
$\Delta Tangibility_{t-1,t}$			-0.004			0.108			-0.229
			(0.104)			(0.085)			(0.199)
$CapEx_t$	0.275***	0.284***	0.281***						
	(0.034)	(0.037)	(0.044)						
Cash $Accumulation_t$				-0.244***	-0.259***	-0.281***			
				(0.083)	(0.083)	(0.084)			
$AssetGrowth_t$							0.118**	0.112**	0.092*
							(0.049)	(0.051)	(0.055)
Constant	0.023**	0.031**	0.034**	0.029***	0.011	0.01	0.028	0.038	0.052*
	(0.010)	(0.015)	(0.014)	(0.007)	(0.011)	(0.012)	(0.019)	(0.029)	(0.028)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	266	266	266	266	266	266	266	266	266
R^2	0.21	0.23	0.27	0.06	0.08	0.09	0.03	0.04	0.15

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table XII
Effects of Rating Refinement Changes on Firms under S&P Benchmark

Panel A reports effects of rating refinement changes on firms' debt and equity issuance conditional on S&P ratings. *Long-term DebtIss* is defined as the change in firms' issuance of long-term debt net of the cash and scaled by the lagged total assets; *EquityIss* is firms' equity issuance scaled by the lagged total assets; *Upgrade* and *No Change* are rating upgrades and no changes resulting from Moody's rating refinements, respectively; *SP Rating* is firms' pre-existing S&P ratings denoted with 21 for "AAA" and 1 for "C"; *YieldSpread* is the firms' ex ante yield spread based off equal-duration treasury yield; *Size* is calculated as the log of the market value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firms' original rating assignments. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Panel A

Dependent Variable	**ΔLong-Term DebtIss$_{t,t+1}$**			**ΔEquityIss$_{t,t+1}$**		
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_t$	0.038**	0.066***	0.073***	0.004	-0.019	-0.022*
	(0.015)	(0.018)	(0.017)	(0.010)	(0.013)	(0.013)
No Change$_t$	0.031**	0.051***	0.058***	0.017*	0.010	0.007
	(0.015)	(0.015)	(0.014)	(0.010)	(0.011)	(0.011)
SP Rating$_{t-1}$	0.000	-0.010**	-0.010***	-0.003***	0.002	0.003
	(0.002)	(0.004)	(0.004)	(0.001)	(0.003)	(0.003)
YieldSpread$_{t-1}$		0.004	0.004		-0.002	-0.002
		(0.005)	(0.005)		(0.004)	(0.004)
ΔSize$_{t-1,t}$		-0.201***	-0.033		0.030	0.033
		(0.041)	(0.047)		(0.030)	(0.029)
ΔMV/BV$_{t-1,t}$		0.184***	0.076**		0.014	0.02
		(0.027)	(0.031)		(0.020)	(0.020)
ΔProfitability$_{t-1,t}$		0.769***	0.417**		0.012	0.01
		(0.189)	(0.183)		(0.137)	(0.136)
ΔTangibility$_{t-1,t}$		-0.069	-0.098		-0.326***	-0.324***
		(0.152)	(0.139)		(0.110)	(0.109)
ΔLT DebtIss$_{t-1,t}$			-0.384***			
			(0.066)			
ΔEquityIss$_{t-1,t}$						-0.114*
						(0.063)
Constant	-0.036	0.165**	0.155**	0.049***	-0.034	-0.039
	(0.023)	(0.075)	(0.069)	(0.015)	(0.054)	(0.054)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes
No. of Obs.	181	181	181	181	181	181
R^2	0.04	0.3	0.42	0.07	0.19	0.21

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table XII – *Continued*

Effects of Rating Refinement Changes on Firms under S&P Benchmark

Panel B reports effects of rating refinement changes on firms' capital expenditures, cash accumulation, and asset growth. *CapEx* is firms' capital expenditure; *CashAccumulation* is the change in cash and cash equivalents; *AssetGrowth* is firms' asset growth rate; *SP Rating* is firms' pre-existing S&P ratings denoted with 21 for "AAA" and 1 for "C"; all other variables are defined as before. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

