Does the bond market want informative credit ratings?

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Abstract

We examine the information content of Moody's traditional credit ratings compared to those produced by an independent subscriber-paid firm. We find that the independent ratings provide more timely information and we quantify the consequence of relying on Moody's ratings to assess credit quality. Prevailing wisdom suggests that traditional credit ratings are slow to downgrade because Moody's is compensated by issuers. However, our results suggest that regulated investors dominating fixed income markets have benefited from Moody's sluggish downgrades. Regulatory reliance on relatively uninformative credit ratings allows banks, insurance companies, and pension funds to hold riskier bonds and thus earn higher returns. We discuss several important differences between the traditional credit rating and its independent alternative in the context of the changing regulatory environment following Dodd-Frank.

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Regulators have a compelling interest in controlling the exposure of banks, pension funds, and insurance companies to financial risk. The Federal Deposit Insurance Corporation absorbs failed bank losses, the U.S. Pension Benefit Guaranty Corp absorbs failed private pension losses, and insurance company failure is also potentially costly to taxpayers (e.g., the bailout of American International Group in 2008).[1] Regulators have historically relied on credit ratings produced by Nationally Recognized Statistical Rating Organizations (NRSROs) to certify credit quality.[2] However, in the wake of taxpayer-funded bailouts of financial institutions bearing excessive risk, the wisdom of this reliance is in doubt. After much Congressional deliberation regarding credit rating efficacy, President Obama signed into law the Dodd-Frank Wall Street Reform and Consumer Protection Act (hereafter Dodd-Frank) on July 21, 2010. Section 939A, reported in the Appendix, requires regulators to replace credit ratings with alternative measures of credit quality, yet it provides no guidance as to replacement benchmarks.

The prevailing explanation for the 'failure' of the Big 3 rating agencies (Moody's Investor Service, Standard & Poor's, and Fitch Ratings) is the conflict of interest inherent in the issuer-pays compensation structure.[3,4] Consistent with this belief, we document that Moody's credit ratings (MCRs) provide less timely (i.e., delayed) information compared to the Financial Health Ratings (FHRs) produced by Rapid Ratings (RR), an independent credit rating agency compensated by investors and other subscribers. We quantify the consequence of relying on the

[1] The 2009 annual report of the PBGC forecasts a $4 billion deficit by 2019; reports available at pbgc.gov. The Deposit Insurance Fund balance was $-20.9 billion at the end of 2009, down from $52.4 billion in 2007; annual reports are available at FDIC.gov.

[2] Basel II employs these ratings to establish minimum capital adequacy requirements. The Department of Labor similarly relies on ratings to regulate pension funds as per the Employee Retirement Income Savings Act of 1974 (ERISA). Likewise, financial risk borne by insurance companies is limited by the National Association of Insurance Commissioners (NAIC) and state regulators.

[3] SEC rules recognize that it is a conflict of interest for an NRSRO to be paid by an issuer or underwriter; Exchange Act Rule 17g-5(b)(1). NRSROs are required to maintain procedures reasonably designed to mange this conflict; Section 15E9(h) of the Exchange Act.

[4] We explore recent literature pertaining to ratings shopping, subjectivity, and the role of inflated credit ratings in the structure finance markets in section II. For regulatory and legislative commentary on credit ratings 'failure', see U.S. Senate (2002), comments by Chairman Waxman (U.S. Congress, 2008)), and comments by SEC Commissioner Casey (2009).

less timely MCR for information about credit quality. Further, we explore an alternative explanation for the less timely MCR. We provide evidence that regulated institutional investors *benefit* from the regulatory reliance on the relatively uninformative MCRs. Specifically, delayed downgrades allow regulated investors to hold risky bonds and thus earn higher yields. We conclude that the MCR provides less timely information not merely due to conflicts of interest in the issuer-pays model, but also because the largest bond market participants prefer it this way.[5]

We define 'regulatory arbitrage' as financial institutions and other regulated investors taking advantage of credit ratings that do not fully reflect financial risk in order to earn higher yields while still complying with regulatory restrictions. Even without systematic rating inflation, regulated investors can exploit noisy ratings to conduct regulatory arbitrage, cognizant of the difference between actual credit risk (which can be priced appropriately using more timely credit analysis) and that implied by the NRSRO rating. Moody's president Raymond McDaniel clearly articulates the widespread aversion to informative MCRs:

> *"The real problem is not that the market does underweight ratings quality but rather that, in some sectors, it actually penalizes quality ... It turns out that ratings quality has surprisingly few friends: issuers want high ratings;* investors don't want rating downgrades*; short-sighted bankers labor short-sightedly to game the rating agencies for a few extra basis points on execution."*[6] (emphasis added)

We find evidence to support our definition of regulatory arbitrage as a rational, market-based explanation for the sluggish updating by Moody's: holding riskier bonds allows funds to earn higher returns. Specifically, we document higher returns to a portfolio that buys and holds bonds until maturity, default, or Moody's downgrades to speculative grade compared to a portfolio buying and holding the same bonds until maturity, default, or the RR downgrades to speculative grade. Of the bonds downgraded only by RR, average bond prices fall significantly around the

[5] Large, regulated entities (including insurance companies, banks, pension funds, and dealers) hold approximately 40% of US corporate bonds and asset-backed securities. By comparison, atomistic domestic households and foreign investors account for 11% and 29%, respectively. In EU bond markets, retail investors (households) represent closer to 3%. Source: SIFMA (2007b).

[6] Quote taken from a 2007 internal Moody's memo presented as evidence to the Congressional hearing on credit rating agencies and the financial crisis on October 22, 2008.

RR downgrade. However, among the bonds that recover and avoid default, market prices necessarily converge back to par as the bonds mature. Among bonds that default, selling at the delayed Moody's downgrade results in significant lost principal. But among bonds that ultimately recover, selling on the earlier RR downgrade lowers returns.

Given the more-timely information provided by the FHR and significant, downward bond price movements well in advance of MCR downgrades, we conclude that institutional investors do not rely on the MCR for information regarding credit quality. They do, however, benefit from the regulatory reliance on the less timely MCR. In efficient markets, investors earn higher returns as a reward for bearing more risk. In fixed income markets, taxpayer dollars insure the dominant institutional investors taking such risks and the incentive for regulatory arbitrage is clear.

To the best of our knowledge, our paper is the first to offer this alternative, market-based explanation for sluggish MCRs. We contribute to the credit ratings literature in the following additional ways. We examine the dichotomies of timely versus stabile credit ratings, cardinal (absolute) versus ordinal (relative) ratings, quantitative models versus qualitative analysis, and the incentive structure of the issuer-pays versus subscriber-pays raters. We quantify the wealth effects of relying on the MCR versus the more -timely FHR and we explore the extent to which the FHR appears to inform the equity market.

Regarding compensation structure, each rater appears to focus on mitigating the error type most important to its paying clients. Compensated by issuers, Moody's appears most opposed to misclassifying a healthy firm as distressed or calling default too soon (a Type II error). Conversely, compensated by investors and other subscribers, RR appears more concerned with misclassifying a distressed firm as healthy or calling default to slowly (a Type I error). Among bonds that ultimately default, RR downgrades the FHR to speculative grade long before Moody's follows suit. Likewise, we document a higher default frequency among issues with

investment grade ratings according to the MCR compared to the FHR.[7] Among bonds that ultimately default, a portfolio manager would significantly mitigate losses on principal by selling bonds when RR downgrades to speculative grade as compared to waiting for Moody's to downgrade the bond to speculative grade. This result is important because many regulated investors face fire sales associated with regulatory compliance based on the MCR downgrade (see Ellul, Jotikasthira, and Lundblad (2010)).

Moody's stable (i.e., slow-to-update) ratings avoid prematurely forcing sales associated with regulatory compliance and triggering covenants in debt contracts (see Cantor and Mann (2006)). However, if the purpose of ratings-based regulation (or ratings-based covenants) is to set limits on credit risk born by institutions backed by taxpayers (or other corporate counterparties), then credit ratings should reliably map to absolute levels of credit risk. We find that the FHR better reflects absolute credit risk than the MCR. Default frequency within investment and speculative grade classifications, as indicated by the MCR, varies significantly from year to year.[8] However, default frequency within investment and speculative grade classifications, as indicated by the FHR, exhibits less variation. The distinction between absolute and relative credit ratings has potential implications for efficient capital allocation. Regulations and lending rules based on ratings that are relative rather than absolute result in markets funding riskier debt in some years (e.g. 2003) and denying funds to safer borrowers in others (e.g. 2007).[9]

Our results should be of interest to regulators as they digest the Dodd-Frank mandate and consider alternative benchmarks for restraining excessive risk in regulated financial institutions. In particular, our results support regulatory benchmarks that reflect absolute credit risk (as

[7] Specifically, one year prior to default, 2.61% of defaulting firms had FHRs classified as investment grade while 51.35% of defaulting bonds were rated investment grade according to MCR. This 51.35% corresponds to 5.67% of defaulting firms with a disproportionate amount of defaulting issues.

[8] This finding is consistent with results of Campbell and Taksler (2002) who find that traditional credit ratings cannot better explain the cross-sectional variation in credit spreads than a simple measure of equity volatility.

[9] 4.1% of bonds rated A3 (investment grade) defaulted in 2003 yet no bonds rated B2 (speculative grade) defaulted in 2007. As another example, 30.6% of bonds rated A1 defaulted in 2008. This extreme example is a result of the large number of bonds issued by Lehman Brothers that were outstanding at the time of the company's bankruptcy in September 2008.

opposed to the relative ratings historically employed). Our results also suggest careful consideration of both error types in assessing credit quality: delayed downgrades of defaulting bonds result in lost principal, but forcing the liquidation of bonds that may ultimately recover lowers investors' yields. Our results should also be of interest to issuers and institutional investors as they contemplate implications of the new regulatory environment.[10] Retail investors relying on MCRs for information will note that they are clearly disadvantaged relative to institutional investors purchasing or producing more timely credit analysis. Finally, our results should be of interest to academics and a host of corporate counterparties including customers, suppliers, and employees basing long-term contracting decisions on the perceived financial health of the firm.[11]

The rest of the paper proceeds as follows. Section II provides institutional detail, contrasts the two rating firms along relevant dimensions, and reviews relevant literature. Section III describes the sample selection and data collection. Section IV presents our empirical results and Section V concludes.

II. Rating Archetypes, Institutional Detail, and Related Literature

We employ Moody's as the archetype of the traditional ratings system. The MCR is an alphanumeric issue-level assessment of expected loss intended to reflect both the probability of default and the expected loss given default. However, these ratings are ordinal rather than cardinal. That is, the absolute level of credit risk associated with any particular rating varies through time. The MCR is a product of quantitative and qualitative analysis. Compensated by issuers, Moody's is most concerned with mitigating Type II errors (incorrectly indicating distress in a healthy firm). Consistent with their incentive structure, their stated objective is to "rate through the cycle" and the MCR is thus slow to reflect changes in credit quality. With long-

[10] Kisgen (2005) and Hovakimian, Kayhan, and Titman (2009) suggest that issuers consider credit rating implications when raising capital. It will be interesting to observe any change in the relevance of MCRs for corporate capital structure when MCRs lose regulatory significance.

[11] Ratings triggers in corporate debt contracts increase coupon rates or require early principal repayment; see Bhanot and Mello (2006) for a discussion of optimal ratings triggers in corporate debt contracts.

standing NRSRO designation, the MCR has historically been useful for regulatory compliance. Empirically, ratings by the Big 3 are highly correlated suggesting that results for S&P or Fitch would likely be similar to those reported here for Moody's. In atypical cases where they differ, Fitch tends to issue the highest credit ratings and Moody's the lowest, particularly among lower-rated bonds; Bongaerts, Cremers, and Goetzman (2010). We thus believe that our use of Moody's does not result in an unfairly "issuer-friendly" depiction of the Big 3.

We employ Rapid Ratings (RR) as an archetype of an emerging independent credit scoring system that differs from the Big 3 in each of the aforementioned dimensions. Their FHR is a firm-level assessment of financial health, paid for by investors and other subscribers. The FHR falls along a 100-point scale intended to reflect a continuum from expected failure (default) to optimal performance in a combination of sales, cost structure, profitability, leverage, debt service management and working capital efficiency. These ratings are cardinal; the FHR is designed to reflect absolute credit risk in a stable manner over time. Because RR is equally concerned with mitigating Type I errors (incorrectly classifying distressed firms as healthy), the FHR updates frequently. In fact, because the FHR is a product of quantitative models (with no qualitative analysis) each FHR is updated quarterly. Choosing not to apply for NRSRO designation, RR never enjoyed regulation-based demand for its product.

To support our use of RR as the alternative, independent rater, we note its recognition by regulators, law makers, and market participants. RR was the only non-Big-3 credit rating agency invited to speak on the ratings competition panel at the SEC Roundtable in 2009 and to testify before both congressional bodies in the run up to the most sweeping change in rating agency regulation in history.[12] Beyond hedge funds hoping to generate alpha, corporations such as Microsoft employ the RR system for enterprise risk management.[13] While they share some attributes, recent additions to list of NRSROs, such as Egan Jones, are less useful for our

[12] See Caragata and Gellert (2009) and Gellert (2009 a,b,c).

[13] See "Developing a 360-Degree View of Credit Risk" by Richard Gamble, *Treasury & Risk* August 2009.

purposes. Although these raters were not useful for regulatory purposes in earlier years, the NRSRO designation may alter their clientele and incentive structure in recent years. Additionally, these raters cover fewer firms than RR which is likely attributable to their qualitative analysis.[14]

Because the MCRs are based largely on unobservable qualitative analysis by analyst committees (Fons, Cantor, and Mahone (2002)) and the FHR technology is proprietary, we cannot directly compare the sophistication of either rating technology. However, our purpose is not to horserace the field of ratings technologies. Indeed, Moody's research suggests that their acquired KMV technology is more timely than the MCR (see Korablev and Dwyer (2007)), as are the watch lists they sell to subscribers. Our focus pertains to the reliance (regulatory and otherwise) on the MCR itself. It is the MCR, not KMV or the watch list, that measures credit risk for a host of regulation as well as extant academic research, investment fund guidelines, and ratings triggers in debt covenants and other corporate contracts.

