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Debt Structure and Credit Ratings

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Abstract

We investigate whether a firm's debt structure can act as a mitigating factor to the negative effects of a corporate rating downgrade. Specifically, we study how a firm's relative mix of bank and non-bank financing affects its stock market valuation and leverage adjustment following a downgrade. We document that, in the high-yield segment, companies with a larger proportion of bank debt suffer less from the distorting effects of rating downgrades, as they: (i) experience less negative abnormal stock returns around the event; (ii) reduce their market leverage less than peers that rely more on other sources of debt. Our findings confirm the benefits of bank financing for risky firms and provide a number of new insights into how debt structure affects firm value and capital structure decisions over and above the information directly embedded in credit ratings.

JEL Classification: G14; G24; G32

Keywords: Credit rating agencies; Market reaction; Debt structure

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1 Introduction

The importance of credit ratings for firms is a well-established fact. Whether ratings are used by investors as a valuable source of information on the creditworthiness of the issuer or merely as an indicator to comply with regulatory requirements, managers seem to devote significant effort in targeting and maintaining a minimum rating level (Graham and Harvey, 2001). A vast body of literature has focused on the negative consequences of rating downgrades for firms. Holthausen and Leftwich (1986), Hand, Holthausen, and Leftwich (1992), Dichev and Piotroski (2001) were among the first to show that downgrades translate into negative abnormal stock and bond returns for the issuer both in the short and in the long run. More recently, Ellul, Jotikasthira, and Lundblad (2011) document large fire sales, induced by regulatory constraints, of corporate bonds downgraded to speculative grade. Kisgen (2009) argues that firms reduce leverage and debt issuance following credit rating downgrades in an attempt to preserve their minimum target rating.[1]

In this paper, we investigate whether a firm's debt structure can act as a mitigating factor to the negative effects of a corporate rating downgrade. Specifically, we study how a firm's relative mix of bank and non-bank financing affects its stock market valuation and leverage adjustment following a downgrade. Our research question is motivated by the view that, for some firms, bank based financing may prove to be more beneficial than bond based financing. Previous studies hypothesize that banks have a higher ability to monitor the lender (Diamond, 1984; Boyd and Prescott, 1986; Berlin and Loyes, 1988) than bond holders, easier access to private information and thereby the ability to perform internal credit assessment (Fama, 1985), as well as lower coordination hurdles in case of restructuring or debt renegotiation (Gertner and Scharfstein, 1991; Chemmanur and

[1] Tang (2009) and Almeida, Cunha, Ferreira, and Restrepo (2015) document a reduction in leverage and investment also when downgrades are mechanical and not driven by changes in firms' fundamentals.

Fulghieri, 1994; Houston and James, 1996). Both theory and evidence agree that firms are better off replacing costly bank debt with non-bank debt as their credit quality improves (Diamond, 1991; Chemmanur and Fulghieri, 1994; Boot and Thakor, 1997; Bolton and Freixas, 2000; Denis and Mihov, 2003; Rahu and Sufi, 2010). However, for firms of lower credit quality, the benefits associated with bank financing may still outweigh the costs. We investigate whether and how those potential benefits materialize following a negative signal issued by rating agencies on the creditworthiness of a firm.

A concern that arises when simultaneously looking at corporate credit ratings and debt structure is that the latter strongly depends upon the former. Denis and Mihov (2003) and Rahu and Sufi (2010) document that the proportion of bank financing tends to be very low for investment-grade firms and much higher for high-yield firms. If we merely looked at the mix between bank and non-bank debt in our analysis, we would simply be capturing the difference between firms of high and low credit quality. To address this issue, in all our specifications we investigate the role of the debt composition separately for investment-grade and high-yield firms and, where possible, we control for the individual rating (e.g. AA-, AA, AA+) or the rating class (e.g. AA).

We start by looking at how the reaction of stock market investors to the rating downgrade of a firm is affected by its mix of bank and non-bank debt. We consider all rating changes initiated by Standard & Poor's (S&P), Moody's, and Fitch for non-financial U.S. firms traded on Amex, Nasdaq, and NYSE and covered by Compustat and Capital IQ from 2001 to 2013. As a measure of debt mix we take the proportion of bank debt over total debt at the fiscal year-end prior to the downgrade. We employ a standard event study methodology to assess the impact of rating changes on stock returns. We find that firms that rely relatively more on bank financing experience less negative abnormal stock returns after a rating downgrade, and the mitigating effect is more significant for

high-yield firms. The findings are robust to the inclusion of a set of control variables that previous literature has found to be significant in explaining the stock price reaction to a downgrade. Our results suggest that the market value of riskier firms is less sensitive to downgrades the higher the recourse to bank financing and, hence, that equity investors attach a value to this type of debt when the credit quality deteriorates.

Next, we advance and test the hypothesis that the positive value assigned by investors to bank debt around a downgrade may stem from benefits associated with the firm's capital structure and access to funding. We examine how market leverage changes following rating downgrades in our sample of firms and whether such changes are linked to the debt structure. We follow the empirical design suggested by Flannery and Rangan (2006) and Kisgen (2009) to select the key determinants of the firm's target leverage and to measure the adjustment of the actual leverage towards the target. We observe that, in the two years after a rating downgrade, market leverage decreases as a result of a resizing in net debt issuance and, for high-yield firms, of positive net equity issuance. However, in the high-yield segment, we document that firms with a larger share of bank debt to total debt reduce their leverage less than peer firms that rely more on other sources of debt.[2] Bank financing may then help alleviate the distorting effects of a rating downgrade on the capital structure in risky firms.

All in all, we conclude that, for high-yield firms, a higher proportion of bank debt financing mitigates the negative effects of a credit rating downgrade in terms of market value and market leverage. These findings seem to confirm that bank debt is beneficial for these firms and is valued by stock investors.

The question then arises whether the mix of bank versus non-bank debt itself is also valued by

[2]As before, in order to minimize the feedback effect of rating changes on the debt structure, we consider the proportion of bank debt financing at the fiscal year-end prior to the downgrade.

rating agencies: Do credit rating agencies assign different ratings to companies with very similar credit quality (in terms of capital structure, profitability, growth opportunities, etc.) that only differ for the sources of debt financing? The documentation on rating methodologies issued by the three main rating agencies makes little, if any, reference to the debt composition of firms as a determinant of corporate ratings beyond the capital and the debt maturity structure. To investigate this aspect we need to control for the endogeneity between debt structure and credit ratings. We use an ordered probit model for corporate ratings, estimated separately for investment-grade and high-yield firms and only on firms with relatively low bank debt in each of the two groups. We then derive predicted ratings both in sample and out of sample for firms with low and high bank debt, respectively. The comparison between predicted and actual ratings reveals that rating agencies penalize investment-grade firms that use relatively more bank debt compared to those that borrow from the market, while no significant difference emerges within high-yield firms.

This paper contributes to several strands of the existing body of research. First, we add to the literature that emphasizes the importance of considering debt heterogeneity in empirical studies of capital structure (Rauh and Sufi, 2010; Colla, Ippolito, and Li, 2014). Second, our findings enrich the studies that investigate the role of credit ratings with respect to firm value (Holthausen and Leftwich, 1986; Jorion, Liu, and Shi, 2005; Bannier and Hirsch, 2010) and capital structure decisions (Kisgen, 2006; 2009). Third, we add to the studies that finds that capital markets make adjustments if the market perception is that a credit rating is not fully capturing all relevant corporate information (Alp, 2013; Baghai, Servaes, and Tamayo, 2014).

The rest of the paper is organized as follows. We describe the data in Section 2. In Sections 3 and 4, we outline the empirical design and discuss our findings. Section 5 concludes.

2 Data

Our initial sample consists of rated U.S. firms traded on the Amex, Nasdaq, and NYSE and covered by Compustat from 2001 to 2013. We measure a firm's rating with the Long Term Local Currency Issuer Rating for Standard & Poor's (S&P), the Long Term Estimated Senior Rating for Moody's, and the Long Term Issuer Default Rating for Fitch. Data on credit ratings and rating changes (downgrades and upgrades) for our sample firms come from Bloomberg and Capital IQ. Table 1 displays how we convert the alphanumerical credit ratings from the three rating agencies into numerical codes using an ordinal scale ranging from 1 for the highest rated firms to 21 for the lowest rated firms. Ratings indicating a firm in default or in selected default are assigned the value 22. Firms rated from 1 to 10 (from 11 to 21) constitute investment-grade (high-yield) firms. For part of the analysis that follows, we group the individual ratings of firms not in default into the following six rating classes in descending order: (1) Prime and high grade; (2) Upper medium grade; (3) Lower medium grade; (4) Speculative; (5) Highly speculative; (6) Substantial risks, extremely speculative, and default imminent.