Panel B

Dependent Variable	$\Delta CapEx_{t,t+1}$			$\Delta CashAccumulation_{t,t+1}$			$\Delta AssetGrowth_{t,t+1}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Upgrade_t$	0.047**	0.046**	0.053**	-0.018*	-0.018**	-0.030**	0.073**	0.073**	0.086**
	(0.021)	(0.022)	(0.022)	(0.009)	(0.009)	(0.012)	(0.032)	(0.032)	(0.035)
$No\ Change_t$	-0.010	-0.010	0.004	0.003	0.002	-0.004	0.024	0.023	0.046
	(0.021)	(0.022)	(0.018)	(0.009)	(0.009)	(0.010)	(0.032)	(0.032)	(0.028)
$SP\ Rating_{t-1}$	0.007***	0.007**	0.001	0.000	-0.001	0.001	0.006*	0.005	-0.004
	(0.002)	(0.003)	(0.005)	(0.001)	(0.001)	(0.003)	(0.003)	(0.005)	(0.007)
$YieldSpread_{t-1}$		-0.001	0.005		-0.003	-0.003		-0.002	0.003
		(0.008)	(0.006)		(0.003)	(0.003)		(0.012)	(0.010)
$\Delta Size_{t-1,t}$			-0.311***			0.001			-0.447***
			(0.057)			(0.027)			(0.093)
$\Delta MV/BV_{t-1,t}$			0.333***			0.004			0.482***
			(0.034)			(0.018)			(0.054)
$\Delta Profitability_{t-1,t}$			(0.107)			0.336***			0.565
			(0.225)			(0.125)			(0.354)
$\Delta Tangibility_{t-1,t}$			-0.751***			0.147			-0.762***
			(0.190)			(0.110)			(0.285)
$\Delta CapEx_{t-1,t}$	-0.615***	-0.616***	-0.378***						
	(0.075)	(0.075)	(0.068)						
$\Delta Cash\ Accumulation_{t-1,t}$				-0.439***	-0.440***	-0.407***			
				(0.053)	(0.053)	(0.059)			
$\Delta AssetGrowth_{t-1,t}$							-0.556***	-0.556***	-0.438***
							(0.069)	(0.070)	(0.069)
Constant	-0.165***	-0.161**	-0.02	0.019	0.036	0.001	-0.195***	-0.179*	0.058
	(0.033)	(0.062)	(0.089)	(0.014)	(0.026)	(0.050)	(0.048)	(0.093)	(0.141)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	181	181	181	181	181	181	181	181	181
R^2	0.32	0.32	0.63	0.30	0.30	0.35	0.29	0.29	0.57

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.

Table XIII

Change in Firms' Financing Decisions One Year Prior to the Rating Refinement

This table examines the cross-section variation in firms' financing decisions one year prior to Moody's rating refinement. Panel A estimates firms' likely rating changes based on their actual rating refinement changes whereas Panel B defines firms' likely rating outcomes based on their ex ante yield spreads. *Long-Term DebtIss* is defined as firms' issuance of long-term debt scaled by the lagged total assets; *EquityIss* is firms' equity issuance scaled by the lagged total assets; *Upgrade* and *No Change* are dummy variables denoting whether firms are likely to experience rating upgrades and no rating changes, respectively; *Size* is calculated as the log of the market value of total assets; *MV/BV* is the market-to-book ratio; *Profitability* is the operating income before depreciation and scaled by total assets; *Tangibility* is firms' net PP&Es scaled by the total assets; and lastly, *A, Baa,* and *Ba* are dummy variables indicating firms' original rating assignments. All accounting variables are yearly results calculated based on quarterly COMPUSTAT data.

	Panel A						Panel B					
Dependent Variable	**ΔLong-Term Debtlss$_{t-1,t}$**			**ΔEquitylss$_{t-1,t}$**			**ΔLong-Term Debtlss$_{t-1,t}$**			**ΔEquitylss$_{t-1,t}$**		
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade$_{t-1}$	0.010	0.001	0.002	0.013	0.016*	0.006	0.008	0.01	0.011	-0.003	-0.004	-0.002
	(0.013)	(0.013)	(0.013)	(0.009)	(0.010)	(0.006)	(0.013)	(0.013)	(0.012)	(0.009)	(0.010)	(0.006)
No Change$_{t-1}$	0.019	0.013	0.012	-0.004	0.000	0.000	-0.003	-0.005	-0.001	0.008	0.009	0.006
	(0.014)	(0.014)	(0.013)	(0.010)	(0.010)	(0.006)	(0.013)	(0.013)	(0.012)	(0.009)	(0.010)	(0.006)
ΔSize$_{t-2,t-1}$		-0.043	0.101*		-0.051	0.029		-0.036	0.109*		-0.056	0.027
		(0.050)	(0.059)		(0.037)	(0.022)		(0.051)	(0.059)		(0.038)	(0.022)
ΔMV/BV$_{t-2,t-1}$		0.091	-0.003		0.048	-0.002		0.090	-0.008		0.040	-0.006
		(0.058)	(0.060)		(0.043)	(0.025)		(0.059)	(0.061)		(0.044)	(0.026)
ΔProfitability$_{t-2,t-1}$		0.603***	0.410**		-0.134	-0.039		0.623***	0.435**		-0.092	-0.024
		(0.180)	(0.179)		(0.133)	(0.078)		(0.178)	(0.177)		(0.132)	(0.077)
ΔTangibility$_{t-2,t-1}$		0.003	-0.046		0.047	-0.02		0.032	-0.02		0.008	-0.036
		(0.185)	(0.179)		(0.136)	(0.080)		(0.185)	(0.179)		(0.137)	(0.080)
ΔNet LT Debtlss$_{t-2,t-1}$			-0.300***						-0.301***			
			(0.069)						(0.069)			
ΔEquitylss$_{t-2,t-1}$						-0.677***						-0.679***
						(0.031)						(0.031)
Constant	0.000	0.005	-0.013	-0.009	0.005	0.000	0.009	0.007	-0.013	-0.006	0.010	0.001
	(0.010)	(0.016)	(0.016)	(0.007)	(0.012)	(0.007)	(0.008)	(0.016)	(0.016)	(0.006)	(0.012)	(0.007)
Rating Class Fixed Effects		Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
No. of Obs.	252	252	252	252	252	252	252	252	252	252	252	252
R^2	0.01	0.08	0.15	0.01	0.05	0.68	0.00	0.08	0.15	0.00	0.04	0.68

Standard errors are in parentheses. ***Significant at 1%; **significant at the 5%; *significant at 10%.