A. Regulatory Arbitrage

As early as 1998, Chairman Alan Greenspan discussed regulatory arbitrage associated with risk-based capital requirements at a conference hosted by the Federal Reserve Bank of New York; see Greenspan (1998). Shortly thereafter, Partnoy (1999) suggests that uninformative credit ratings are useful to mitigate costs associated with regulatory compliance:

> *"In simple terms, a good rating entitles the issuer (and the investors in a particular issue) to certain advantages related to regulation. ...ratings are valuable, not because they are accurate and credible, but because they are the key to reducing costs associated with regulation... In theory, rating agencies have good reason to avoid conflicts of interest and to protect accuracy ... However, once the ratings of a small number of credit rating agencies are enshrined by regulators ... the markets become less vigilant..." (pp. 681-2)*

More recently, the empirical work of Bongaerts, et al (2010) highlights the importance of the investment grade certification for regulatory compliance. Specifically, these authors find that the

[14] Our sample contains FHRs for 5,856 companies and financial institutions over the period 1988-2009; each rated quarterly, based on data availability. Egan Jones' website suggests coverage of 1,250 firms.

presence of Fitch ratings is strongly associated with Moody's and S&P ratings on opposite sides of the investment-grade barrier. Fitch serves not to produce information, but to allow marginal issuers to raise capital.[15]

The investment- versus speculative-grade threshold is the most prominent rating threshold, but regulatory pressure for inflated ratings extends to the coveted AAA rating.[16] While there are 'sticks' associated with ratings that are 'too low' there are 'carrots' associated with those that are especially high. Under Basel guidelines, banks holding corporate bonds rated toward the upper end of the rating spectrum enjoy the lowest minimum capital requirements.[17] Overall, it appears that issuers are not the only CRA constituents preferring inflated ratings and slow downgrades. Regulated investors dominating fixed income markets rationally prefer regulatory reliance on uninformative ratings in order to engage in regulatory arbitrage – provided they can purchase or produce higher quality risk metrics to appropriately price risk.

B. NRSRO designation

The Securities and Exchange Commission (SEC) created the NRSRO designation in 1975 in order to identify credit ratings agencies (CRAs) whose ratings would be useful for regulatory compliance. The collapse of Enron (2001) and WorldCom (2002) without warning resulted in The Credit Rating Agency Reform Act of 2006 intended to promote competition. Following this Act there are 10 such registered firms, but the industry is still commonly referred to as an oligopoly with 'two and a half' players.[18,19] The combination of regulation-induced

[15] NAIC guidelines and the Basel accords both employ the lower of two ratings or the middle of three ratings to serve as the basis for regulatory benchmarks.

[16] Cantor and Packer (2007) review the ubiquitous regulatory use of credit ratings to mitigate insolvency risk of banks, pension funds and insurance companies since the 1930s.

[17] Specifically, AAA to AA- rated corporate securities carry a 20% risk weight while A+ to A- corporates have a 50% risk weight and BBB+ to BB- face a 100% risk weight. Information on the Basel Committee on Banking Supervision is found here: http://www.bis.org/bcbs/ and details of minimum capital requirements are found here: http://www.bis.org/publ/bcbs128b.pdf

[18] Then ten NRSROs are Moody's, S&P, Fitch, DBRS, A.M. Best, Japan Credit Rating Agency, Rating & Investment Information, Egan-Jones Ratings Company, LACE Financial, and Realpoint.

demand and a history of First Amendment (freedom of the press) protection afforded these firms considerable power as gatekeepers to fixed income markets.[20]

Prior to Dodd-Frank (Section 939B available in the Appendix), these firms were also exempt from Regulation Fair Disclosure (Reg FD) which allowed them to receive inside information unavailable to other market participants; SEC (2003).[21] Testimony by an S&P managing director cautions the presumption of private information and suggests little impact of this dimension of Dodd Frank:

> *"Our ratings opinions are based on public information provided by the issuer, audited financial information, and qualitative analysis of a company and its sector.…We are not auditors, we do not audit the auditors of the companies that we rate or repeat the auditors' accounting work, and we have no subpoena power to obtain information that a company is not willing to provide."* Barone (2000).

In the wake of the most recent financial crises, regulators and legislators again question the quality of ratings produced by NRSROs and call for an alternative regulatory framework; see for example comments by SEC Commissioner Casey (2009). In response to such criticism, Deven Sharma, President of S&P, suggests that regulatory reliance on credit ratings is misguided and calls for regulators to remove rating-based requirements. Such regulation results in "*over-reliance on ratings*" in ways the CRAs never intended; *".. a credit rating is not intended to be, and must never be used, as the sole determinant of how well an investment meets an investor's needs*."[22,23] In any case, Dodd-Frank aims to eliminate the NRSRO designation by July 2011.

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[19] SEC (2008a) reports a Herfindahl-Hirschman Index [HHI] of 3,778 for all NRSRO ratings outstanding, which is the equivalent of 2.65 equally-sized firms. For comparison, the Department of Justice (www.justice.gov/atr/public/testimony/hhi.htm) presumes antitrust concerns in industries with HHI > 1800.

[20] The First Amendment has historically protected Moody's from investors suing over inaccurate ratings and/or issuers suing over punitive unsolicited ratings. For example, see Jefferson County School District No R-1 v. Moody's Investor's Services, United States Court of Appeal for the Tenth Circuit, May 4, 1999, 175 F. 3d 848.

[21] Ederington and Yawitz (1987) suggest that CRAs had such access prior to Regulation FD.

[22] "Why Rating Requirements Don't Make Sense" by Deven Sharma, *Wall Street Journal* Jan 18, 2010.

[23] David Becker, SEC General Counsel, corrects assertions made by Mr. Sharma, noting that the SEC effectively exempted NRSROs from liability under the Securities Act. "Big Rating Agencies Are Exempt", *Wall Street Journal*, January 28, 2010.

C. Dichotomies differentiating the FHR and MCR

C1. Issuer-pays versus subscriber-pays

Perhaps the most important difference between Moody's and RR is their compensation structure; MCRs are paid for by issuers while FHRs are paid for by investors and other subscribers. One primary concern over the issuer-pays model is that of potential ratings shopping, where issuers pay only for the most favorable ratings. Concerns for reputation capital should, to some extent, mitigate ratings shopping. Mathis, McAndrews and Rochert (2009) show that this reputation concern varies with the complexity and opacity of issuer quality.

Recent papers by Skreta and Veldkamp (2009) and Sangiorgi, Sokobin, and Spatt (2009) describe the ratings shopping associated with an issuer-pay model and problems, such as free riding, of the alternative investor-pay model.[24] An important implication of the model developed by Skreta and Veldkamp is that increasing competition (without addressing the conflict of interest inherent in the issuer-pays model) *worsens* the problem of biased ratings. Consistent with this prediction, results obtained by Becker and Milbourn (2010) suggest that ratings become inflated and less informative after Fitch enters the market. Another potential problem with the issuer-pays model is a lack of incentive for adequate surveillance. Issuers pay for MCRs at issuance; any subsequent surveillance is a cost center. A recent SEC examination concluded that "*the surveillance processes used by the rating agencies appear to have been less robust than their initial ratings processes*"; SEC (2008b).

Most relevant to our study is how compensation structure affects sensitivity to error types. All accuracy-oriented raters prefer *no* errors. But given imperfect forecasting, we expect RR, compensated by end users concerned with timely risk metrics, to tolerate some Type II error (incorrectly classifying healthy firms as distressed) in order to mitigate Type I error (incorrectly certifying distressed firms as healthy). To the contrary, we expect Moody's, compensated by

[24] Grossman and Stiglitz (1980) detail the spillover effect that limits the gains to any one investor from purchasing information.

issuers and useful for regulatory arbitrage, to be most concerned with mitigating Type II errors at the expense of higher Type 1 error. Indeed, Moody's employees (Fons, et al (2002)) state:

> *"...the potentially self-fulfilling nature of ratings creates a strong bias against "false" negative predictions (compared with other credit measurement systems) because ratings themselves can be causal, either because of market reactions to rating changes or because of the use of ratings in agreements between the issuer and investors or other parties..."*

C2. Cardinal versus Ordinal ratings

Cardinal ratings convey an absolute amount of credit risk; ordinal measures provide only a relative ranking among a particular group at one point in time. RR designed the FHR as a cardinal measure of credit quality.[25] The MCR is an ordinal measure; Fons, et al (2002). This relative measure allows Moody's to rate through the economic cycle. However, it also allows for changing standards. Blume, Lim, and MacKinlay (1998) conclude that CRAs imposed stricter standards in the latter part of their sample.[26] This evidence from their earlier sample is in stark contrast to evidence of inflated credit ratings in current studies; Coval et al (2009) and Griffin and Tang (2010). Because ordinal ratings by NRSROs do not map consistently to actual risk levels, funding rules (or regulatory constraints) based on ratings will, in turn, vary the marginal risk born over time. Regulators have drawn arbitrary lines at AAA and BBB credit ratings with highly consequential implications for crossing these lines. But there are no established standards for what ratings actually imply about credit quality.

C3. Quantitative models versus qualitative analysis

RR produces a new FHR every quarter using a quantitative model employing audited financial data from Bloomberg. In contrast, the MCR relies more heavily on qualitative analysis:

> *"A credit rating is forward-looking, and, by its very nature, subjective. The role of the Moody's rating committee is to introduce as much objectivity into the process as possible ...*

[25] http://www.rapidratings.com/modules/content/content.php?content.19

[26] A more recent study by Jorion, Shi, and Zhang (2009) notes that these results are confined to investment grade issuers and attributes them to changes in accounting quality.

guided by a common set of basic analytical principles, including global consistency, an emphasis on qualitative factors, *and a focus on the long-term."*[27](emphasis added)

But the benefits of qualitative analysis conducted by human analysts come with a cost. Regular surveillance would require costly human capital for the Big 3. Another potential problem associated with qualitative ratings is the concern about subjectivity and conflict of interest.[28]

One benefit of an automated quantitative system is that re-rating each issuer quarterly assures regular surveillance. Moody's argues against quantitative models as volatile and "based upon transient market sentiment"; Fons, et al (2002). This may be a valid concern over Merton-style structural models (such as Moody's KMV). We explore this concern over market models in section D below, but not all models employ market data. For example, the FHR is the product of audited financial data alone.

C4. Timeliness versus stability

The International Organization of Securities Commissions (IOSCO, 2008) Code of Conduct explicitly requires 'timely' ratings updates:

"A CRA should ensure that adequate personnel and financial resources are allocated to monitoring and updating its ratings... once a rating is published the CRA should monitor on an ongoing basis and update the ratings by (a) regularly reviewing the issuer's creditworthiness; ... (c) updating on a timely basis the rating, as appropriate, based on the results of such review..."

Timeliness in credit ratings thus implies advanced warning. For example, we do not consider Moody's downgrade of Enron from investment grade to speculative grade four days prior to bankruptcy a timely rating change.[29,30] However, there are two error types associated with ratings

[27] Source: http://v3.moodys.com/ratings-process/Credit-Policy/001. S&P (2003) states a similar policy and Fitch (2007) suggest roughly equal weight is placed on quantitative and qualitative analysis.

[28] The SEC (2008b) examination provides internal emails and other evidence of inadequate surveillance attributable to inadequate personnel and notes that "*the rating agencies did not always document significant steps in the rating process – including the rationale for deviations from their models and for rating committee actions and decisions – and they did not always document significant participants in the rating process*". See also Griffin and Tang (2010).

[29] See *Rating the Raters: Enron and the Credit Rating Agencies, Hearings Before the Senate Committee on Governmental Affairs*, 107th Cong. 471 (March 20, 2002).

accuracy. A hypothetical uninformative rater could appear to predict bankruptcy early simply by downgrading all firms annually and subsequently upgrading (reversing) those that do not default. Thus, there exists a genuine tension between error types and accuracy requires some degree of rating stability; Cantor (2001), Cantor and Mann (2006), Gunter (2004). Delaying downgrades that would trigger a sale could potentially prevent the transaction (should the issuer recover) and would at least delay the transaction cost. However, any such benefit of delaying sales is found among firms that recover; delaying sales of firms that do not recover is especially costly. At the margin, issuers are rationally more concerned about Type II errors, while uninsured creditors are more concerned about Type I errors. The less obvious concern addressed in this paper is the sensitivity of the government-backed, regulated investor.

Survery data regarding market preference for timely ratings contain mixed findings. Moody's concludes that "*investors dislike downgrades as much as issuers*"; Fons, et al (2002). Others suggest that investors prefer timely ratings, even if they fluctuate and ultimately reverse, and believe CRAs respond too slowly to deteriorating credit quality; Ellis (1998), Baker and Mansi (2002), Association for Finance Professionals (2002). This conflict perhaps reflects a divergence of interests between insured institutional investors subject to regulatory constraints and retail investors who are neither insured nor regulated – and the extent to which they rely on MCRs for information. Informative downgrades lower asset values and regulatory compliance potentially forces liquidation of such distressed assets; Ellul et al (2010). Still, active investors who provide liquidity (potential buyers) benefit from timely credit risk assessment.[31]

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[30] Prior literature examining the timeliness of MCRs suggests a partial adjustment process in response to deterioration in credit quality which results in less accurate, but more stable ratings; see Altman and Kao (1992) and Altman and Rijken (2004), and Beaver, Shakespeare, and Soliman (2006). Others examine the extent to which credit ratings appear to inform markets and report mixed results; see Hettenhouse and Sartoris (1976), Weinstein (1977), Pinches and Singleton (1978), Wakeman (1981), Ingram, Brooks and Copeland (1983), Holthausen, and Leftwich (1986), Hand, Holthausen, and Leftwich (1992) Goh and Ederington(1993), Hite and Warga (1997), and Ederington and Goh (1998).

[31] Counterparties such as corporate customers, suppliers, and employees making long-term contracting decisions based on perceived financial health also benefit from timely information; see Hertzel, Li, Officer and Rodgers (2008) regarding contagion of distress along the supply chain.

Moody's argues that it should be cautious when downgrading bonds because downgrades are consequential; Cantor (2001), and Cantor, Mahoney, and Mann (2003). Altman and Rijken (2005) express concern over pro-cyclicality, or the fear that downgrades could exacerbate recessions. The counter argument, made by Asea and Blomberg (1998), is that cyclicality is not a result of conservative funding in recessions, but of liberal funding during expansionary periods. Liberal rating of (and lending to) higher-risk borrowers during expansion results in higher default rates and fuels the cycle. This interpretation is more consistent with the most current financial crises resulting from inflated ratings and excess lending to high risk borrowers; Coval et al (2009) and Griffin and Tang (2010). Ignoring deteriorating financial health by delaying downgrade postpones (or, worse, exacerbates) market disruption.[32] If minimizing large disruptive changes is the objective, an argument can be made for the steady release of incremental information.