Since we focus on the link between bank debt and credit ratings, we remove financial firms (SIC codes 6000 to 6999) whose debt structure is not comparable to those of other companies. We collect firm-level stock prices from the Center for Research on Securities Prices (CRSP) and annual accounting data from Compustat. Firm-level yearly data on the debt structure are from Capital IQ.[3] Following Colla, Ippolito, and Li (2014) we also remove; (1) Firm-years with missing or zero values for total assets and total debt; (2) firm-years with market or book leverage outside the unit interval; (3) firm-years for which the total debt as reported by Capital IQ and Compustat differs

[3]Our sample period starts in 2001 because, for most firms, reliable data on the debt structure are only available in Capital IQ from that year.

by more than 10%. We winsorize all continuous variables at 1% and 99%.

Table 2 documents the number of sample firms in each rating class between 2001 and 2013. In line with previous literature (Alp, 2013; Baghai, Servaes and Tamayo, 2014) we observe a decrease in the proportion of firms rated investment-grade over the years, and a corresponding increase in the proportion of firms rated high-yield. Unsurprisingly, the effect is stronger in the aftermath of the 2007–2009 recession period.[4]

The debt structure variable that we adopt throughout the analysis is the proportion of bank debt to total debt. Bank debt is collected from Capital IQ, and consists of the sum of all term loans and revolving credit (withdrawn). Table 3 shows the distribution of bank debt to total debt across rating classes for our sample firms: The mean usage of bank debt varies from 5.3% for prime and high-grade rated firms, to 31.9% for speculative firms, highlighting an important difference in the debt structure across the rating spectrum. Starting from the lower medium investment-grade class (rating class 3) and moving down the rating scale, we also observe a relevant variation in the recourse to bank debt for firms that belong to the same rating class.

3 Empirical Results

In the following two subsections we investigate whether a firm's debt structure can act as a mitigating factor to the negative effects of a corporate rating downgrade. Our focus is on how a firm's relative mix of bank and non-bank financing affects its stock market valuation and leverage adjustment following a downgrade. We center our analysis on downgrades as they are important signals issued by rating agencies on the creditworthiness of a firm. A concern that arises when

[4]The overall size of our sample is about 20%-25% smaller than the corresponding sample size of comparable studies, given that we require data availability and consistency in both Compustat and Capital IQ.

simultaneously looking at corporate credit ratings and debt structure is that the latter strongly depends upon the former. If we merely looked at the mix between bank and non-bank debt in our analysis, we would simply be capturing the difference between firms of high and low credit quality. To address this issue, we continuously investigate the role of the debt composition separately for investment-grade and high-yield firms and, where possible, control for the individual rating or rating class.

3.1 Credit rating changes and market value

In this section we test to what extent the effect of credit rating changes on the market value of a firm depends upon its debt structure. In line with the relevant literature (Holthausen and Leftwich, 1986; Hand, Holthausen, and Leftwich, 1992; Jorion, Liu, and Shi, 2005) we employ a standard event study methodology to assess the impact of rating changes on stock prices. We estimate normal (i.e. expected) returns by means of a one-factor market model:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \epsilon_{i,t} \tag{1}$$

where $R_{i,t}$ is the raw return on the common share of issuer i on day t and $R_{m,t}$ is the daily return on the value-weighted NYSE/AMEX/NASDAQ market index. The market model is estimated on a window from -210 to -15 days relative to the event date.[5] We obtain daily abnormal stock returns $AR_{i,t}$ as the difference between the raw return and the return estimated from the market

[5] Our results are robust to longer estimation windows of nine and twelve months. We opt for a simple specification such as the standard market model, as Kothari and Warner (2007) show that short-horizon event studies are not very sensitive to the benchmark specification.

model:

$$AR_{i,t} = R_{i,t} - (\widehat{\alpha}_i + \widehat{\beta}_i R_{m,t}) \tag{2}$$

We derive cumulative abnormal returns (CARs) for issuer i around each event date by aggregating $AR_{i,t}$ over the three days centered on the announcement date of the rating change, i.e. $CAR_i(-1,1) = \sum_{t=-1}^{+1} AR_{i,t}$. We retain CARs only for issuers with non-missing returns on all three days.

Table 4 presents univariate statistics of CARs around the rating changes that involve our sample firms. As expected, rating downgrades are associated with negative and significant abnormal returns, and the effect is significantly stronger for high-yield firms than for investment-grade companies. We then investigate whether the stock price reaction to the downgrade differs according to the debt structure of the firm. To distinguish between firms that rely less or more on bank financing, we use an indicator variable which equals zero if the ratio of bank debt to total debt of the firm at the year-end before the downgrade is below the median value of the ratio for the corresponding rating class in the year, and one otherwise. The rating class of the firm is determined with respect to the rating before the downgrade and follows the six classes in Table 1. We compute medians across rating classes instead of individual ratings to ensure a sufficient sample size on a yearly basis. We adopt yearly medians to account for the significant time variation in bank financing over our sample period, which is evident from Figure 1: We observe a clear increase in the median bank debt to total debt ratio for both investment-grade and high-yield firms in the years from 2004 to 2008, followed by a sharp drop until 2010. The tent-shaped curve reflects the increased use of bank debt in the years leading up to the financial crisis and the subsequent shift to non-bank debt funding in the aftermath of the crisis.

We find that the debt structure does not seem to matter for investment-grade companies, while

in high-yield firms the negative stock return following a downgrade is significantly stronger for firms that rely less on bank financing. These preliminary findings seem to be consistent with our hypothesis that bank financing may be useful in mitigating the distorting effects of a firm's downgrade. For completeness, we also report CARs for upgrades: In line with previous research (e.g., Holthausen and Leftwich, 1986; Hand, Holthausen, and Leftwich, 1992; Goh and Ederington, 1993) we do not find stock prices to react significantly to upgrades. Thus, we will focus the remainder of our analysis of stock returns only on downgrades.

While the univariate findings provide some interesting insights, we need to control for a number of variables that may also affect CARs. Table 5 displays the results from multivariate regressions of the CARs surrounding credit rating downgrades:

$$CAR_{i,t} = \gamma_t + \beta' X_{i,t} + \xi_t \tag{3}$$

Where X is a vector of control variables that previous literature has found to be significant determinants of abnormal returns: (1) the numerical value of the firm's rating before the downgrade as from Table 1; (2) the magnitude of the downgrade, i.e. the number of notches of the rating change, measured as the numerical value of the new rating minus the numerical value of the old rating; (3) a fallen angel dummy, that takes a value of one if the rating changes from investment-grade to high yield; (4) a dummy that takes a value of one if the downgrade was preceded by a negative watch; (5) the natural logarithm of the reciprocal of the number of days between the date of the last rating downgrade performed by another rating agency and the event date;[6] (6) the size of the firm, measured as the natural logarithm of market capitalization. We include year fixed effects,

[6]Days are set equal to 60 if both agencies change on the same date, if the previous change by the other agency was in the opposite direction, or if the previous change by the other agency was more than 60 days earlier.

γ_t, to account for the impact that financial markets conditions may have on investors' reaction to negative news such as a downgrade.

In the first three columns we regress CARs on these standard variables. The first column shows results for all downgrades while the second and third columns display results conditional on whether the rating prior to the downgrade was investment-grade or high yield, respectively. In general, we observe that the stock price response to the downgrade is negatively associated with the starting credit quality of the firm: The better the original rating, the less negative the abnormal returns following the downgrade. In high-yield firms we observe that the stock price reaction is also stronger for downgrades of more notches and milder if the rating action had been somehow anticipated by a negative watch. Finally, subsequent downgrades from different rating agencies seem to trigger a stronger response from the investors.

From the fourth column onwards we add to the baseline specification our variable of interest, i.e. the ratio of bank debt to total debt of the firm at the year-end prior to the downgrade. The variable is positive and statistically significant with a coefficient ranging from 2.0 percentage points for high-yield firms (significant at 5% confidence level) to 2.5 percentage points for investment-grade firms (significant at 10% confidence level). To assess whether our findings might be simply masking the different debt maturity of bank and bond debt, we also include as control variable the proportion of short term debt to total debt of the firm at the year-end prior to the downgrade, where short term debt is all debt due within one year. The last three columns in Table 5 show that controlling for debt maturity does not explain away our results: A higher proportion of short term debt indeed translates into more negative abnormal returns, but the proportion of bank debt to total debt remains significant and virtually unchanged. All in all, the findings in Table 5 confirm that equity capital market investors react less negatively to a rating downgrade the more a firm's

debt is based on bank financing.