The issue of stability is unfortunately complicated by the conflict of interest in raters compensated by issuers. Former managing director Frank Raiter (2008) testified that S&P sacrificed ratings quality to boost profitability. Former managing director Eric Kolchinsky (2010) also testified that Moody's focused on market share at the expense of ratings accuracy. Whether Moody's preference for slowly-updating ratings reflects the desires of institutional investors or a conflict of interest inherent in the issuer-pays model, regulators mitigating taxpayer-funded losses by banks, insurance companies and pension funds make better-informed decisions with more timely information about credit quality.

D. Additional considerations

This last section reviews literature that is relevant when considering information production, regulation of credit risk, and the evolution of the ratings industry.

D1. Non-regulatory demand for the MCR

[32] High-profile firms that collapsed while still investment grade include Pacific Gas & Electric (2001), Southern Cal Edison (2001), WorldCom (2002), and Global Crossing (2002).

In the theoretical model of Boot, Milbourn, and Schmeits (2006), credit ratings are important for two reasons. First, the credit watch procedure motivates firms to take corrective action when facing deteriorating financial health. Second, institutional investors condition their investment decisions on credit ratings. In their model, MCRs are informative because of the credit watch procedure which is, in turn, only effective because institutional investors rely on the resulting ratings. Given that Dodd-Frank will nullify regulatory reliance on the MCR, selling the watch list may become a more important business for Moody's. Still, there should remain non-regulatory demand for the publicly available MCR. Even though the MCR is less timely than private or commercially available credit analysis, the publicly available MCR serves as a low-cost coordination mechanism. Replacing the MCR with commercially-available credit risk metrics would increase the cost of contracting. The imperfect indication of credit quality is also balanced by the ease of use for academics measuring or controlling for credit risk in empirical work.

D2. Market-based models

Shumway (2001) finds that models based on market data predict bankruptcy better than those employing traditional accounting ratios. Similarly, Hillegeist, et. al. (2004) find that default prediction based on Merton's (1974) bond pricing model (such as the KMV model and the model employed by Vassalou and Xing, (2004)) is more accurate than traditional accounting-based bankruptcy prediction models (such as Altman (1968) and Ohlson (1980)).[33] However, even if a Merton model better predicted default, it is less useful for distinguishing between, say, AAA and AA levels of risk (neither of which is likely to default). A default prediction model that does not distinguish along a continuum of credit quality is insufficient for regulators to establish banks' capital requirements. A higher level of granularity in credit ratings is also useful to the market

[33] The debate surrounding Merton-style structural models is beyond the scope of this paper. See Bharath and Shumway (2008) for a thorough examination of these models. These authors clearly articulate the problematic assumptions underlying these models, including the assumption that the value of each firm follows a geometric Brownian motion and that each firm issues only one zero-coupon bond.

for pricing risk and thus more efficiently allocating capital; Tang (2009). Moreover, because market data are much more volatile than accounting data, market-based risk metrics will likely suffer from much higher Type II errors and reversals. Such volatility would appear to preclude the use of a Merton model for regulatory purposes.

III. Data

A. Moody's credit ratings

We use Moody's Default and Recovery Database. The DRD database includes complete Moody's credit ratings histories for debt obligations issued by public firms in the United States and abroad. Moody's generates credit ratings that fall along a 21-point alphanumeric scale. The scale ranges from most creditworthy to least creditworthy: Aaa, Aa1, Aa2 Aa3, A1, A2, A3, Baa1, Baa2, Baa3, Ba1, Ba2, Ba3, B1, B2, B3, Caa1, Caa2, Caa3, Ca, and C. Moody's denotes obligations with credit ratings equal to Baa3 or higher as "investment grade" and obligations with credit ratings equal to Ba1 or lower as "speculative grade". Our analysis focuses on debt obligations' credit ratings between 1988 and 2009. Table I displays the distribution of issuers' senior debt and lowest rated bonds by year for each year of the sample.

[Insert Table I here.]

Panel A of Table I displays annual counts of the number of senior bonds in our sample, summed by year-end Moody's credit ratings. Panel B scales the numbers in Panel A by the annual sums (bottom row of Panel A). We add shading to Panel B for ease of visual interpretation: darker shading indicates that a relatively larger percentage of bonds have a particular credit rating for a given year. The rightmost column of Panel B indicates that 40% of senior bonds' year-end credit ratings are Aaa. This large percentage reflects bonds issued by the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac). Removing bonds issued by Fannie Mae and Freddie Mac reduces the percentage of senior bonds with Aaa ratings to a more modest 4.8% Panel C of Table I is similar to Panel A, but it displays annual counts of firms' lowest rated bonds in our sample, summed by

year-end Moody's credit ratings. Panel D of Table I is similar to Panel B, but it scales the numbers in Panel C by the annual sums (bottom row of Panel C). The lowest-rated bonds are more evenly distributed than the senior bonds in Panels A and B. We note that the largest bins are those just above the investment grade threshold. Holding firms with deteriorating financial health just above this line is consistent with Moody's stated concerns about regulatory consequences and other ratings triggers.

We restrict our sample to regular bonds. The DRD database contains information on the bonds' sale dates, maturity dates, face values, and coupon rates. For bonds that default, our data include the date of the default and a short description of the default event (e.g., the two most common reasons for default are missed a coupon payments and bankruptcies).

B. Rapid Ratings Financial Health Ratings

The Rapid Ratings database includes complete Financial Health Ratings histories for public firms in the United States and abroad. RR generates FHRs every quarter for all firms with accounting data available from Bloomberg. FHRs fall along a 100-point numeric scale, where one is least financially healthy and 100 is most financially healthy. RR denotes firms with FHRs equal to 65 or higher as "investment grade" and firms with FHRs equal to 64 or lower as "non-investment grade". We map the 100-point FHR scale to the 21-point MCR scale in the Appendix Table A.1 for reference. Our analysis focuses on firms' FHRs between 1988 and 2009. Table II displays annual counts of the number of firms in our sample, summed by year-end FHR. Panel B scales the numbers in Panel A by the annual sums (bottom row of Panel A) and adds shading for ease of visual interpretation. Similar to the MCRs in Table I Panel D, we note that the largest FHR bins are those just above the investment-grade threshold. This finding is inconsistent with the notion that FHRs call downgrades earlier simply because they are more conservative.

[Insert Table II here.]

C. Intersection of Moody's and Rapid Ratings

Moody's provides credit ratings for debt obligations issued by 6,115 firms and RR provides FHRs for 5,856 firms. Figure 1 displays the allocation of firms with debt obligations receiving MCRs from Moody's, firms receiving FHRs from RR, and the intersection of the two. The most prominent bankruptcies in U.S. history are among the 2,203 firms in the intersection, including Lehman Brothers Holdings Inc., Washington Mutual Inc., Worldcom Inc., General Motors Company, CIT Group, and Enron Corporation.[34]

The 3,912 firms with only MCRs (in the left moon of the Venn diagram) are largely conduit lenders; for example, there are 14 distinct "AIG SunAmerica Global Financing" issuers. We include AIG in the intersection, but none of these AIG conduits. The "MCR only" set also includes some foreign industrials (e.g., Abu Dhabi National Energy Company) and foreign banks (e.g., Australia and New Zealand Banking Grp. Ltd.). The 3,653 firms receiving only FHRs (in the right moon of the Venn diagram) are firms with audited financials available on Bloomberg but without public bonds. Indeed, the majority of public firms do not have credit ratings from NRSROs. Cornaggia, et al (2010) note that of their sample of 1980-2009 CRSP/Compustat firms, only 16% have a credit rating. In order to demonstrate the coverage of well-known firms, we recreate the Venn diagram for firms covered by Compustat in Figure 1 Panel B. Of these firms, 2,473 (4,617) have an MCR from Moody's (FHR from RR) at some point over the sample period; the intersection includes 1,565 firms. Unless otherwise specified, the tests, tables, and results in this paper are based upon the full Moody's-RR intersection of 2,203 issuers.

[Insert Figure 1 here.]

We compare the subsamples of firms that are covered by Moody's only, by RR only, or by both raters in Table III. Not surprisingly, the largest firms are covered by both raters. It is initially surprising to note that the total number of firm years is far greater for RR. (Figure 1

[34] The true intersection may be larger than 2,203 issuers. We employ a text-matching program provided by Van Anthony to match issuers in the Moody's database to those in the RR data, by name. Following the text matching by computer we visually inspect each match to ensure accuracy. This inspection involves some discretion, but is conducted in a conservative manner that reduces sample size but ensures matches are certain.

indicates that the total number of firms rated by RR is less than the number of firms with bonds rated by Moody's.) This apparent discrepancy reflects the fact that RR essentially rates all firms for which they can obtain financial data – irrespective of whether the firm issues bonds. Because the MCR is at the issue level, we have no Moody's ratings for firms prior to their bond issuance. This distinction is apparent in the differences in size and leverage of the firms rated only by RR compared to those rated only by Moody's. Firms without public bonds are smaller and have lower debt-to-capital ratios.

[Insert Table III here.]

Note that Moody's ratings convey information about expected losses on individual obligations. In contrast, RR's FHRs describe the financial health of firms. We were initially concerned about comparing disperse MCRs (at the issue level) to a single FHR (at the firm level). However, the mapping is one-to-one for a large majority of our sample. Table IV Panel A reports summary statistics for the number of bonds and the dispersion of ratings within firm-years. Although 54% of the sample has more than one bond outstanding, the median firm has only two bonds outstanding and they share the same MCR. The average firm has 10.83 bonds outstanding with less than one notch difference between highest- and lowest-rated bonds. This average is skewed by the frequent issues of Fannie Mae and Freddie Mac. Panel B further compares the highest- and lowest-rated bonds for the 54% of the sample with more than one bond. On average, the bonds are of similar size, but the lowest-rated bonds have higher coupon rates and longer duration. On average, the highest- and lowest- rated bonds have the same rating. At the median, the lowest-rated bond is one notch lower than the highest. We conclude that the granularity of the MCR system is an advantage over the firm-level FHR, but only for a small percentage of firms with complex debt structures. Where applicable in the tests that follow, we cluster standard errors at the firm level in order to control for correlations within issues by the same firm.

[Insert Table IV here.]

Before we compare their default prediction in section IV below, we establish that any disagreement between the FHR and MCR appears due to a difference in surveillance (updating ratings to reflect new information regarding credit quality) rather than a difference of opinion at the time of issuance. Specifically, we group bonds according to their (21-point) MCRs. For all bonds with a given MCR, we construct a histogram of the firms' FHRs. Panel A of Figure 2 displays an overhead view of these histograms on the day the bonds are issued. The contour lines indicate a 10 percent increase in mass relative to the surrounding areas. Panel B displays an overhead view of these histograms five years after the bonds are issued. The contour lines indicate a 20 percent increase in mass relative to the surrounding areas. Higher "peaks" in Panel A reflect smaller FHR variance for each MCR at the time of issuance compared to the flatter picture in Panel B reflecting higher FHR variance for each MCR five years hence.

[Insert Figure 2 here.]

D. Additional data sources

We collect daily stock prices from the Center for Research in Security Prices. We match these stock prices to firms in the Moody's-RR intersection. We employ daily bond prices obtained from the Trade Reporting and Compliance Engine (TRACE). However, the National Association of Securities Dealers (NASD) only began collecting TRACE data on July 1, 2002; Edwards, Harris, Piwowar, (2007). We thus augment these data with bond prices hand collected from Bloomberg. We match these bond prices to bonds issued by firms in the Moody's-RR intersection.

IV. Empirical design and results

A. Information content of credit ratings

We employ a host of empirical tests to determine the information content of the MCR and the FHR. First, we compute traditional accuracy ratios, which are designed to compare ordinal rankings, i.e., how well a system rank orders rated assets. Second, another dimension of accuracy requires information regarding actual, or absolute, credit quality so we examine the

whether the MCR and FHR serve as cardinal measures of credit quality. Next, we measure the timeliness of information provision by comparing the MCR and FHR to stock and bond price movements. Following Altman, Gande, and Saunders (2009) and Beaver et al. (2006), we employ Granger causality tests of informational efficiency. Finally, we quantify the wealth effects associated with timely information provision.

A1. Accuracy ratios

Moody's measures its own performance using empirical cumulative distributions of default prediction and accuracy ratios (see Cantor and Mann (2003)). Figure 3 displays cumulative distributions of default and the corresponding accuracy ratios for both Moody's and RR. For Panel A, we count the number of bonds with a given MCR as of January 1 of any year of the sample and the number of those bonds that default over the following year. For each MCR, we divide the full sample count of defaulted bonds by the full sample count of bonds. The figure plots the cumulative distribution of these values, moving from the lowest MCR to the highest. For Panel B, we count the number of firms with a given FHR as of January 1 of any year of the sample and the number of those firms with at least one bond that defaulted over the following year. For each FHR, we divide the full sample count of firms with at least one defaulted bond by the full sample count of firms. The figure plots the cumulative distribution of these values. The dashed line in both panels represents the cumulative distribution of ratings that have no predictive content. Said differently, if credit ratings were randomly assigned, then we would expect equal percentages of defaults among the ratings, and the dashed line representing a uniform cumulative distribution function would emerge.

[Insert Figure 3 here.]

The cumulative distribution for MCR lies higher and to the left than the cumulative distribution for FHR. This result indicates that Moody's assigns the lowest MCRs to more issues prior to default than RR assigns the lowest FHRs to firms prior to default. We compute accuracy ratios in order to formally express the difference between these cumulative distributions.

Accuracy ratios measure the area between the cumulative distribution and the dashed line. The larger the ratio, the more accurate the ratings are in an ordinal sense. For Panel A, we calculate the accuracy ratio as follows:

$$\text{Accuracy ratio}_{\text{Moody's}} = \sum_{i=1}^{N}\left[\sum_{j=1}^{i}\left(\frac{\text{Number of issues that default over the next year}_j}{\text{Number of issues}_j}\right) - \frac{i}{N}\right] / N \quad (1)$$

$N = 21$ and i is a numerical translation of issues' MCRs. For example, $i = 1$ for issues with the lowest credit rating (C) as of January 1 of any year of the sample, and i = 21 for issues with the highest credit rating (Aaa) as of January 1 of any year of the sample. The accuracy ratio for Panel A is 0.32. For Panel B, we calculate the accuracy ratio as follows:

$$\text{Accuracy ratio}_{\text{RR}} = \sum_{i=1}^{N}\left[\sum_{j=1}^{i}\left(\frac{\text{Number of firms with at least one issue default next year}_j}{\text{Number of firms}_j}\right) - \frac{i}{N}\right] / N \quad (2)$$

$N = 100$ and i is a numerical depiction of firms' FHRs. For example, $i = 1$ for firms with FHRs equal to 1 as of January 1 of any year of the sample, and $i = 100$ for firms with FHRs equal to 100 as of January 1 of any year of the sample. The accuracy ratio for the RR cumulative distribution is 0.19, which is smaller than that of the Moody's cumulative distribution (0.32).

Because this measure does not reflect accuracy with respect to absolute levels of credit risk, this is not our primary measure of information content. Indeed, an important shortcoming of tests of ordinal accuracy is best described with an example. Imagine if a rater awarded one of three hypothetical ratings: A, B, or C. Provided that all defaulting bonds are rated C at the time of default, the rater could randomly assign ratings of A or B to bonds that do not default, and the accuracy ratio would suggest perfect performance. Still, the accuracy ratio highlights the issue-level advantage of the MCR. Because RR produces exactly one FHR for each rated firm, its ordinal performance will underperform Moody's as the MCR varies by issue for each firm. Note from Table I that senior secured bonds receive better ratings than junior debentures. Given a

default event by a firm, the MCR is more useful for determining which issue(s) are at the lowest tier of the capital structure.

A2. Cardinal versus ordinal ratings

If the purpose of ratings-based regulation and ratings-based bond covenants is to set limits on tolerable credit risk born by creditors, funds, and financial intermediaries, then effective ratings should reliably map to actual credit risk. We examine the extent to which investment-grade certification implies any particular level of credit risk in Figure 4. Specifically, we compare the default frequencies of investment- and speculative-grade MCRs and FHRs by year. For January 1 of each year of the sample, we calculate the percentage of bonds that default over the following year according to whether Moody's rated the issue as speculative grade or investment grade. Panel A displays these results. The percentage of speculative grade bonds that defaults ranges from 0.49% in 1989 to 20.2% in 1992. Over the sample period, the standard deviation of the percentage of speculative grade bonds that default is 5.68%. The percentage of investment grade bonds that default ranges from 0% for most years of the sample to 2.60% in 2009. The standard deviation of the percentage of investment grade bonds that default is 0.92%.

[Insert Figure 4 here.]

Panel B of Figure 4 displays the results of similar analysis for FHRs. For January 1 of each year of the sample, we calculate the percentage of firms that have at least one bond default over the following year according to whether RR rated the firm as investment grade or non-investment grade. Over the sample period, the standard deviation of firms with non-investment grade FHRs that have at least one bond default is 0.98%, and the standard deviation of firms with investment grade FHRs that have at least one bond default is 0.29%.

Comparing panels A and B reveals that MCRs are stable in the sense that they do not update frequently. However, MCRs are less stable than FHRs in the sense that the information they convey with respect to default prediction exhibits more variation. Rules restricting lending

to investment grade MCRs appear to allow riskier lending in some years and deny safer lending in others.

A3. Measuring Timeliness

We begin this section with distributions of ratings prior to default. We examine ratings distributions both one and two years prior to default but display only the former in interest of conserving space. Panel A of Figure 5 displays MCRs belonging to bonds that default one year later. The tallest bar represents CIT Group's bonds. Over one thousand bonds issued by CIT Group defaulted within one (two) year(s) of having a Baa1 (A2) rating.[35] Comparing the mass distributions in plots of ratings one and two years prior to default (the latter not shown), it appears that Moody's downgrades a significant portion of bonds between one and two years prior to their defaults. Approximately 20% of bonds with a C rating default 12 to 24 months later, which is similar to the default rate of bonds rated B3 at that time. More than 60% of bonds with a C rating default within 12 months. Panel B plots the FHRs of firms that have at least one bond that defaults one year later. In contrast to the one-to-two-year transition for the MCR, the FHRs of firms with defaulting bonds migrate to speculative grade more than two years prior to the default event.

[Insert Figure 5 here.]

For the subsample of defaulting issues, Figure 6 plots average MCRs, FHRs, Z-Scores and bond prices from two years prior to default (-730 days) to two months after default (+60 days). We use all available data and thus sample size varies by panel. Bond prices are the most restrictive. The average MCR (Z-Score) migrated into speculative grade territory (distress zone

[35] We consider that credit ratings of bonds issued by high-frequency issuers may disproportionately drive results—credit ratings at issuance, as well as the timing and magnitude of ratings changes, are highly correlated within issuers. We consider addressing this over-representation problem by including only one bond per issuer at any given time. However, this approach is problematic. (Should we keep the highest- or lowest-rated bond for each issuer? Perhaps we should choose by seniority or maturity?) More importantly, issue-level ratings are one clear advantage of the Moody's rating system relative to the RR system. Moody's provides more granular analysis than RR because it analyzes, rates, and monitors each issue. We note that high-frequency issuance should generally benefit Moody's performance metrics relative to the FHRs because most large, frequent issuers do not default.

of discrimination) 87 (503) days before default. Average FHRs in Panel B were in speculative grade territory the entire two years prior to default. The distributions in Table I (Panel D) and Table II suggest that the results in Figure 6 reflect earlier identification of default, rather than broad pessimism by RR. Consistent with our hypothesis that the bond market does not rely on MCRs for information, this figure demonstrates that bond market prices reflect the deterioration in credit quality well in advance of the MCR downgrade. Moreover, the earlier Z-Score indication suggests that the delay in MCR downgrade is not attributable to inferior ratings technology, but rather is an intentional delay by Moody's. Moody's argues that their reluctance to downgrade bonds with deteriorating credit quality reflects a tension between accuracy and stability. However, Figures 6 suggests that the FHR improves the timeliness without introducing higher ratings volatility. We explore this point in greater detail below.

[Insert Figure 6 here.]

We explicitly test the difference in timeliness of default prediction between the MCR and FHR in Table V. We examine the amount of time prior to bonds' defaults for a number of benchmarks. We assign the firm-level FHRs to the bonds issued by those firms. The results in Table V indicate that RR first downgrades firms with bonds that later default an average of 5.9 years in advance. In contrast, Moody's first downgrades the bonds to speculative grade an average of 3.0 years prior to default. This difference is large in magnitude (2.8 years) and is statistically significant at the 1% level. This difference is remarkably different from the one to four month lead time of the Egan Jones ratings, as documented by Beaver et al (2006).

[Insert Table V here.]

We document the relative frequencies of reversal late in Table VIII. For the purpose of Table V, we note that the FHR is more likely to reverse (return to investment grade) and thus we also document the final FHR downgrade to speculative territory. The final FHR downgrade follows the MCR downgrade, on average, but this distribution is skewed. In most cases, the final FHR downgrade precedes the MCR downgrade; median days are 505 (197) prior to default for

the FHR (MCR). In real time, an investor would not know which downgrade would be the final. Thus, we explore the wealth effects of responding to the initial FHR downgrade to speculative grade for firms that default (and, separately, for all firms) in later tables.

For comparison, Table V also indicates that firms' stock prices drop 50% off peak an average of 6.5 years before the bonds default. The short time frame between the peak and the initial 50% decline reflects stock price volatility of this group of firms. Thus, we also note the average four year window between the date the stock price fell below this (50% off peak) threshold for the last time and the default event. On average, stock prices drop first (and potentially rebound), RR's FHRs drop second (and potentially rebound), and MCRs drop third.

For our final test of timeliness, we examine Granger causality in Table VI. We match quarterly observations of firm-level FHRs to each of the issues rated by Moody's. I.e., our tests employ quarterly observations at the issue level, where each issue has a MCR and an associated FHR. In order to make the 100-point RR scale comparable to the 21-point Moody's scale, we transform FHRs into one of 20 bins, where the first bin contains issues associated with firms having FHRs between one and five, the second bin contains issues associated with firms having FHRs between six and ten, and so forth. This approach allows us to create a dummy variable taking a value of one if the bond's issuer's FHR undergoes a significant change since the last quarter and zero if it remains the same or nearly the same. *FHR bin change* takes a value of one if the bond's issuer's FHR changes bins (migrating up or down) and zero if it does not. We also create a dummy variable taking a value of one if the issue's MCR changes (again, migrating up or down) since the last quarter and zero if it remains the same since the last quarter (*MCR change*). We conduct logistic vector autoregressions using these dummy variables and their lags:

$$\text{MCR change}_{i,t} = \alpha + \sum_{j=1}^{N} \beta_j \text{ MCR change}_{i,t-j} + \sum_{j=1}^{N} \gamma_j \text{ FHR bin change}_{i,t-j} + \varepsilon_{i,t} \qquad (3)$$

$$\text{FHR bin change}_{i,t} = \alpha + \sum_{j=1}^{N} \beta_j \text{ MCR change}_{i,t-j} + \sum_{j=1}^{N} \gamma_j \text{ FHR bin change}_{i,t-j} + \varepsilon_{i,t} \qquad (4)$$

where β's and γ's are coefficient estimates, α's are the regression constants, i represents the individual issue, t represents the quarter, and j represents the number of lags. We follow these regressions with F-tests of the null hypothesis that changes in FHR do not Granger cause changes in MCR using equation (5), and of the null hypothesis that changes in MCR do not Granger cause changes in FHR using equation (6):

$$H_0 : \gamma_j = 0, \forall\, j \qquad (5)$$

$$H_0 : \beta_j = 0, \forall\, j \qquad (6)$$

We test equations (5) and (6) using one to four quarterly lags. By comparison, Beaver et al. (2006) use six monthly lags. Our approach allows us to examine the information content of a full year's worth of lagged data, instead of drawing inferences from a specific lag length. Columns 1 and 2 of Table VI contains the results.

[Insert Table VI here.]

Changes in FHR bins Granger cause changes in MCRs, but not the other way around. Columns 3 and 4 (5 and 6) repeat this analysis, but with dummy variables that take values of one for upgrades (downgrades) and zero if the MCR or FHR bin does not change or migrates down (up). The results in columns 3 and 4 indicate that upgrades in FHR bins Granger cause upgrades in MCRs, but not the other way around. The results in columns 5 and 6 indicate that for downgrades, Granger causality flows in both directions. However, the F-statistics in column 5 are larger than those in column 6. Taken as a whole, Table VI results suggest that FHRs are more informative than MCRs.

A4. Wealth implications of timeliness

The preceding results suggest that the FHR provides more timely information than the MCR. But how does this timeliness really matter? We attempt here to quantify the wealth implications of timely information. We begin by examining pre-default price and yield data. We collect price data for bonds that 1) had investment grade MCRs at the time of issuance, 2) were issued by firms with investment grade FHRs at the time of issuance, 3) later defaulted, and 4)

both Moody's and Rapid Ratings downgraded the bond/firm to speculative grade prior to the default. Criteria 1) and 2) preclude original high yield debt in this table (i.e., many bonds that eventually default were classified as speculative by both FHR and MCR at the time of issuance).

We examine price and yield data at four points in time: the date Moody's downgrades the bond to speculative grade, seven calendar days prior to this MCR downgrade, the date that RR first downgrades the bonds' issuers to non-investment grade, and the date that RR last downgrades bonds' issuers to non-investment grade.[36] RR's first and last downgrades differ because FHRs migrate up before migrating down again (a result we further explore in Table VIII). Table VII contains these results.

[Insert Table VII here.]

The results indicate significant differences in the prices and yields at the various points in time. Prices are significantly lower ($11.70 to $15.40) and yields are significantly higher (5.9% to 9.7%) when Moody's downgrades the bonds to speculative grade compared to when RR downgrades the bonds' issuers. These results highlight the costly consequence of delaying sales of defaulting bonds beyond the earlier FHR warning. So why would sophisticated institutional investors have any use for the MCRs? Evidence presented in Table VIII, Figure 7, and Table IX below suggests rational answers.

Because RR releases new FHRs every quarter and the scale of FHRs is more granular than the scale of MCRs, it is likely that RR reverses its downgrades more often than Moody's does. Table VIII documents this difference. For any given year, RR upgrades 8.95% of firms' FHRs to investment grade after having downgraded them to non-investment grade in the past. In contrast, only 0.79% of firms see Moody's upgrade a bond after previously downgrading the bond to speculative grade. This result highlights a potential downside of timely credit ratings: if

[36] A potential concern is that Moody's downgrades result in regulatory-induced selling pressure. We examine prices and yields seven days prior to sidestep this effect. This approach provides estimates of prices and yields near the time of the Moody's downgrade, but free from any distortion due to regulatory-induced selling pressure.

ratings are employed as benchmarks in loans or other corporate contracts, downgrades may trigger technical default and re-contracting under new terms more favorable to the lender.

[Insert Table VIII here.]

Importantly, reversals indicate that the rating system triggers prematurely only if firms later prove solvent. For firms that ultimately default, early triggers are better (even if reversed once or twice along the way). We documented wealth implications of delayed sales of *defaulting* bonds in Table V. We must also explore potential wealth implications of pre-mature sales of bonds that ultimately recover and avoid default. We begin by plotting average bond prices around the initial FHR downgrade (to speculative grade) in Figure 7. This figure contains only the subsample of bonds for which Moody's maintains its investment grade MCR, however the picture is similar when bonds with downgraded MCRs are included. This figure demonstrates that many firms downgraded by RR (and negatively re-priced by the market) ultimately recover. Indeed, if firms manage to avoid default, bond prices must converge to par as they mature.

[Insert Figure 7 here.]

In general, speculative grade bonds are riskier than bonds with investment grade ratings. Risky bonds require higher compensatory yields, but not all risky bonds default. We explore the wealth effects of both error types (early sales of recovering bonds as well as delayed sales of defaulting bonds) employing the full sample of debt certified as investment grade at the time of issuance. Specifically, Table IX examines 2,244 bonds that, at the time of issuance, have both investment grade MCRs and FHRs. Panel A describes the bonds which each rater downgrades and Panel B examines portfolio returns earned by relying on the FHR versus the MCR for sell signals.

Panel A indicates that RR is more likely to downgrade than Moody's and that sales prompted by the Moody's downgrade result in significantly greater lost principal. The average price at the RR (Moody's) downgrade is 98.87 (92.08) and the difference is significant at 1%. These results are consistent to those reported for the smaller sample of defaulting bonds in Table

VII. Table IX Panel A further indicates that bonds downgraded by Moody's are significantly smaller issues (average face value $313 million versus $384 million) with significantly higher coupon rates (6.73% versus 6.13%) than those downgraded by RR.