The above specification rests on the assumption that the proportion of bank debt and the proportion of short term debt reflect the debt structure of the firm before the downgrade takes place. In fact, this may not be the case when multiple downgrades occur in the same fiscal year, and the debt structure may be altered during the year as an effect of subsequent downgrades. To control for this, in Table 6 we rerun the event study only on the first rating change that takes place each fiscal year. We note that the coefficient estimates are similar to those reported in Table 5 with one important difference: Only the results for high-yield firms remain statistically significant. For those firms the coefficient is 2.1%, statistically significant at 5% confidence level. All in all, the results presented in Tables 4 to 6 suggest that, for high-yield firms, the market value turns out to be less sensitive to rating downgrades, the higher the proportion of bank financing.

3.2 Credit rating changes and market leverage

The above findings indicate that equity capital markets seem to take into account the debt structure when reacting to a credit rating downgrade in risky firms. In this section we investigate if this positive effect stems from the firm's capital structure and its access to funding. In particular, we analyse how market leverage changes after a rating downgrade when the debt structure of the firm is accounted for.

Our empirical design builds upon Flannery and Rangan (2006) and Kisgen (2009). The starting point is the partial adjustment model of market leverage proposed by Flannery and Rangan (2006). The basic premise of this model is that firms may only partially adjust to a target leverage over time due to adjustment costs. In their framework a firm's target market debt ratio (MDR)—defined as short-term debt plus long-term debt, divided by total debt plus the market value of equity—can be

determined as a linear combination of various capital structure determinants X as follows:

$$MDR^*_{i,t} = \beta X_{i,t-1} \tag{4}$$

The variables X include: (1) Profitability, measured as EBIT over total assets; (2) Depreciation over total assets; (3) Tangibility, measured as the proportion of property, plant and equipment to total assets; (4) R&D, i.e. research and development expenses, measured both as a ratio over total assets and with a dummy variable which equals one when the information is missing in the Compustat filings; (5) Market-to-Book ratio, measured as book value of assets minus book value of equity plus market value of equity, all divided by book value of assets; (6) Size, as the natural logarithm of market capitalization; (7) the annual median market leverage for the industry the company belongs to (based on 2-digit SIC code). To account for the possibility that a firm may be unable to fully adjust to its target leverage due to adjustment costs, Flannery and Rangan (2006) propose a partial adjustment model, which Kisgen (2009) extends as follows to examine the incremental effects of rating changes:

$$MDR_{i,t} - MDR_{i,t-1} = \lambda\beta X_{i,t-1} - \lambda MDR_{i,t-1} + \Phi_1 Downgrade_{i,t-1} + \Phi_2 Upgrade_{i,t-1} + \epsilon_{i,t} \tag{5}$$

where λ is the speed of adjustment, and $Downgrade$ and $Upgrade$ are dummy variables equal to 1 if the firm was downgraded or upgraded in the previous year, respectively. Kisgen (2009) documents asymmetric changes in leverage following rating actions: Market leverage is reduced after downgrades, but does not change significantly after upgrades.

We further refine the analysis by examining the magnitude of adjustment toward a target lever-

age conditional on whether the firm was downgraded in the previous period:

$$(MDR_{i,t} - MDR_{i,t-1})|Downgrade_{i,t-1} = \lambda\beta X_{i,t-1} - \lambda MDR_{i,t-1} + \eta P_{i,t-2} + \kappa L_{i,t-2} + \epsilon_{i,t} \quad (6)$$

In this specification, we, in addition to the determinannts X, add our variable of interest, bank debt over total debt, P, as well as the amount of short term debt to total debt, L, both computed at fiscal year-end before the downgrade (hence in $t-2$). We also add year fixed effects, and the net magnitude of the rating changes that affect the firm in the year of the downgrade (in notches), computed across all rating agencies, as a control for the intensity of the rating change. Given the heterogeneity of debt structure across rating classes, we re-estimate model (6) separately on investment-grade and high-yield firms. We label a firm as high-yield if at least one rating agency among S&P, Moody's and Fitch rates the company at speculative or lower before the downgrade takes place. Conversely, to be labelled as investment-grade, all credit rating agencies must give the firm a rating of lower medium or above.

Table 7 presents univariate statistics of changes in market leverage following credit rating changes in the prior period. Not surprisingly, the reduction in leverage following a downgrade is statistically greater for high-yield firms compared to investment-grade rated firms. Again, to distinguish between firms that rely less or more on bank financing, we use an indicator variable which equals zero if the ratio of bank debt to total debt of the firm at the year-end before the change is below the median value of the ratio for the corresponding rating class (of the six rating classes in Table 1) in the year, and one otherwise. We find that the debt structure does not seem to matter for investment-grade companies, while in high-yield firms the change in market leverage following a downgrade is significantly stronger for firms that rely less on bank financing. High-yield firms change their market leverage less if they are above the median of bank to total debt financing within their rating

group. For completeness, we report the effect of upgrades on market leverage, although they are less evident. Firms that are rated investment-grade increase their leverage after an upgrade while there is no significant effect for high-yield rated firms. No definitive conclusions can be drawn regarding the effect of the debt structure given that the sample size of some rating classes is very small. All in all, the main take away from Table 7 is that high-yield firms reduce their leverage less if their debt structure consists relatively more of bank debt.

Table 8 displays the results from regression (5), which is the (unconditional) benchmark specification on the entire panel. In our setting, the dummy variable $Downgrade$ ($Upgrade$) indicates the event that at least one of the rating agencies that rate the firm has reduced (increased) the issuer's rating during the previous year. We also include year fixed effects. In the first column we see that the lagged level of market leverage is the chief explanatory factor of changes in leverage. The higher the existing leverage, the larger is the reduction in leverage. Profitability and the median level of industry leverage are important explanatory variables as well. The reduction in market leverage is lower, the higher the median industry leverage level. The effect of profitability is the opposite: The higher the profitability, the more market leverage is reduced. These effects are consistent with the results in Flannery and Rangan (2006). The downgrade dummy enters the regression with a negative and statistically significant coefficient of -1.4%, in column 2, which is consistent with Kisgen's (2009) results. This means that, following a downgrade, firms need to reduce their market leverage more.

The results from model (6) are shown in Table 9. In the first three columns we look at leverage changes in all firms that were downgraded in the previous year. The following three columns present the results for investment-grade firms. The last three columns present the results for high-yield firms. Overall, lagged market leverage remains the most important factor in explaining the

change in market leverage. Also depreciation is an important factor for high-yield firms. Both these variables have a strongly negative impact on the change in market leverage. That is to say, the higher these variables, the more market leverage will be reduced. Firm size and median levels of industry debt have the opposite effect. Larger firms in general, and high-yield firms in industries with high levels of debt, experience less reduction in market leverage.

Our key variable, bank debt to total debt, is positive and significant with a coefficient of 2.8%. It remains virtually unchanged after controlling also for the amount of short term debt to total debt and rating change intensity. The positive effect of bank debt for downgraded firms is only present however for the firms that were high-yield before the downgrade, while it is not significant for investment-grade firms. All in all, the results from tables 7 to 9 provide evidence that the more a high-yield firm relies on bank debt, the less that firm will have to reduce its leverage following a credit rating downgrade.

In order to examine what drives the change in market leverage, we look at the capital structure of downgraded firms from two years before the downgrade to two years after the downgrade. We estimate the following regressions:

$$Y_{i,t} = \alpha_i + I_{i,t}^{t-2} * \beta_1 + I_{i,t}^{t} * \beta_2 + I_{i,t}^{t+1} * \beta_3 + I_{i,t}^{t+2} * \beta_4 + \epsilon_{i,t} \tag{7}$$

where α represents firm fixed effects, the I variables are indicators for two fiscal years before, the fiscal year of, the fiscal year after, and two fiscal years after the downgrade, respectively. We use three dependent variables, Y, namely: (1) Yearly changes in market leverage (MDR); (2) Net debt issuance, defined as the amount of long term debt issued in the year minus long term debt reduction in the year plus the change in current debt, all divided by total assets at the beginning of the year; (3) Net equity issuance, defined as the sale of common and preferred stock minus the purchase of

common and preferred stock, divided by total assets at the beginning of the year. The β coefficients represent the within-firm change in the dependent variable for a given fiscal year relative to the omitted category, which is the year before the downgrade $t-1$. We choose as the omitted category one year before the downgrade to test whether patterns are statistically significantly different right before and immediately after the downgrade. Thus, the β_3 coefficient represents the average within-firm change in the outcome variable in the fiscal year after the downgrade relative to the fiscal year before the downgrade.

Table 10 presents the results. We note that there are no significant effects for either of the outcome variables from two years before to the year before the downgrade. By contrast, most coefficients estimates are statistically significant in the year of the downgrade, and each of the following two years. MDR increases in the year of the downgrade, but is reduced in the following two years. The magnitude appears to be largest among the investment grade group of firms. This pattern of change in MDR is driven by the fact that firms—in relation to the year before the downgrade—reduce their net debt issuance while they simultaneously increase their net equity issuance.