Panel B displays annualized returns from portfolios governed by one of two portfolio strategies. *Moody's portfolio* (*Rapid Ratings portfolio*) involves buying bonds on the issue date at the offer price and then holding the bond until it matures or Moody's downgrades the bond (Rapid Ratings downgrades the issuing firm) to speculative grade. We assume that coupon payments, as well as proceeds from the sale of bonds, when applicable, will be reinvested in an index of investment grade debt.[37] We examine separately for various portfolio cutoff dates the full sample of bonds with price data, the subsample of bonds for which both raters downgrade to speculative grade, and all bonds that have maturity dates earlier than the portfolio cutoff date. Average annualized equal-weighted returns are consistently higher for Moody's portfolios and the difference is generally significant. We note from Panel A that bonds downgraded by both RR and Moody's have higher average coupon rates (6.79%) than the full sample (5.70%). The Moody's portfolio holds these higher coupon bonds an average of 2.2 years longer than the RR portfolio. Selling these high-coupon bonds earlier lowers the RR portfolio yield. Figure 6 and Table VII indicate that the Moody's portfolio strategy contains riskier bonds. But Figure 7 and Table IX suggest that this risk results in higher portfolio yield. We infer a rational preference on the part of regulated institutional investors, especially those insured by taxpayers against losses, for regulatory reliance on the less timely MCR. Meanwhile, investors can rely on more timely information to price default risk appropriately.

Table V suggests the possibility that the FHR leads not only the MCR, but also the equity market. We explore this possibility further in Table X by examining stock returns following

[37] Un-tabulated results are robust to reinvestment in Treasury bills. Our results are also robust if we assume bonds in the Moody's portfolio are sold any time between 7 days prior to 14 days after the Moody's downgrade. We consider this range for two reasons. First, we anticipate some price pressure at the Moody's downgrade because of regulatory-induced sales. Second, it may take investors more than one day to sell these bonds in compliance with the regulatory statutes. Finally, our results are qualitatively similar if we compute value-weighted returns instead of equal-weighted returns.

large changes in the FHR. Taking short positions in stocks of firms that are downgraded by RR (by 10 points or more) and investing the proceeds in long portfolios of firms that are upgraded by RR (by 10 points or more) generates an average quarterly return of 2.70% (significant at 10%) and an average annual return of 6,17% (significant at 5%). This trading strategy may not be executable due to transactions costs and constraints on short positions, but these results suggest information in the FHR that is useful for predicting future stock returns.[38]

V. Conclusion

Moody's has become the target of much criticism over inflated, subjective, and sluggish credit ratings. But Moody's has consistently disclosed that their ratings are based largely on qualitative analysis and that they intend for their ratings to change slowly. Further, they have disclosed that their ratings are relative and thus do not reliably indicate absolute credit risk. Finally, Moody's clearly expresses primary concern over minimizing Type II classification errors. Perhaps regulators, investors, and academics employing Moody's ratings to assess current, absolute financial risk have misused the product. Indeed, the less-timely information provided by traditional ratings leads us to conclude that their market demand is attributable to over-reliance by regulators (so-called regulatory arbitrage). Banks, pension funds, and insurance companies take advantage of stale ratings, cognizant of the difference between actual credit risk (which the market prices using more timely credit analysis) and that implied by the credit rating. They bear higher risk to earn higher returns, ultimately protected by government insurance.

The new Dodd-Frank legislation requires regulators to replace the NRSRO benchmarks, but it does not provide alternatives. Our results suggest regulators consider the following: 1) the tension between Type I and Type II errors (i.e., costs associated with delayed sales of risky bonds that ultimately default as well as costs associated with premature liquidation of risky

[38] To our knowledge, Moody's does not claim to inform the equity market. But for completeness, we replicate the strategy in Table X using large changes (separately, at least 2 or 3 notches) in the MCR to trigger short sales and share purchases. The average returns are negative, but not significantly different from zero.

bonds that ultimately recover), 2) the potential for subjectivity in qualitative analysis, 3) the importance of gauging absolute credit risk instead of relying on relative rankings, and 4) the impact of rater compensation structure on the timeliness of information production.

Appendix

A.1. Relevant Sections of Dodd-Frank Wall Street Reform and Consumer Protection Act

SEC. 939A. REVIEW OF RELIANCE ON RATINGS.

(a) AGENCY REVIEW.—Not later than 1 year after the date of the enactment of this subtitle, each Federal agency shall, to the extent applicable, review—
(1) any regulation issued by such agency that requires the use of an assessment of the credit-worthiness of a security or money market instrument; and
(2) any references to or requirements in such regulations regarding credit ratings.

(b) MODIFICATIONS REQUIRED.—Each such agency shall modify any such regulations identified by the review conducted under subsection (a) to remove any reference to or requirement of reliance on credit ratings and to substitute in such regulations such standard of credit-worthiness as each respective agency shall determine as appropriate for such regulations. In making such determination, such agencies shall seek to establish, to the extent feasible, uniform standards of credit-worthiness for use by each such agency, taking into account the entities regulated by each such agency and the purposes for which such entities would rely on such standards of credit-worthiness.

(c) REPORT.—Upon conclusion of the review required under subsection (a), each Federal agency shall transmit a report to Congress containing a description of any modification of any regulation such agency made pursuant to subsection (b).

SEC. 939B. ELIMINATION OF EXEMPTION FROM FAIR DISCLOSURE RULE.

Not later than 90 days after the date of enactment of this subtitle, the Securities Exchange Commission shall revise Regulation FD (17 C.F.R. 243.100) to remove from such regulation the H. R. 4173—513 exemption for entities whose primary business is the issuance of credit ratings (17 C.F.R. 243.100(b)(2)(iii)).

SEC. 334. TRANSITION RESERVE RATIO REQUIREMENTS TO REFLECT NEW ASSESSMENT BASE.

(B) MINIMUM RESERVE RATIO.—The reserve ratio designated by the Board of Directors for any year may not be less than 1.35 percent of estimated insured deposits, or the comparable percentage of the assessment base set forth in paragraph (2)(C).

(d) RESERVE RATIO.—Notwithstanding the timing requirements of section 7(b)(3)(E)(ii) of the Federal Deposit Insurance Act, the Corporation shall take such steps as may be necessary for the reserve ratio of the Deposit Insurance Fund to reach 1.35 percent of estimated insured deposits by September 30, 2020.

Table A.1 – Ratings Scales Equivalence

This table displays Moody's credit ratings for corporate debt, the definitions of those ratings, and the equivalent firm-level Financial Health Ratings issued by Rapid Ratings. The information in this table comes from a combination of a document published by Moody's ("Moody's Ratings Symbols & Definitions," available at http://www.rbcpa.com/Moody's_ratings_and_definitions.pdf) and Rapid Ratings (http://www.rapidratings.com/modules/content/content.php?content.19).

	Moody's			Equivalent Financial Health Rating issued by Rapid Ratings
	Credit rating	Numerical value assigned	Definition	
Investment grade	Aaa	21	Judged to be of the highest quality, with minimal credit risk.	95
	Aa1	20	Judged to be of high quality and subject to very low credit risk.	
	Aa2	19		90
	Aa3	18		85
	A1	17	Considered upper- medium grade and are subject to low credit risk.	
	A2	16		80
	A3	15		75
	Baa1	14	Subject to moderate credit risk. They are considered medium-grade and as such may possess certain speculative characteristics.	
	Baa2	13		70
	Baa3	12		65
Speculative grade	Ba1	11	Judged to have speculative elements and are subject to substantial credit risk.	60
	Ba2	10		55
	Ba3	9		50
	B1	8	Considered speculative and are subject to high credit risk.	45
	B2	7		40
	B3	6		35
	Caa1	5	Judged to be of poor standing and are subject to very high credit risk.	30
	Caa2	4		25
	Caa3	3		20
	Ca	2	Highly speculative and are likely in, or very near, default, with some prospects of recovery of principal and interest	15
	C	1	The lowest rated class of bonds and are typically in default, with little prospect for recovery of principal or interest.	10
	Default	--		5

References

Altman, Edward I., 1968, Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance*, 189–209.

Altman, Edward I., Amar Gande, and Anthony Saunders, 2009, Bank debt versus bond debt: evidence from secondary market prices, *Journal of Money, Credit, and Banking* 42 (4), 755-767.

Altman, Edward. I. and Duen Li Kao, 1992, The implications of corporate bond ratings drift, *Financial Analysts Journal* June, 64-75.

Altman, Edward I. and Herbert A. Rijken, 2004, How rating agencies achieve rating stability, *Journal of Banking & Finance* 28(11), 2679-2714.

Altman, Edward I. and Herbert A. Rijken, 2005, The effects of rating through the cycle on rating stability, rating timeliness and default prediction performance, working paper.

Asea, Patrick K. and S. Brock Blomberg, 1998, Lending cycles, *Journal of Econometrics* 83, 89-128.

Association for Financial Professionals, 2002, Ratings agencies surveys: accuracy, timeliness, and regulation, www.afponline.org.

Baker, H. Kent, and Sattar. A. Mansi, 2002, Assessing credit agencies by bond issuers and institutional investors, *Journal of Business Finance and Accounting* 29 (9), 1367-1398.

Barone, Ronald M., 2002, Testimony before the Permanent Subcommittee on Investigations of the Committee on Government Affairs, U.S. Senate, July 23.

Bhanot, Karan, and Antonio S. Mello, 2006, Should corporate debt include a rating trigger?, *Journal of Financial Economics* 79, 69-98.

Bharath, Shreedhar T., and Tyler Shumway, 2008, Forecasting default with the Merton distance-to-default model, *Review of Financial Studies* 21 (3) 1339-69.

Beaver, William. H., Catherine Shakespeare, and Mark T. Soliman, 2006, Differential properties in the ratings of certified versus non-certified bond-rating agencies." *Journal of Accounting and Economics* 42, 303–334.

Becker, Bo and Todd Milbourn, 2010, Reputation and competition: evidence from the credit rating industry, forthcoming at *Journal of Financial Economics*.

Bongaerts, Dion, Martijn Cremers, and William Goetzman, 2010, Tiebreaker: certification in multiple credit ratings, forthcoming *Journal of Finance*.

Boot, Arnoud W.A., Todd T. Milbourn, and Anjolein Schmeits, 2006, Credit ratings as coordination mechanisms, *Review of Financial Studies* 19 (1) , 81-118.

Blume, Marshall E., Felix Lim, and A. Craig MacKinlay, 1998, The declining credit quality of U.S. corporate debt: Myth or reality?, *Journal of Finance* 53(4), 1389-1413.

Cantor, Richard, 2001, Moody's Investors Service response to the consultative paper issued by the Basel Committee on Bank Supervision: A new capital adequacy framework, *Journal of Banking and Finance*, 25(1), 171-185.

Cantor, Richard, Christopher Mahoney and Christopher Mann, 2003, Are corporate bond ratings procyclical? Moody's Investors Service Special Comment, October.

Cantor, Richard and Chris Mann, 2003, Measuring the performance of corporate bond ratings, Moody's Investors Service Special Comment, April.

Cantor, Richard and Chris Mann, 2006, Analyzing the tradeoff between ratings accuracy and stability, Moody's Investors Service Special Comment, September.

Cantor, Richard, and Frank Packer, 1997, Differences of opinion and selection bias in the credit rating industry, *Journal of Banking & Finance* 21(10), 1395-1417.

Campbell, John Y. and Glen B. Taksler, 2002, Equity volatility and corporate bond yields, Harvard Institute of Economic Research discussion paper number 1945.

Caragata, Patrick and James Gellert, 2009, Competition in the credit rating industry: Are we asking the right questions and getting the right answers?, SEC Roundtable to Examine Oversight of Credit Rating Agencies, April 15, Washington DC.

Casey, Commissioner Kathleen L., 2009, In search of transparency, accountability, and competition: The regulation of credit rating agencies, *The SEC Speaks in 2009*, U.S. Securities and Exchange Commission, February 6, Washington, D.C.

Coval, Joshua, Jakub Jurek, and Erik Stafford, 2009, The economics of structured finance, *Journal of Economic Perspectives* 23(1), 3–25.

Ederington, Louis H. and Jeremy C. Goh, 1998, Bond rating agencies and stock analysts: Who knows what when?, *Journal of Financial and Quantitative Analysis* 33(4), 569-585.

Ederington, Louis H. and Jess B. Yawitz, 1987, The bond rating process, In *Handbook of Financial Markets and Institutions*, 6th Ed, Edward Altman, editor, New York NY: John Wiley and Sons.

Edwards, Amy, Lawrence Harris, and Michael Piwowar, 2007, Corporate Bond Market Transaction Costs and Transparency, *Journal of Finance* 62 (3), 1421-1451.

Ellis, David M. 1998, Different sides of the same story: investors' and issuers' views of rating agencies, *The Journal of Fixed Income* 9, 35-45.

Ellul, Andrew, Chotibhak Jotikasthira, and Christian Lundblad, 2010, Regulatory pressure and fire sales in the corporate bond markets, *Journal of Financial Economics*, forthcoming.

FitchRatings, 2007, Inside the Ratings: What Credit Ratings Mean.

Fons, Jerome S., Richard Cantor, and Christopher Mahoney, 2002, Understanding Moody's corporate bond ratings and rating process, Moody's Investors Service Special Comment, May.

Gellert, James H., 2009a, Rapid Ratings Statement at SEC Roundtable to Examine Oversight of Credit Rating Agencies, April 15, Washington DC.

Gellert, James H., 2009b, Rapid Ratings testimony concerning "*Transforming Credit Rating Agencies*" before the U.S. House of Representatives Committee on Financial Services and Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises, September 30.

Gellert, James, 2009c, Testimony concerning proposals to enhance the regulation of credit rating agencies, before the Committee on Banking, Housing and Urban Affairs United States Senate, August 5, 2009

Goh, Jeremy C, and Ederington, Louis H., 1993, Is a bond rating downgrade good news, bad news or ne news to stockholders? *Journal of Finance* 48, 2001-2008.

Greenspan, Alan, 1998, The role of capital in optimal banking supervision and regulation, Federal Reserve Bank of New York Economic Policy Review, October, 163-168.

Griffin, John M. and Dragon Tang, 2010, Did subjectivity play a role in CDO credit ratings? Working paper.

Grossman, S. and J. Stiglitz, 1980, On the impossibility of informationally efficient markets, *American Economic Review* 70(3), 393-408.

Hand, John R. M., Robert W. Holthausen, and Richard W. Leftwich, 1992, The effect of bond rating agency announcements on bond and stock prices, *Journal of Finance* 47(2), 733.752.

Hertzel, Michael G., Zhi Li, Micah S. Officer, and Kimberly J. Rodgers, 2008. Inter-firm linkages and the wealth effects of financial distress along the supply chain, *Journal of Financial Economics* 87(2), 374-387.

Hettenhouse, George W. and William L. Sartoris, 1976, An analysis of the information value of bondrating changes, *Quarterly Review of Economics and Business* 16, 65–78.

Hillegeist, Stephen A., Elizabeth K. Keating, Donald P. Cram, and Kyle G. Lundstedt, 2004, Assessing the probability of bankruptcy, *Review of Accounting Studies* 9, 5-34.

Hite, Gailen and Arthur Warga, 1997, The effect of bond-rating changes on bond price performance, *Financial Analysts Journal*, May/June, 35-51.

Holthausen, Robert W. and Richard W. Leftwich, 1986, The effect of bond rating changes on common stock prices, *Journal of Financial Economics* 17, 57-89.

Hovakimian, Armen, Ayla Kayhan, and Sheridan Titman, 2009, Credit rating targets, working paper.

Ingram, R., L. Brooks and R. Copeland, 1983, The information content of municipal bond rating changes: A note, *Journal of Finance* 38, 997-1003.

IOSCO, 2008, Code of Conduct Fundamentals for Credit Ratings Agencies

Jefferson County School District No R-1 v. Moody's Investor's Services, United States Court of Appeal for the Tenth Circuit, May 4, 1999, 175 F. 3d 848.

Jensen, Michael C. and Clifford W. Smith, 1984, The theory of corporate finance: A historical overview, Reprinted from *The Modern Theory of Corporate Finance*, New York: McGraw-Hill.

Jorion, Philippe, Charles Shi, and Sanjian Zhang, 2009, Tightening credit standards: the role of accounting quality, *Review of Accounting Studies* 14, 123-160.

Kisgen, Darren, 2005, Credit ratings and capital structure, *Journal of Finance* 61 (3), 1035-1072.

Kolchinsky, Eric, 2010, Statement before the Senate Permanent Subcommittee on Investigations, Hearing on *Wall Street and the Financial Crisis: The Role of Credit Agencies*, April 23.

Korablev, Irina, and Douglas Dwyer, 2007, Moody's KMV: Power and level validation of Moody's KMV EDF credit measures in North America, Europe, and Asia.

Loffler, Gunter, 2004, Ratings versus market-based measures of default risk in portfolio governance, *Journal of Banking and Finance* 28, 2715-2746.

Mathis, Jerome, James McAndrews, and Jean-Charles Rochet, 2009, Rating the raters: Are reputation concerns powerful enough to discipline rating agencies?, *Journal of Monetary Economics* 56, 657-674.

Merton, Robert C., 1974, On the pricing of corporate debt: the risk structure of interest rates, *Journal of Finance* 29, 449-70.

Partnoy, Frank, 1999, The Siskel and Ebert of financial markets: two thumbs down for the credit rating agencies, *Washington University Law Quarterly* 77, 619-712.

Pinches, George E. and J. Clay Singleton, 1978, The adjustment of stock prices to bond rating changes, *Journal of Finance* 33, 29-44.

Raiter, Frank L., 2008, Credit rating agencies and the financial crisis, Statement before the Committee on Oversight and Government Reform, U.S. House of Representatives, October 22.

Sangiorgi, Francesco, Jonathan Sokobin, and Chester Spatt, 2009, Credit-rating shopping, selection and the equilibrium structure of ratings, working paper.

Shumway, Tyler, 2001, Forecasting bankruptcy more accurately: A simple hazard model, *Journal of Business*, January 2001, 101-24.

SIFMA, 2007a, *FINRA's TRACE and the U.S. corporate bond market*, September 11, 2007.

SIFMA, 2007b, *SIFMA/EPDA/EHYA response to CESR call for evidence on non-equity markets transparency*, March 6, 2007.

Skreta, Vasiliki, and Laura Veldkamp, 2009, Ratings shopping and asset complexity: A theory of ratings inflation, *Journal of Monetary Economics* 56, 678-695.

Standard and Poors, 2003, Corporate Ratings Criteria, www.standardandpoors.com

Tang, Tony T., 2009, Information asymmetry and firms' credit market access: Evidence from Moody's credit rating format refinement, *Journal of Financial Economics* 93, 325-51.

United States Congress (2008), *Credit Rating Agencies And The Financial Crisis*, House of Representatives Committee on Oversight and Government Reform, October 22.

United States Senate (2002), *Rating the Raters: Enron and the Credit Rating Agencies, Hearings Before the Senate Committee on Governmental Affairs*, 107th Cong. 471, March 20.

U.S. Securities and Exchange Commission, 2003, "Report on the Role and Function of Credit Rating Agencies in the Operations of the Securities Markets" written as required by Section 702(b) of the Sarbanes-Oxley Act of 2002, Washington DC, January.

U.S. Securities and Exchange Commission, 2008a, "Annual Report on Nationally Recognized Statistical Rating Organizations" as required by Section 6 of the Credit Rating Agency Reform Act of 2006, Washington DC, June.

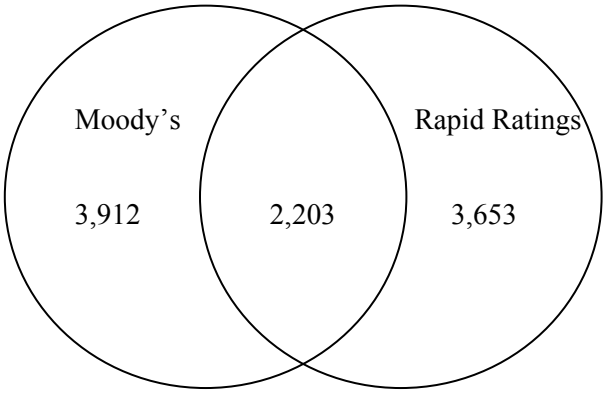
U.S. Securities and Exchange Commission, 2008b, Summary Report of Issues Identified in the Commission Staff's Examination of Select Credit Rating Agencies, Washington DC, July.

Vassalou, Maria, and Yuhang Xing, 2004, Default risk in equity returns, *Journal of Finance* 59, 831-68.

Wakeman, Lee M. 1981, The real function of bond rating agencies, *Chase Financial Quarterly,* V.1, 18-25. Reprinted in *The Modern Theory of Corporate Finance*, Michael C. Jensen and Clifford W. Smith, Jr., Editors, New York: McGraw-Hill, Inc., 1984.

Weinstein, M., 1977, The effect of a rating change announcement on bond price, *Journal of Financial Economics* 5, 329.350.

Panel A – All Issuers



Panel B – Issuers in Compustat, only

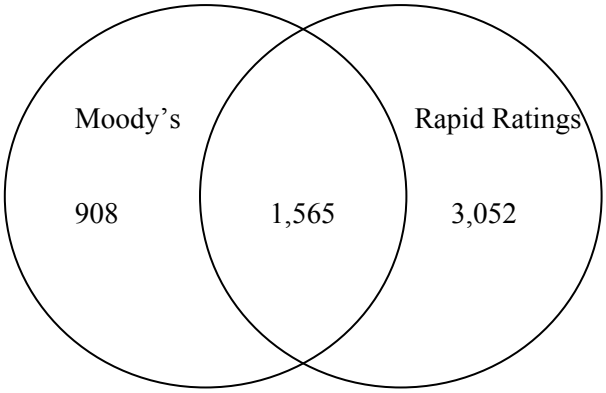
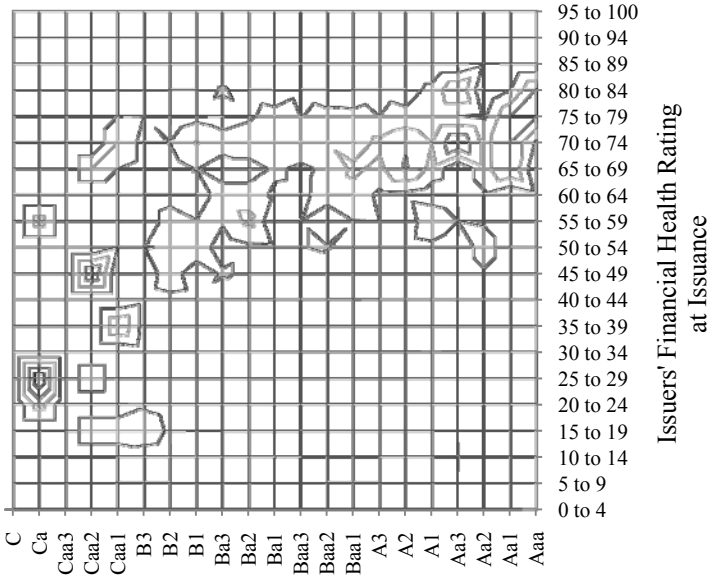


Figure 1 – Allocation of Issuers Covered by Moody's Investors Service and Rapid Ratings
Panel A displays the number of issuers with at least one bond rated by Moody's Investors Service, the number of issuers for which Rapid Ratings provides a Financial Health Rating, and the intersection of these two criteria. The sample period is 1988 to 2009. Panel B excludes issuers in Panel A that do not have data in Compustat.

Panel A – Distributions of Financial Health Ratings at Issuance



Panel B – Distributions of Financial Health Ratings Five Years after Issuance

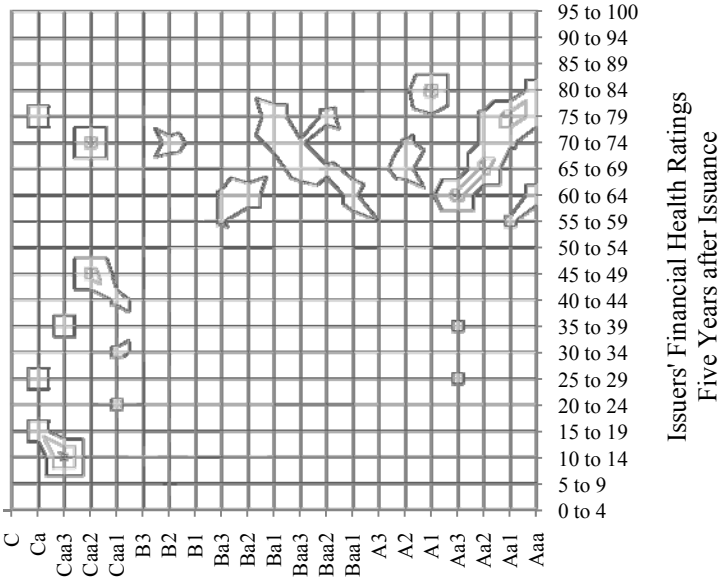
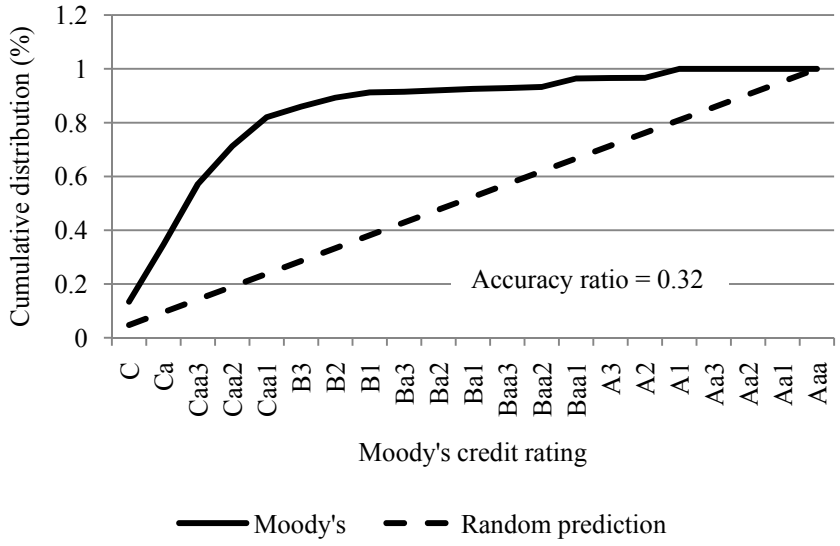


Figure 2 – Distributions of Issuers' Financial Health Ratings by Moody's Credit Rating
For all bonds with a given Moody's Credit Rating, we construct a histogram of the issuers' Financial Health Ratings. Panel A displays an overhead view of these histograms on the day the bonds are issued. The contour lines indicate a 10 percent increase in mass relative to the surrounding areas. Panel B displays an overhead view of these histograms five years after the bonds are issued. The contour lines indicate a 20 percent increase in mass relative to the surrounding areas.