Figure 2 displays the pattern of the yearly average change of the outcome variables from regression (7) from two years before the downgrade to two years after the downgrade. Averages and 95% confidence intervals are displayed. Thus, while Table 10 present the changes in market leverage and its key components in relation to the year before the downgrade, figure 2 depicts these changes year by year. Some interesting patterns emerge with respect to how investment-grade and high-yield firms behave after the downgrade. In sub-figures (d) and (g) we see that, for both groups, MDR drops in the year after the downgrade and that the reduction continues also in the subsequent year. The initial drop is however of a much larger magnitude for the high-yield firms compared

to the investment-grade firms. As shown in sub-figures (e) and (h) net debt issuance is zero for both groups of firms in the years after the downgrade. By contrast, net equity issuance increases in each of the two years after the downgrade for high-yield firms (sub-figure i), while it decreases for investment-grade firms (sub-figure f). Thus, high-yield firms' relative reduction in market leverage compared to investment-grade firms stems from their increase in shareholders equity rather than on large differences in the amount of outstanding debt.

4 Credit rating level and bank debt

The findings so far suggest that high-yield companies with more bank financing suffer less from the distorting effects of a rating downgrade on their market value and their capital structure. The question then remains if the debt structure itself has a direct impact on the firm's credit rating.

The link between the debt structure of a firm and its credit rating is well established in the literature. Denis and Mihov (2003), Rahu and Sufi (2010) document that firms with high credit quality borrow primarily from the bond market, while the proportion of bank debt increases for riskier borrowers.[7] The summary statistics in Table 3 confirm this empirical evidence for our sample firms. Such difference in the usage of bank versus market based debt is itself largely determined by the firm's rating, as predicted by the theoretical models based on information asymmetry, borrower reputation, and efficient renegotiation.

What, instead, remains fairly unexplored is the extent to which the mix between bank debt and other sources may directly impact corporate credit ratings. Essentially, we here ask whether credit rating agencies assign different ratings to companies with very similar credit quality (in

[7]Firms with low credit ratings lack access to shelf registration debt, medium-term note programs, and commercial paper.

terms of capital structure, profitability, growth opportunities, etc.) that only differ for the sources of debt financing. The documentation on rating methodologies issued by the three main rating agencies highlights the importance of a firm's capital structure (i.e. debt-equity ratios) and of the maturity structure of the debt (i.e. long-term versus short-term debt) in assigning long term issuer credit ratings. However, little if any reference is made to the firm's debt composition. Specifically, Moody's does not explicitly include debt structure among the determinants of credit ratings for non-financial firms (see Moody's, 2016, for individual sectors), while Fitch only refers to bank debt as a potential source of financial flexibility in passing (Fitch, 2010). S&P indicates that the debt composition is taken into account when assigning corporate ratings (Standard and Poor's, 2008), but its effect is ambivalent: While in normal market condition the access to the bond market is seen as preferable for investment-grade firms, bank credit is recognized as the most reliable source for debt capital for speculative-grade firms and/or in volatile markets, although the benefits associated with bank credit may be partly offset by tighter covenants. Ultimately, whether the debt structure of a firm affects its credit ratings remains an empirical question.

To investigate this aspect, we need to control for endogeneity, as we know that the credit quality of the issuer plays a significant role in determining the access to different funding sources. To address the endogeneity issue, we exploit the cross-sectional variation in the debt composition of firms with similar credit quality suggested by Rahu and Sufi (2010) and confirmed by the summary statistics in Table 3. First, within each of the six rating classes, we distinguish between firms that rely less or more on bank financing by defining an indicator variable which equals zero if the ratio of bank debt to total debt of the firm at the year-end is below the median value of the ratio for the corresponding rating class in the year, and one otherwise.

Second, we estimate an ordered probit model to explain the ratings in our panel as a func-

tion of firm characteristics, year and industry fixed effects. We estimate the model separately for investment-grade and high-yield firms, following evidence of different empirical patterns in corporate ratings between the two groups (Alp, 2013). Importantly, the model is estimated only on firms that have a bank debt indicator equal to zero (i.e. below median bank debt for the corresponding rating class in the year). The ordered probit model maps the individual ratings $IR_{i,t}$ of firm i in year t into a partition of the unobserved linking variable $Z_{i,t}$ according to threshold points μ as follows:

$$IR_{i,t} = \begin{cases} 1 & \text{if } Z_{i,t} \in (-\infty, \mu_1) \\ 2 & \text{if } Z_{i,t} \in [\mu_1, \mu_2) \\ \vdots & \\ 9 & \text{if } Z_{i,t} \in [\mu_8, \mu_9) \\ 10 & \text{if } Z_{i,t} \in [\mu_9, \infty) \end{cases} ; IR_{i,t} = \begin{cases} 11 & \text{if } Z_{i,t} \in (-\infty, \mu_{11}) \\ 12 & \text{if } Z_{i,t} \in [\mu_{11}, \mu_{12}) \\ \vdots & \\ 16 & \text{if } Z_{i,t} \in [\mu_{15}, \mu_{16}) \\ 17 & \text{if } Z_{i,t} \in [\mu_{16}, \infty) \end{cases} \tag{8}$$

for investment-grade ($IR_{i,t} = 1, ..., 10$) and high-yield ($IR_{i,t} = 11, ..., 17$), respectively. In the high-yield subsample, we group together the ratings classified as substantial risk, extremely speculative, and default imminent (i.e. rating codes from 17 to 21) since they are scarce and this would lead to empty cells in the probit. The latent variable $Z_{i,t}$ is then linked to a set of underlying observed variables:

$$Z_{i,t} = \alpha_t + \gamma_j + \beta' X_{i,t} + \epsilon_{i,t} \tag{9}$$

where α_t denotes year fixed effects, γ_j denotes industry fixed effects (based on 2-digit SIC codes), β is the vector of slope coefficients, and the matrix $X_{i,t}$ contains columns with explanatory variables.[8]

[8]Given that we use year and industry fixed effect, but not firm fixed effects, our specification is unlikely to suffer

The selection of the explanatory variables to include in the ordered probit is dictated by both prior literature (Alp, 2013; Baghai, Servaes and Tamayo, 2014) as well as industry practice in the rating process (Standard and Poor's, 2008). We employ the following variables: (1) Firm size, measured as the natural logarithm of market capitalization; (2) Cash, given by the sum of cash and short-term investments, divided by total assets; (3) Tangibility, measured as the total value of property, plant, and equipment, divided by total assets; (4) R&D, i.e. research and development expenses divided by total assets, set to zero if data are missing; (5) Capex, i.e. capital expenditures divided by total assets; (6) Market-to-Book ratio, measured as book value of assets minus book value of equity plus market value of equity, all divided by book value of assets; (7) Interest coverage, measured as operating income after depreciation plus interest expenses, divided by interest expenses; (8) Profitability, measured as operating income before depreciation, divided by sales; (9) Leverage, measured as short-term debt plus long-term debt, all divided by total assets; (10) Beta, derived from regressing the firm's daily stock returns on the CRSP value-weighted index return over the past calendar year; (11) Idiosyncratic risk, measured as the root mean squared error from the regression of firm's daily stock returns on the CRSP value-weighted index return;[9] (12) Short-term debt, measured as short-term debt divided by total debt. Following Alp (2013) and the rating agencies guidelines, we use averages of interest coverage, profitability, and total debt leverage computed over the past three years. We add year fixed effects to capture the time variation in rating standards documented by Alp (2013) and Baghai, Servaes and Tamayo (2014), as well as industry fixed effects to account for specificities in ratings across sectors.

Table 11 reports the estimates from the ordinal probit regressions on investment-grade and high-

from the incidental parameter problem. However, we also repeat the estimation using a standard OLS model and our conclusions remain unchanged. The results are available from the authors upon request.

[9] A minimum of 50 observations in the calendar year is required to estimate the beta and the idiosyncratic risk.

yield firms. Since our outcome variables are inversely related to credit quality, a positive coefficient indicates a negative impact on the level of rating, and vice versa. The findings confirm the relevance of the standard determinants of credit ratings.

Third, we use the predicted probabilities generated from the ordered probit models to derive predicted ratings both in-sample for firms whose proportion of bank debt is below the median for the corresponding rating class in the year, and out-of-sample for firms with a ratio of bank debt to total debt above the median. We define rating errors as the difference between the rating predicted by the model and the actual rating assigned by the rating agency. Positive rating errors indicate that the actual rating is better than the predicted one, while negative rating errors indicate that the actual rating is more conservative than the predicted one. Given our estimation strategy, if bank financing is a significant determinant of corporate ratings over and beyond the standard determinants included in the ordered probit, we expect to find differences in the rating errors between firms that rely relatively less or more on bank debt.

Figure 3 shows the distribution of rating errors in-sample (low bank debt) and out-of-sample (high bank debt) for both investment-grade and high-yield firms. Summary statistics of the rating errors are reported in Table 12. Our findings indicate that, on average, rating agencies assign higher ratings than the ones predicted by the model to investment-grade firms and lower ratings than the predicted ones to speculative firms: In essence, our probit specification consistently underestimates (overestimates) corporate ratings for companies of high (low) credit quality. Most interestingly, this pattern is not entirely homogeneous across low bank debt and high bank debt firms. Investment-grade issuers that rely relatively less on bank financing enjoy significantly higher ratings than those whose proportion of bank debt is above the median. No significant difference emerges, instead, between low and high bank debt firms in the high-yield category. This seem to suggest that rating

agencies particularly value the recourse to the bond market for companies of good credit standing, while they recognize the importance and flexibility of bank funding as the credit quality deteriorates.

It is worth noticing that our empirical strategy relies on two main assumptions. First, potential omitted variables from the probit specification should not be correlated with the recourse to bank financing. Second, we estimate the ordered probit model on individual rating codes (1 to 17) while we categorize firms into low and high bank debt over six rating classes. This could lead to a problem if all low (high) bank debt firms of a given rating class were clustered into specific individual ratings: For example, if all low bank debt firms in the rating class 3 had rating BBB- and all high bank debt firms had rating BBB+. This is not the case, as we compute that the proportion of firms labelled as high bank debt in each rating code ranges between 35% and 67%.

5 Conclusion

We find that high-yield firms that rely relatively more on bank financing versus public debt financing experience less negative abnormal stock returns after a credit rating downgrade. In other words, the market value for a high-yield firm is less sensitive to downgrades the higher the bank content of its debt structure. This suggests that equity capital market investors view the composition of debt as an additional factor to take into account when pricing equity around credit rating events.

In addition, we also find that in the years after a downgrade, high-yield firms with a larger share of bank debt to total debt need to reduce their leverage less than peer firms that rely more on other financing sources. From the viewpoint of a manager of a high-yield firm, bank financing may thus help alleviate the distorting effects of a rating downgrade on the firm's capital structure. All in all, our results point to that a firm's debt structure play an important role over and beyond what can be attributed to its credit rating.

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Table 1: Mapping of alphanumerical credit ratings into numerical codes

This table reports the mapping of the alphanumerical credit ratings from Moody's, Standard and Poor's, and Fitch into numerical codes.

Main classification	Rating	Moody's	S&P	Fitch	Code	Rating class
Investment-grade	Prime	Aaa	AAA	AAA	1	1
	High	Aa1	AA+	AA+	2	1
		Aa2	AA	AA	3	1
		Aa3	AA-	AA-	4	1
	Upper medium	A1	A+	A+	5	2
		A2	A	A	6	2
		A3	A-	A-	7	2
	Lower medium	Baa1	BBB+	BBB+	8	3
		Baa2	BBB	BBB	9	3
		Baa3	BBB-	BBB-	10	3
High-yield	Speculative	Ba1	BB+	BB+	11	4
		Ba2	BB	BB	12	4
		Ba3	BB-	BB-	13	4
	Highly speculative	B1	B+	B+	14	5
		B2	B	B	15	5
		B3	B-	B-	16	5
	Substantial risks	Caa1	CCC+	CCC+	17	6
		Caa2	CCC	CCC	18	6
		Caa3	CCC-	CCC-	19	6
	Extremely speculative	Ca	CC	CC	20	6
	Default imminent	C	C	C	21	6
In default	In default		D	DDD/DD/D	22	-

Table 2: Credit rating distribution over time

This table displays the yearly rating distribution of our sample firms, classified according to the six rating classes defined in Table 1. The sample includes rated non-financial U.S. issuers with valid data available from CRSP, Compustat and Capital IQ.

Rating class	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	33	29	26	22	23	24	23	23	22	22	18	17	19
2	139	140	137	136	131	118	116	106	104	102	107	108	117
3	247	269	258	261	253	244	239	239	250	261	264	268	268
4	229	283	291	288	285	279	272	254	225	234	259	257	258
5	160	171	168	181	175	198	209	197	209	225	208	220	220
6	26	28	17	13	13	14	10	14	27	9	10	9	9
Total	834	920	897	901	880	877	869	833	837	853	866	879	891

Table 3: Bank debt to total debt: Summary statistics

This table reports summary statistics for the proportion of bank debt to total debt in our sample firms, classified according to the six rating classes defined in Table 1. The sample includes rated nonfinancial U.S. issuers with valid data available from CRSP, Compustat and Capital IQ.

Rating class	Mean	Std. dev.	10th	25th	50th	75th	90th	# Obs
1	0.053	0.150	0.000	0.000	0.000	0.037	0.124	301
2	0.053	0.113	0.000	0.000	0.002	0.054	0.175	1,561
3	0.136	0.222	0.000	0.000	0.030	0.177	0.421	3,321
4	0.319	0.323	0.000	0.005	0.231	0.530	0.887	3,414
5	0.309	0.326	0.000	0.000	0.197	0.540	0.888	2,541
6	0.255	0.270	0.000	0.039	0.162	0.396	0.612	199

Table 4: Stock price response to credit rating changes: Univariate

This table reports univariate results for issuers' CARs surrounding rating changes based on whether the issuer was rated investment-grade (IG) or high-yield (HY) prior to the rating change. CARs are market-adjusted stock returns aggregated over the three-day event window (-1, 1), where day 0 is the date of a rating change. The rating changes include downgrades and upgrades of nonfinancial U.S. issuers by S&P, Moody's and Fitch. Firms are split into low bank debt and high bank debt depending on whether the ratio of bank debt to total debt of the firm at the year-end before the rating change is below or above the median value of the ratio for the corresponding rating class in the year. Rating classes are as defined in Table 1. T-test and z-test denote two-sample t-test for difference in means and Wilcoxon test for difference in medians. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Mean	Std. err.	# Obs	t-test	z-test
IG: Downgrades	-0.011***	0.002	1,653	7.501***	6.728***
HY: Downgrades	-0.034***	0.003	2,564		
IG low bank debt/total debt: Downgrades	-0.012***	0.003	875	-0.612	0.774
IG high bank debt/total debt: Downgrades	-0.010***	0.003	778		
HY low bank debt/total debt: Downgrades	-0.038***	0.003	1,360	-1.790*	-2.185**
HY high bank debt/total debt: Downgrades	-0.029***	0.004	1,204		
IG: Upgrades	0.001	0.001	752	-0.642	0.378
HY: Upgrades	0.002*	0.001	2,130		
IG low bank debt/total debt: Upgrades	0.002	0.001	422	1.048	0.624
IG high bank debt/total debt: Upgrades	-0.000	0.002	330		
HY low bank debt/total debt: Upgrades	0.002	0.001	1,107	-0.323	-0.491
HY high bank debt/total debt: Upgrades	0.002	0.002	1,023		

Table 5: Stock price response to credit rating downgrades: Multivariate

This table reports regression results for issuers' CARs surrounding rating downgrades. CARs are market-adjusted stock returns aggregated over the three-day event window (-1, 1), where day 0 is the date of a downgrade. The downgrades by S&P, Moody's and Fitch refer to nonfinancial U.S. issuers. Explanatory variables include: The numerical rating prior to the downgrade (Previous rating); the unit increase in the numerical rating following the downgrade (# notch changes); a dummy variable that equals one if, following the downgrade, the issuer has lost his investment-grade status (From IG to HY); a dummy variable that equals one if the issuer was put under negative watch before the downgrade (Preceded by neg. watch); the natural logarithm of the reciprocal of the number of days between the date of the last rating downgrade performed by another rating agency and the event date (ln(Days)); the natural logarithm of market capitalization (Size); the proportion of bank debt (Bank debt/Total debt) and the debt maturity (Short-term debt/Total debt), at the year-end prior to the downgrade. Robust standard errors in parenthesis. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms	IG	HY	All firms	IG	HY	All firms	IG	HY
Previous rating	-0.004***	-0.005***	-0.006***	-0.004***	-0.005***	-0.006***	-0.004***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
# notch changes	-0.010***	0.003	-0.017***	-0.010***	0.004	-0.017***	-0.008**	0.004	-0.015***
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)
From IG to HY	-0.001	-0.008		-0.001	-0.009		-0.002	-0.009	
	(0.005)	(0.006)		(0.005)	(0.006)		(0.005)	(0.006)	
Preceded by neg. watch	0.008**	0.003	0.009*	0.008**	0.003	0.009*	0.008**	0.003	0.009*
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)
ln(Days)	-0.006***	-0.006**	-0.006*	-0.006***	-0.006**	-0.006*	-0.006**	-0.006**	-0.005*
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Size	0.002	-0.004**	0.006***	0.003**	-0.004**	0.006***	0.003*	-0.004**	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Bank debt/total debt				0.023***	0.025*	0.020**	0.023***	0.023*	0.019**
				(0.007)	(0.013)	(0.008)	(0.007)	(0.014)	(0.008)
Short-term debt/total debt							-0.026**	0.011	-0.043***
							(0.010)	(0.009)	(0.016)
Constant	-0.034*	0.005	0.003	-0.039**	0.003	-0.007	-0.032*	-0.000	-0.011
	(0.019)	(0.022)	(0.033)	(0.019)	(0.022)	(0.033)	(0.019)	(0.021)	(0.033)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,217	1,653	2,564	4,217	1,653	2,564	4,196	1,651	2,545
Adj. R-squared	0.043	0.066	0.038	0.045	0.068	0.040	0.045	0.068	0.040