Panel A – Cumulative Percentage of Issue Defaults by Moody's Credit Rating



Panel B – Cumulative Percentage of Firms with Defaulting Debt by Financial Health Rating Bin

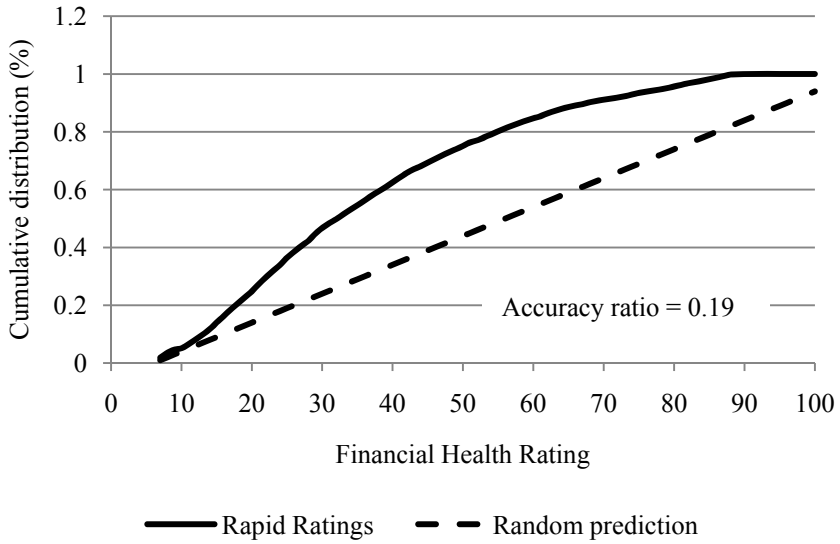
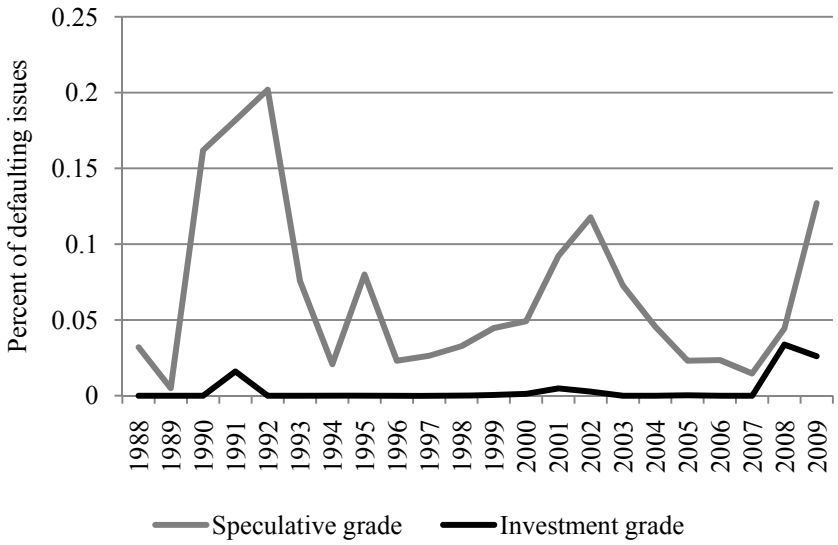


Figure 3 – Empirical Cumulative Distributions of Default Prediction Ability and Accuracy Ratios
Panel A: We count the number of bonds with a given credit rating as of January 1 of any year of the sample and the number of those bonds that default over the following year. For each credit rating, we divide the full sample count of defaulted bonds by the full sample count of bonds. The figure plots the cumulative sum of these values, moving from the lowest credit rating to the highest. Panel B: We count the number of firms with a given Financial Health Rating as of January 1 of any year of the sample and the number of those firms with at least one bond that defaulted over the following year. For each Financial Health Rating, we divide the full sample count of firms with at least one defaulted bond by the full sample count of firms. The figure plots the cumulative sum of these values, moving from the lowest Financial Health Rating to the highest. The dashed line in both panels represents the empirical cumulative distribution of ratings that have no predictive content. The accuracy ratio is equal to the area between the solid and dashed lines.

Panel A – Percent of Issues that Default



Panel B – Percent of Firms with At Least One Issue that Defaults

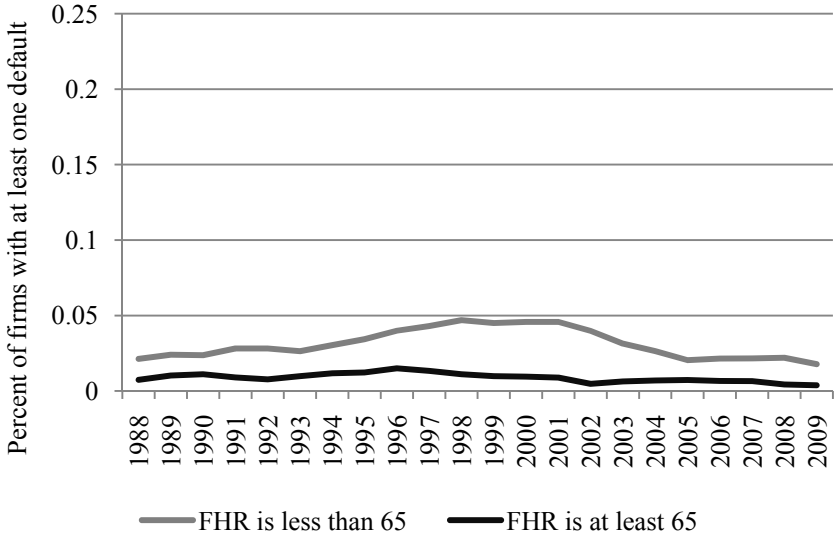


Figure 4 – Time Variance in Default Activity by Credit Quality
Panel A displays, as of January 1 of each year of the sample, the percentage of speculative grade (credit rating equals Ba1 or lower) issues and investment grade (credit rating equals Baa3 or higher) issues that default over the following year. Panel B displays, as of January 1 of each year of the sample, the percentage of firms with non-investment grade Financial Health Ratings (less than 65) and investment grade Financial Health Ratings (at least 65) that have at least one issue default over the following year.

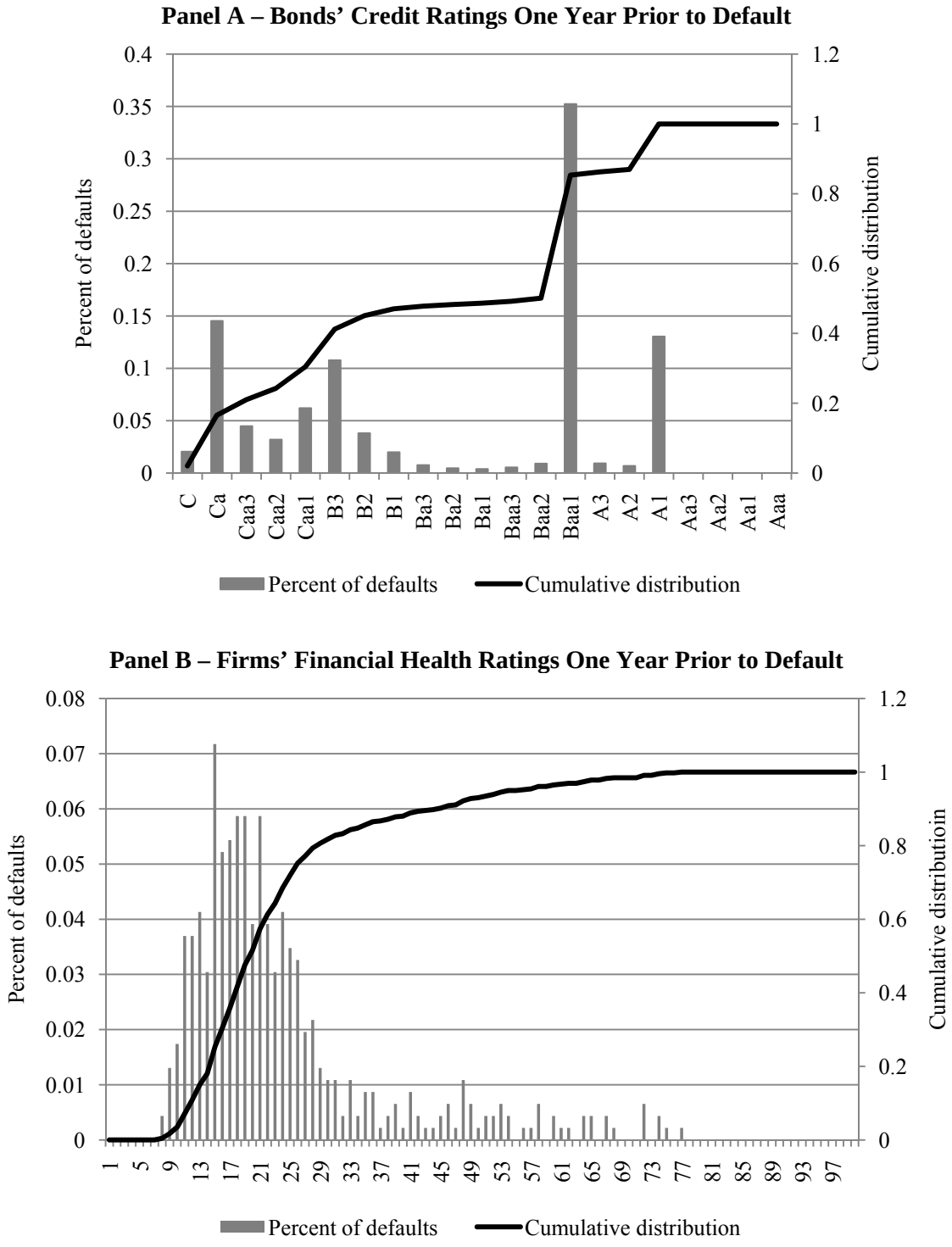
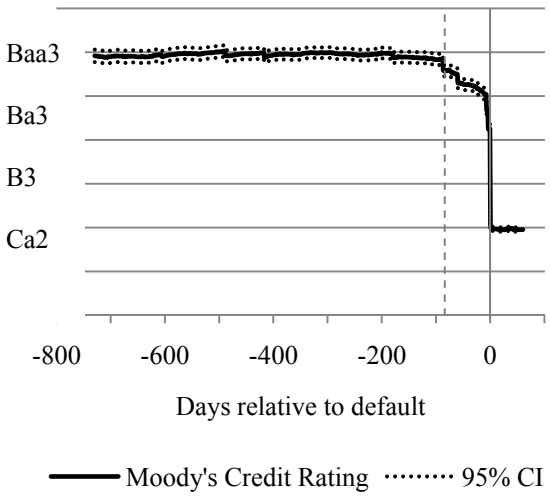
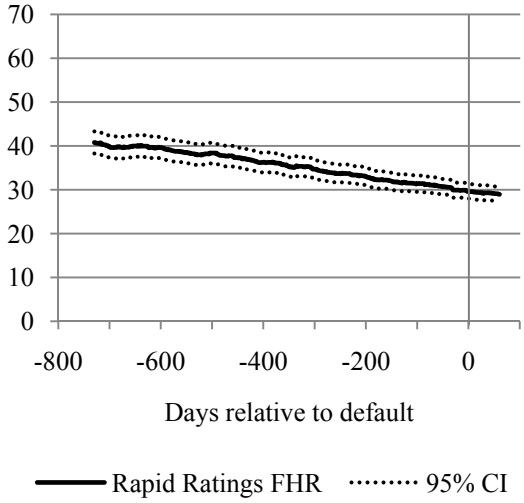


Figure 5 – Credit Ratings and Financial Health Ratings Prior to Default
Panel A displays the distribution of credit ratings for bonds that default one year later. Credit ratings come from Moody's Investors Service. Panel B displays the distribution of Financial Health Ratings for firms that have at least one issue that defaults within one year. Financial Health Ratings come from Rapid Ratings. The sample runs from 1988 to 2009.

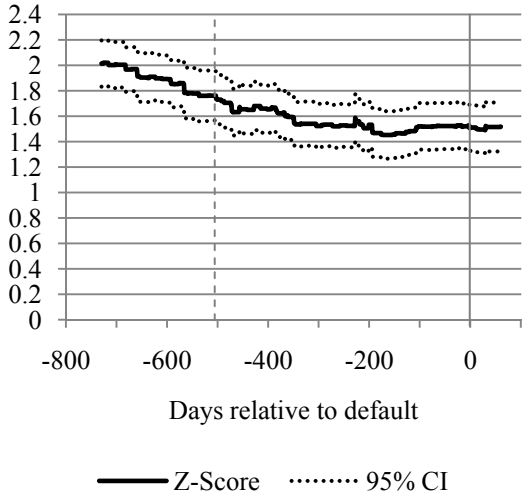
Panel A – Mean MCR around Default



Panel B – Mean FHR around Default



Panel C – Mean Z-Score around Default



Panel D – Mean Bond Price around Default

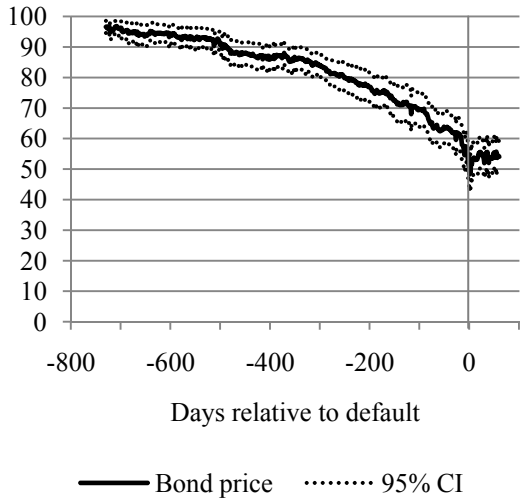


Figure 6 – Mean Credit Rating, Financial Health Rating, Z-Score, and Bond Price around Default
This figure plots mean Moody's credit ratings, Rapid Ratings Financial Health Ratings, Z-Scores, and bond prices, expressed as a percentage of face value, from two years prior to default (-730 days) to two months after default (+60 days). The vertical dashed line in Panel A (C) represents the date at which the average Moody's credit rating (Z-Score) migrated into speculative grade territory (distress zone of discrimination). This migration occurs 87 days before default in Panel A and 503 days before default in Panel C.At the time of default, Panel A represents 1,766 defaulting bonds, Panel B represents 301 firms with at least one defaulting bond, Panel C represents 210 firms with at least one defaulting bond, and Panel D represents 103 defaulting bonds. Credit ratings come from Moody's Investors Service, Financial Health Ratings come from Rapid Ratings, we compute Z-Scores using annual Compustat data, and we collect bond prices from TRACE and Bloomberg.