Table 6: Stock price response to first credit rating downgrades of the year: Multivariate

This table reports regression results for issuers' CARs surrounding the first rating downgrade in a year, in the case of multiple downgrades. CARs are market-adjusted stock returns aggregated over the three-day event window (-1, 1), where day 0 is the date of a downgrade. The downgrades by S&P, Moody's and Fitch refer to nonfinancial U.S. issuers. Explanatory variables include: The numerical rating prior to the downgrade (Previous rating); the unit increase in the numerical rating following the downgrade (# notch changes); a dummy variable that equals one if, following the downgrade, the issuer has lost his investment-grade status (From IG to HY); a dummy variable that equals one if the issuer was put under negative watch before the downgrade (Preceded by neg. watch); the natural logarithm of the reciprocal of the number of days between the date of the last rating downgrade performed by another rating agency and the event date (ln(Days)); the natural logarithm of market capitalization (Size); the proportion of bank debt (Bank debt/Total debt) and the debt maturity (Short-term debt/Total debt), at the year-end prior to the downgrade. Robust standard errors in parenthesis. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms	IG	HY	All firms	IG	HY	All firms	IG	HY
Previous rating	-0.003***	-0.004***	-0.006***	-0.003***	-0.004***	-0.006**	-0.004***	-0.004***	-0.006***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
# notch changes	-0.005	0.006	-0.013*	-0.005	0.006	-0.013*	-0.003	0.006	-0.008
	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)	(0.007)
From IG to HY	0.011*	0.006		0.010*	0.006		0.009	0.006	
	(0.006)	(0.007)		(0.006)	(0.007)		(0.006)	(0.007)	
Preceded by neg. watch	0.006	0.005	0.006	0.005	0.004	0.005	0.005	0.004	0.004
	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)
ln(Days)	-0.017	-0.008	-0.028	-0.016	-0.008	-0.026	-0.004	-0.008	0.003
	(0.016)	(0.008)	(0.027)	(0.015)	(0.008)	(0.027)	(0.011)	(0.008)	(0.023)
Size	0.004**	-0.001	0.007**	0.004**	-0.000	0.007***	0.004**	-0.000	0.007***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Bank debt/total debt				0.021***	0.012	0.019**	0.024***	0.013	0.021**
				(0.008)	(0.011)	(0.010)	(0.008)	(0.012)	(0.010)
Short-term debt/total debt							-0.037***	-0.002	-0.061**
							(0.014)	(0.008)	(0.027)
Constant	-0.096	-0.030	-0.098	-0.096	-0.030	-0.104	-0.038	-0.029	0.013
	(0.066)	(0.039)	(0.117)	(0.066)	(0.039)	(0.117)	(0.051)	(0.039)	(0.102)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,321	988	1,333	2,321	988	1,333	2,310	987	1,323
Adj. R-squared	0.036	0.024	0.033	0.03	0.024	0.035	0.042	0.023	0.038

Table 7: Market leverage following rating changes: Univariate

This table reports univariate results for change in market leverage (MDR), defined as the book value of debt divided by the book value of debt plus the market capitalization of equity, following a rating change in the previous period based on whether the issuer was rated IG or HY prior to the rating change. The rating changes include downgrades and upgrades of nonfinancial U.S. issuers by S&P, Moody's and Fitch. Firms are split into low bank debt and high bank debt depending on whether the ratio of bank debt to total debt of the firm at the year-end before the rating change is below or above the median value of the ratio for the corresponding rating class in the year. Rating classes are as defined in Table 1. T-test and z-test denote two-sample t-test for difference in means and Wilcoxon test for difference in medians. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Mean	Std. err.	# Obs	t-test	z-test
IG: Downgrades	-0.014***	0.004	769	5.532***	5.796***
HY: Downgrades	-0.048***	0.005	969		
IG low bank debt/total debt: Downgrades	-0.012**	0.006	386	0.411	-0.162
IG high bank debt/total debt: Downgrades	-0.015***	0.005	383		
HY low bank debt/total debt: Downgrades	-0.057***	0.007	493	-1.721*	-1.987**
HY high bank debt/total debt: Downgrades	-0.040***	0.007	476		
IG: Upgrades	0.013***	0.003	411	3.484***	4.360***
HY: Upgrades	-0.003	0.003	1,146		
IG low bank debt/total debt: Upgrades	0.013***	0.003	401	-0.316	-0.841
IG high bank debt/total debt: Upgrades	0.020	0.023	10		
HY low bank debt/total debt: Upgrades	-0.001	0.004	1,079	2.406**	1.918**
HY high bank debt/total debt: Upgrades	-0.037**	0.014	67		

Table 8: Market leverage following rating changes: Multivariate

This table reports regression results for changes in market leverage (MDR) defined as the book value of debt divided by the book value of debt plus the market capitalization of equity. Explanatory variables include: Lagged levels of market leverage (MDR_{t-1}); depreciation over total assets ($Depreciation_{t-1}$); EBIT over total assets ($Profitability_{t-1}$); fixed assets over total assets ($Tangibility_{t-1}$); the natural logarithm of market capitalization ($Size_{t-1}$); market-to-book (M/B_{t-1}); research and development expenses over total assets ($R\&D_{t-1}$); a dummy variable equal to 1 for missing research and development expenses ($R\&D\ dummy_{t-1}$); the median market leverage calculated for each year based on 2-digit SIC codes (Median industry $debt_{t-1}$); dummy variables equal to 1 if the firm was downgraded ($Downgrade_{t-1}$) or upgraded ($Upgrade_{t-1}$) in the previous period. The sample includes rated nonfinancial U.S. issuers with valid data available from CRSP, Compustat and Capital IQ. Robust standard errors in parenthesis. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms		
MDR_{t-1}	-0.165***	-0.159***	-0.159***
	(0.008)	(0.008)	(0.008)
$Depreciation_{t-1}$	-0.043	-0.041	-0.040
	(0.049)	(0.049)	(0.049)
$Profitability_{t-1}$	-0.092***	-0.103***	-0.100***
	(0.022)	(0.023)	(0.023)
$Tangibility_{t-1}$	0.002	0.001	0.001
	(0.006)	(0.006)	(0.006)
$Size_{t-1}$	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)
M/B_{t-1}	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)
$R\&D_{t-1}$	-0.077*	-0.078*	-0.079*
	(0.047)	(0.046)	(0.046)
$R\&D\ dummy_{t-1}$	0.010***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)
Median industry $debt_{t-1}$	0.077***	0.075***	0.076***
	(0.012)	(0.012)	(0.012)
$Downgrade_{t-1}$		-0.014***	-0.014***
		(0.003)	(0.003)
$Upgrade_{t-1}$			-0.007***
			(0.003)
Constant	0.077***	0.074***	0.073***
	(0.009)	(0.009)	(0.009)
Year FE	Yes	Yes	Yes
Observations	10,962	10,962	10,962
Adj. R-squared	0.230	0.232	0.232

Table 9: Market leverage following downgrades: Multivariate including bank debt to total debt

This table reports regression results for changes in market leverage (MDR) defined as the book value of debt divided by the book value of debt plus the market capitalization of equity, for all nonfinancial U.S. firms downgraded in the previous year, as well as for downgraded firms conditional on whether they were rated IG or HY before the downgrade. Explanatory variables include: Lagged levels of market leverage (MDR_{t-1}); depreciation over total assets ($Depreciation_{t-1}$); EBIT over total assets ($Profitability_{t-1}$); fixed assets over total assets ($Tangibility_{t-1}$); the natural logarithm of market capitalization ($Size_{t-1}$); market-to-book (M/B_{t-1}); research and development expenses over total assets ($R\&D_{t-1}$); a dummy variable equal to 1 for missing research and development expenses ($R\&D\ dummy_{t-1}$); the median market leverage calculated for each year based on 2-digit SIC codes ($Median\ industry\ debt_{t-1}$); the proportion of bank debt at year-end prior to the rating change ($(Bank\ debt/Total\ debt)_{t-2}$); debt maturity at year-end prior to the rating change ($(Short\ term\ debt/Total\ debt)_{t-2}$); the net magnitude of the rating change across all rating agencies ($Size\ rating\ change)_{t-1}$. Robust standard errors in parenthesis. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms			IG firms			HY firms		
MDR_{t-1}	-0.101***	-0.103***	-0.102***	-0.164***	-0.164***	-0.164***	-0.070***	-0.071***	-0.078***
	(0.017)	(0.017)	(0.018)	(0.029)	(0.029)	(0.032)	(0.024)	(0.024)	(0.025)
$Depreciation_{t-1}$	-0.384***	-0.406***	-0.411***	-0.276	-0.274	-0.240	-0.468***	-0.492***	-0.487***
	(0.118)	(0.119)	(0.119)	(0.187)	(0.188)	(0.192)	(0.156)	(0.158)	(0.158)
$Profitability_{t-1}$	0.064	0.055	0.051	-0.045	-0.045	-0.077	0.153**	0.135*	0.150*
	(0.060)	(0.060)	(0.062)	(0.090)	(0.090)	(0.086)	(0.072)	(0.073)	(0.078)
$Tangibility_{t-1}$	-0.002	0.000	-0.002	-0.015	-0.015	-0.014	0.018	0.020	0.017
	(0.015)	(0.015)	(0.015)	(0.020)	(0.020)	(0.020)	(0.022)	(0.022)	(0.022)
$Size_{t-1}$	0.006***	0.007***	0.008***	0.006**	0.006*	0.006*	0.009***	0.010***	0.010***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
M/B_{t-1}	0.011	0.011	0.011	-0.003	-0.003	-0.003	0.038**	0.037**	0.037**
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.017)	(0.017)	(0.017)
$R\&D_{t-1}$	-0.204*	-0.196*	-0.198*	-0.232*	-0.231*	-0.246*	-0.125	-0.109	-0.101
	(0.113)	(0.113)	(0.114)	(0.134)	(0.134)	(0.135)	(0.156)	(0.157)	(0.159)
$R\&D\ dummy_{t-1}$	0.016**	0.016**	0.016**	0.017*	0.017*	0.018*	0.017*	0.017*	0.018*
	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
$Median\ industry\ debt_{t-1}$	0.058*	0.055*	0.054*	0.029	0.029	0.022	0.085**	0.080*	0.081*
	(0.030)	(0.030)	(0.030)	(0.045)	(0.045)	(0.045)	(0.042)	(0.042)	(0.042)
$(Bank\ debt/Total\ debt)_{t-2}$		0.028**	0.029**		-0.004	-0.010		0.026*	0.028**
		(0.012)	(0.012)		(0.020)	(0.020)		(0.014)	(0.014)
$(Short\ term\ debt/Total\ debt)_{t-2}$			-0.025*			0.019			-0.054**
			(0.014)			(0.017)			(0.024)
$(Size\ rating\ change)_{t-1}$			-0.000			-0.003			0.004
			(0.002)			(0.003)			(0.003)
Constant	-0.083***	-0.096***	-0.074***	0.005	0.006	0.011	-0.081*	-0.089**	-0.089**
	(0.026)	(0.027)	(0.027)	(0.036)	(0.037)	(0.036)	(0.042)	(0.043)	(0.042)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,729	1,729	1,725	765	765	764	964	964	961
Adj. R-squared	0.298	0.301	0.298	0.265	0.264	0.260	0.320	0.321	0.323

Table 10: Changes in market leverage and its key components

This table reports regression results for (i) yearly changes market leverage (MDR), defined as the book value of debt divided by the book value of debt plus the market capitalization of equity; (ii) net debt issuance, defined as the amount of long term debt issued in the year minus long term debt reduction in the year plus the change in current debt, all divided by total assets at the beginning of the year; (iii) net equity issuance, defined as the sale of common and preferred stock minus the purchase of common and preferred stock, divided by total assets at the beginning of the year. Results are presented for all nonfinancial U.S. firms that experienced a downgrade over the sample period, as well as for downgraded firms conditional on whether they were rated IG or HY before the downgrade. Explanatory variables include indicator variables for two fiscal years before the downgrade, the fiscal year of downgrade, the fiscal year after the downgrade, and two fiscal years after the downgrade. Robust standard errors in parenthesis. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms			IG firms			HY firms		
	ΔMDR	Net debt issue	Net equity issue	ΔMDR	Net debt issue	Net equity issue	ΔMDR	Net debt issue	Net equity issue
Two years before downgrade	-0.001	-0.007	-0.001	0.003	-0.007	-0.002	-0.002	-0.003	-0.004
	(0.005)	(0.005)	(0.002)	(0.008)	(0.008)	(0.003)	(0.004)	(0.005)	(0.003)
Year before	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Year of downgrade	0.018***	0.025***	0.004**	0.022***	0.020**	0.004	0.016***	0.034***	0.005*
	(0.005)	(0.005)	(0.002)	(0.007)	(0.008)	(0.003)	(0.005)	(0.006)	(0.003)
Year after downgrade	-0.043***	-0.028***	0.007***	-0.059***	-0.033***	0.007***	-0.022***	-0.019***	0.009***
	(0.004)	(0.004)	(0.002)	(0.007)	(0.007)	(0.002)	(0.004)	(0.005)	(0.002)
Two years after downgrade	-0.025***	-0.020***	0.004**	-0.030***	-0.017***	0.005**	-0.016***	-0.017***	0.005**
	(0.004)	(0.004)	(0.002)	(0.007)	(0.006)	(0.002)	(0.004)	(0.004)	(0.002)
Constant	-0.018***	0.020***	0.000	-0.016	0.034***	0.009**	-0.023***	-0.001	-0.013***
	(0.006)	(0.006)	(0.002)	(0.011)	(0.011)	(0.004)	(0.006)	(0.007)	(0.003)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,764	3,764	3,764	2,200	2,200	2,200	1,803	1,803	1,803
Adj. R-squared	0.284	0.066	0.046	0.312	0.056	0.024	0.283	0.089	0.109

Table 11: Credit rating model: Ordered probit

This table reports estimates from ordinal probit regressions of corporate ratings for investment-grade (IG) and high-yield (HY) firms. The models are estimated only on low bank debt firms, with a ratio of bank debt to total debt below the median value of the ratio for the corresponding rating class in the year. Rating classes are defined in Table 1. Explanatory variables include: Firm size, measured as the natural logarithm of market capitalization (Size); the sum of cash and short-term investments, divided by total assets (Cash); The total value of property, plant, and equipment, divided by total assets (Tangibility); research and development expenses divided by total assets, set to zero if data are missing (R&D); capital expenditures divided by total assets (Capex); Market-to-Book ratio (M/B), measured as book value of assets minus book value of equity plus market value of equity, all divided by book value of assets; operating income after depreciation plus interest expenses, divided by interest expenses (Interest coverage); operating income before depreciation, divided by sales (Profitability); short-term debt plus long-term debt, all divided by total assets (Leverage); Beta, derived from regressing the firm's daily stock returns on the CRSP value-weighted index return over the past calendar year; Idiosyncratic risk, measured as the root mean squared error from the regression of firm's daily stock returns on the CRSP value-weighted index return. Industry fixed effects represent 2 digit SIC-codes. Robust standard errors in parenthesis. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	IG	HY
Size	-0.420***	-0.443***
	(0.058)	(0.041)
Cash	1.204**	1.878***
	(0.594)	(0.337)
Tangibility	-0.893**	0.703***
	(0.440)	(0.262)
R&D	-0.315	2.641**
	(2.067)	(1.274)
Capex	4.153***	-0.024
	(1.458)	(0.596)
M/B	-0.178***	0.158**
	(0.067)	(0.067)
Interest coverage	-0.004*	-0.001
	(0.002)	(0.002)
Profitability	-1.329**	-1.705***
	(0.523)	(0.292)
Leverage	2.168***	1.736***
	(0.440)	(0.249)
Beta	0.140	0.129**
	(0.130)	(0.060)
Idiosyncratic risk	70.852***	37.782***
	(8.773)	(2.957)
Short-term debt/total debt	-1.440***	-0.236
	(0.247)	(0.236)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	2,619	3,018
Pseudo R-squared	0.170	0.209

Table 12: Credit rating errors: Summary statistics

This table presents summary statistics of rating errors for investment-grade (IG) and high-yield (HY) firms. Low (high) bank debt firms have a ratio of bank debt to total debt below (above) the median value of the ratio for the corresponding rating class in the year. Rating classes are defined in Table 1. Rating errors are defined as the difference between the rating predicted by the ordered probit models in Table 11 minus the actual rating assigned by the rating agency. Predicted probabilities are computed in-sample for low bank debt firms and out-of-sample for high bank debt firms. Positive (negative) rating errors indicate that the actual rating is better (worse) than the rating predicted. T-test and z-test denote two-sample t-test for difference in means and Wilcoxon test for difference in medians. KS-test represents the Kolmogorov-Smirnov test for distribution equality. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Mean	Std. err.	# Obs	t-test	z-test	KS-test
IG low bank debt/total debt	0.389***	0.029	2,659	3.040***	3.242***	0.043**
IG high bank debt/total debt	0.263***	0.029	2,524			
HY low bank debt/total debt	-0.059***	0.023	3,088	1.427	1.618	0.028
HY high bank debt/total debt	-0.106***	0.023	3,066			

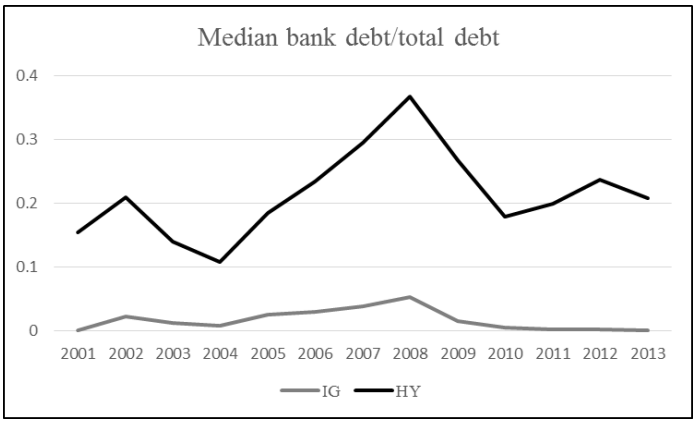

Figure 1: Median of bank debt to total debt by year
The Y axis measure the median level of bank to total debt by year for investment-grade (IG) and high-yield (HY) firms over the sample period.

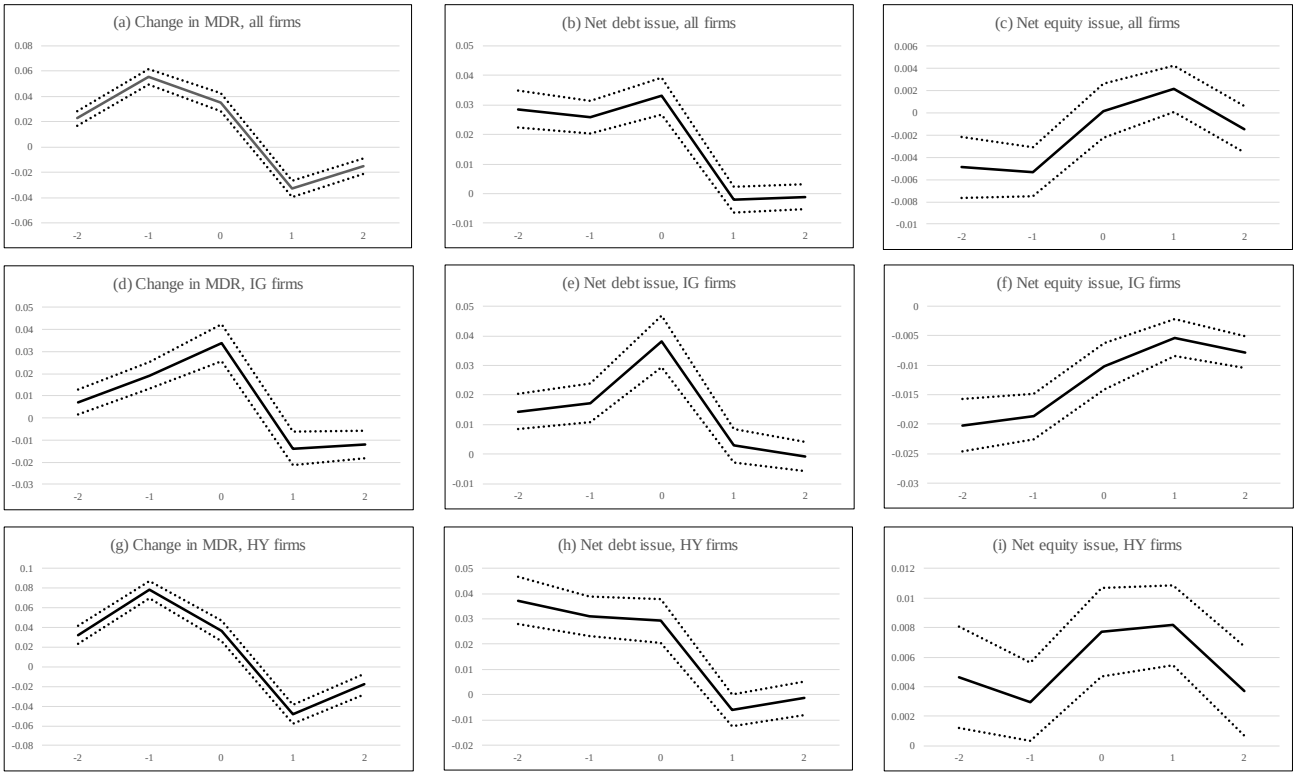

Figure 2: Yearly changes in market leverage and its key components

The Y axis of (i) sub–figures (a), (d), and (g) plot yearly changes in market leverage (MDR), defined as the book value of debt divided by the book value of debt plus the market capitalization of equity; (ii) sub–figures (b), (c), and (h) net debt issuance, defined as the amount of long term debt issued in the year minus long term debt reduction in the year plus the change in current debt, all divided by total assets at the beginning of the year; (iii) sub–figures (b), (c), and (h) plot net equity issuance, defined as the sale of common and preferred stock minus the purchase of common and preferred stock, divided by total assets at the beginning of the year. All X axis represent the years in relation to the year the downgrade occured, year 0.

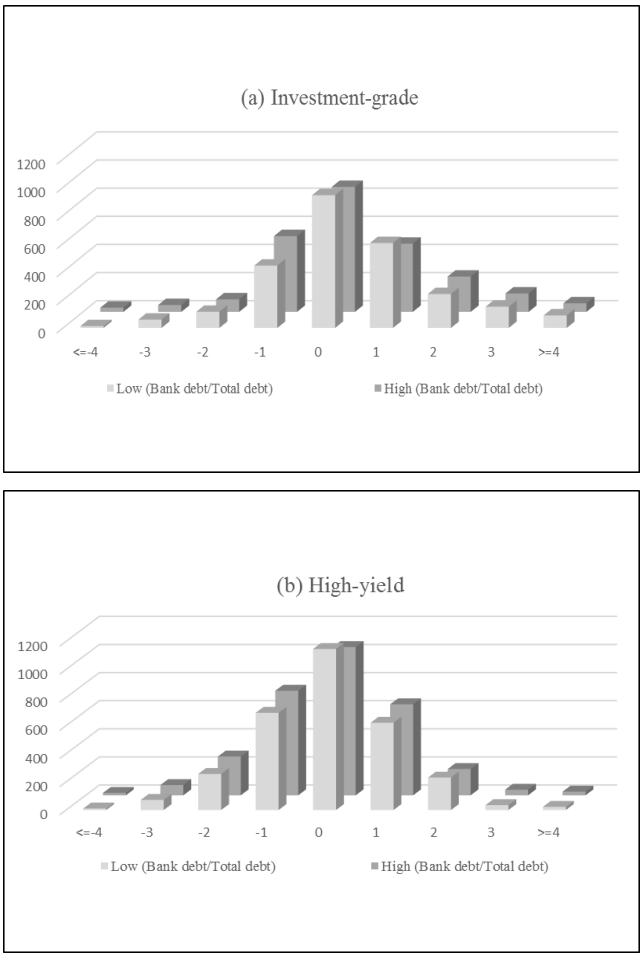

Figure 3: Distribution of rating errors

The staples show the distribution of rating errors for firms based on whether the firm is below or above the median level of bank to total debt by year for investment-grade (sub-figure a) or high-yield (sub-figure b) firms. Rating errors are defined as the difference between the rating predicted by the model minus the actual rating assigned by the rating agency. Positive (negative) rating errors indicate that the actual rating is better (worse) than the rating predicted.