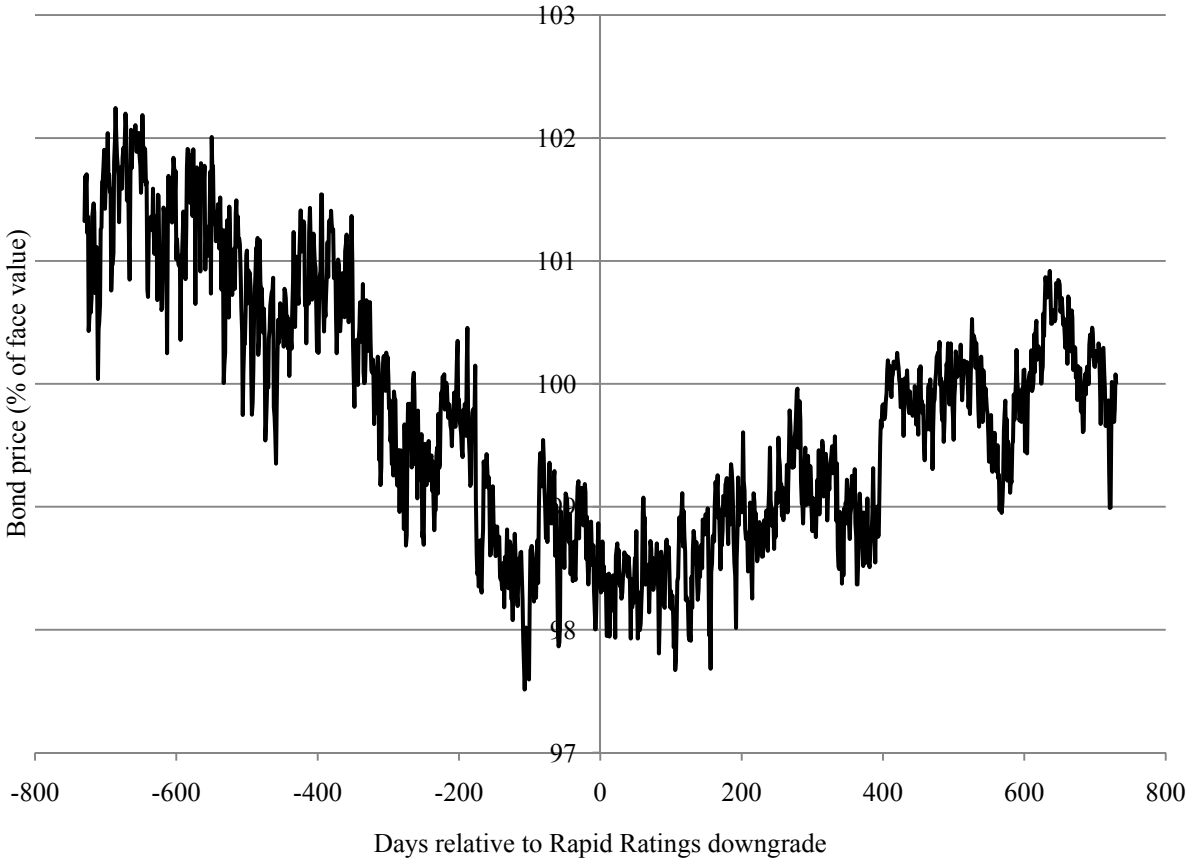


Figure 7 – Mean Bond Price around FHR downgrades (including non-defaulting firms)
This figure plots the mean price of 954 bonds for which Rapid Ratings downgrades the issuing firm to speculative grade, but Moody's does not downgrade the bond to speculative grade. The time series runs from two years prior to the downgrade (-730 days) to two years after the downgrade (+730 days). We collect bond price data from TRACE and Bloomberg.

Table I – Distribution of Moody's Credit Ratings by Year

Panel A displays the number of credit ratings for firms' senior debt at the end of each year. Panel B displays the numbers in Panel A after scaling by the annual sum (bottom row of Panel A). The bottom row of Panel B represents the annual sums divided by the overall sum (lower right corner of Panel A). Credit ratings come from Moody's Investors Service. The concentration of Aaa bonds in Panels A and B reflect issues by Fannie Mae and Freddie Mac. Panel C displays the number of credit ratings for firms' lowest rated debt at the end of each year. Panel D displays the numbers in Panel C after scaling by the annual sum (bottom row of Panel C). The bottom row of Panel D represents the annual sums scaled by the overall sum (lower right corner of Panel C). Darker shading indicates a larger percentage; this technique is intended to improve visual interpretation.

Panel A – Number of Senior Bonds by Moody's Credit Rating and Year

Credit rating	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	Sum
C	0	0	0	0	0	0	0	0	0	0	13	1	17	102	23	10	10	1	25	11	4387	96	4696
Ca	2	0	0	0	20	0	0	1	3	0	7	44	34	190	160	76	30	6	69	12	64	146	867
Caa3	0	0	0	0	0	0	0	0	0	20	9	23	20	81	138	26	4	1	54	8	43	274	701
Caa2	0	0	0	0	0	0	0	0	0	5	15	36	27	126	85	119	107	17	10	12	464	155	1178
Caa1	0	0	0	0	0	0	0	0	0	45	35	22	74	161	224	93	40	56	244	97	104	348	1543
B3	0	0	1	2	5	20	15	382	43	27	89	159	116	106	145	158	85	186	116	45	4829	479	7024
B2	0	2	0	1	23	49	117	36	9	80	420	129	271	302	168	364	259	110	104	100	116	440	3108
B1	8	4	1	45	30	52	120	542	144	135	194	639	125	157	220	359	262	314	159	121	75	1179	4986
Ba3	8	26	17	35	37	13	31	167	250	445	256	569	151	275	454	234	356	217	414	129	120	1050	5318
Ba2	21	23	25	34	306	60	5	130	189	321	492	203	159	314	342	302	488	211	652	147	173	1612	6294
Ba1	43	7		65	43	73	34	40	222	119	185	125	181	392	253	302	261	366	246	316	297	19455	23183
Baa3	134	82	212	291	211	263	174	111	171	227	500	548	228	610	980	1229	672	1719	1154	2670	1559	7066	20987
Baa2	161	323	163	222	248	229	90	313	385	684	728	574	629	850	1338	1635	1437	1173	2779	3001	4519	4527	26421
Baa1	159	224	497	303	348	190	136	363	779	948	1436	965	1113	752	910	980	969	1433	2167	4112	1654	5556	26457
A3	339	313	486	407	752	453	341	494	715	452	878	1005	668	1181	1010	1089	467	1267	1078	3007	2168	8850	27856
A2	401	288	705	493	670	803	727	897	731	649	718	948	1236	1051	1228	2178	1870	1741	3194	4040	17905	17084	60160
A1	198	267	232	674	450	544	360	586	639	594	684	390	374	268	479	1251	819	837	954	2807	23250	20115	57531
Aa3	65	107	239	120	270	169	124	127	917	1061	1772	1540	1092	2031	2600	2345	2560	1954	1255	1581	4079	68814	95101
Aa2	213	132	186	196	326	230	88	47	122	78	412	269	440	633	681	438	723	779	175	4967	1698	1265	14438
Aa1	42	9	5	158	106	65	34	40	193	79	250	192	61	471	141	320	621	510	885	7810	4311	2878	19289
Aaa	211	1025	498	346	762	1106	1176	2717	4197	4006	5568	3845	3466	13387	25268	31939	20971	11256	12791	23307	33100	73803	275210
Sum	2005	2832	3267	3392	4607	4319	3572	6993	9709	9975	14661	12226	10482	23440	36847	45447	33011	24154	28525	58300	104915	235192	682348

Panel B – Within-Year Distributions of Moody's Credit Ratings for Firms' Senior Bonds (%)

Credit rating	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	Sum
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1
Ca	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Caa3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caa2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Caa1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	0
B3	0	0	0	0	0	0	0	5	0	0	1	1	1	0	0	0	0	1	0	0	5	0	1
B2	0	0	0	0	0	1	3	1	0	1	3	1	3	1	0	1	1	0	0	0	0	0	0
B1	0	0	0	1	1	1	3	8	1	1	1	5	1	1	1	1	1	1	1	0	0	1	1
Ba3	0	1	1	1	1	0	1	2	3	4	2	5	1	1	1	1	1	1	1	0	0	0	1
Ba2	1	1	1	1	7	1	0	2	2	3	3	2	2	1	1	1	1	1	2	0	0	1	1
Ba1	2	0	0	2	1	2	1	1	2	1	1	1	2	2	1	1	1	2	1	1	0	8	3
Baa3	7	3	6	9	5	6	5	2	2	2	3	4	2	3	3	3	2	7	4	5	1	3	3
Baa2	8	11	5	7	5	5	3	4	4	7	5	5	6	4	4	4	4	5	10	5	4	2	4
Baa1	8	8	15	9	8	4	4	5	8	10	10	8	11	3	2	2	3	6	8	7	2	2	4
A3	17	11	15	12	16	10	10	7	7	5	6	8	6	5	3	2	1	5	4	5	2	4	4
A2	20	10	22	15	15	19	20	13	8	7	5	8	12	4	3	5	6	7	11	7	17	7	9
A1	10	9	7	20	10	13	10	8	7	6	5	3	4	1	1	3	2	3	3	5	22	9	8
Aa3	3	4	7	4	6	4	3	2	9	11	12	13	10	9	7	5	8	8	4	3	4	29	14
Aa2	11	5	6	6	7	5	2	1	1	1	3	2	4	3	2	1	2	3	1	9	2	1	2
Aa1	2	0	0	5	2	2	1	1	2	1	2	2	1	2	0	1	2	2	3	13	4	1	3
Aaa	11	36	15	10	17	26	33	39	43	40	38	31	33	57	69	70	64	47	45	40	32	31	40
Sum	0	0	0	0	1	1	1	1	1	1	2	2	2	3	5	7	5	4	4	9	15	34	100

Panel C – Number of Firms' Lowest Rated Bonds by Moody's Credit Rating and Year

Credit rating	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	Sum
C	0	0	0	0	0	0	0	6	33	2	97	152	224	251	146	2	40	0	0	30	30	120	1133
Ca	2	3	47	156	38	39	14	40	31	94	100	226	290	217	184	105	70	0	0	30	213	150	2118
Caa3	0	0	0	0	0	0	0	0	0	129	101	196	18	128	137	32	4	35	5	64	154	240	1243
Caa2	0	0	0	0	0	0	0	0	0	12	18	202	121	163	123	56	105	35	118	159	185	243	1540
Caa1	0	0	0	0	0	0	0	0	0	164	94	444	210	193	97	108	96	8	284	166	371	453	2688
B3	56	169	185	30	121	178	122	217	272	381	420	1079	250	428	344	238	319	33	193	226	312	545	6304
B2	112	153	5	43	135	113	218	276	327	349	425	1207	232	220	308	392	491	7	519	263	256	453	6710
B1	74	106	69	39	116	194	132	113	266	218	243	1213	259	351	270	337	188	35	716	519	245	483	6293
Ba3	48	145	43	134	93	116	82	283	272	213	229	430	214	473	320	226	268	108	512	410	307	572	5660
Ba2	8	52	51	81	12	53	137	225	122	155	357	462	276	228	367	340	221	132	553	343	582	360	5165
Ba1	3	8	52	74	16	150	67	81	77	157	157	569	134	429	280	233	315	72	280	437	276	572	4488
Baa3	158	55	71	124	102	175	86	160	302	282	298	538	303	566	401	516	354	349	391	544	486	900	7426
Baa2	84	24	62	197	81	64	151	368	266	342	309	344	529	457	362	268	531	286	309	309	842	511	6878
Baa1	61	142	101	89	131	233	240	335	360	353	363	302	299	657	314	400	318	187	431	400	213	721	6818
A3	164	110	107	130	85	236	223	368	213	392	509	500	139	439	230	348	193	222	221	343	453	390	6281
A2	282	119	169	159	127	139	336	373	83	288	330	233	390	407	204	237	135	241	165	364	391	360	5942
A1	213	152	33	81	144	60	187	147	147	71	266	245	99	66	156	98	33	60	96	392	215	240	3486
Aa3	74	73	85	45	27	59	114	134	40	105	101	57	40	121	90	62	6	36	33	63	30	60	1580
Aa2	3	94	1	117	2	42	34	95	41	32	5	80	1	5	5	0	35	6	31	32	31		997
Aa1	5	0	31	0	17	6	36	15	62	39	30	30	39	9	30	60	0	0	32	60	30	60	632
Aaa	70	225	144	72	25	100	123	90	95	3	33	30	126	10	35	30	60	0	2	30	60	30	1595
Sum	1417	1630	1256	1571	1272	1957	2302	3326	3009	3781	4485	8539	4193	5818	4403	4088	3782	1852	4891	5184	5682	7463	84977

Panel D – Within-Year Distributions of Moody's Credit Ratings for Firms' Lowest Rated Bonds (%)

Credit rating	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	Sum
C	0	0	0	0	0	0	0	0	1	0	2	2	5	4	3	0	1	0	0	1	1	2	1
Ca	0	0	4	10	3	2	1	1	1	2	2	3	7	4	4	3	2	0	0	1	4	2	2
Caa3	0	0	0	0	0	0	0	0	0	3	2	2	0	2	3	1	0	2	0	1	3	3	1
Caa2	0	0	0	0	0	0	0	0	0	0	0	2	3	3	3	1	3	2	2	3	3	3	2
Caa1	0	0	0	0	0	0	0	0	0	4	2	5	5	3	2	3	3	0	6	3	7	6	3
B3	4	10	15	2	10	9	5	7	9	10	9	13	6	7	8	6	8	2	4	4	5	7	7
B2	8	9	0	3	11	6	9	8	11	9	9	14	6	4	7	10	13	0	11	5	5	6	8
B1	5	7	5	2	9	10	6	3	9	6	5	14	6	6	6	8	5	2	15	10	4	6	7
Ba3	3	9	3	9	7	6	4	9	9	6	5	5	5	8	7	6	7	6	10	8	5	8	7
Ba2	1	3	4	5	1	3	6	7	4	4	8	5	7	4	8	8	6	7	11	7	10	5	6
Ba1	0	0	4	5	1	8	3	2	3	4	4	7	3	7	6	6	8	4	6	8	5	8	5
Baa3	11	3	6	8	8	9	4	5	10	7	7	6	7	10	9	13	9	19	8	10	9	12	9
Baa2	6	1	5	13	6	3	7	11	9	9	7	4	13	8	8	7	14	15	6	6	15	7	8
Baa1	4	9	8	6	10	12	10	10	12	9	8	4	7	11	7	10	8	10	9	8	4	10	8
A3	12	7	9	8	7	12	10	11	7	10	11	6	3	8	5	9	5	12	5	7	8	5	7
A2	20	7	13	10	10	7	15	11	3	8	7	3	9	7	5	6	4	13	3	7	7	5	7
A1	15	9	3	5	11	3	8	4	5	2	6	3	2	1	4	2	1	3	2	8	4	3	4
Aa3	5	4	7	3	2	3	5	4	1	3	2	1	1	2	2	2	0	2	1	1	1	1	2
Aa2	0	6	0	7	0	2	1	3	1	1	0	1	0	0	0	0	1	0	1	1	1	0	1
Aa1	0	0	2	0	1	0	2	0	2	1	1	0	1	0	1	1	0	0	1	1	1	1	1
Aaa	5	14	11	5	2	5	5	3	3	0	1	0	3	0	1	1	2	0	0	1	1	0	2
Sum	2	2	1	2	1	2	3	4	4	4	5	10	5	7	5	5	4	2	6	6	7	9	100

Table II – Distribution of Firms' Financial Health Ratings by Year

Panel A displays the number of firms with Financial Health Ratings in the designated range at the end of each year of the sample. Panel B displays the numbers in Panel A after scaling by the annual sum (bottom row of Panel A). The bottom row of Panel B represents the annual sums scaled by the overall sum (lower right corner of Panel A). Financial Health Ratings come from Rapid Ratings. Darker shading indicates a larger percentage; this technique is intended to improve visual interpretation.

Panel A – Number of firms by Financial Health Rating

FHR	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	Sum
0 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
5 - 9	3	1	5	8	7	4	1	4	6	8	17	13	8	14	26	11	6	6	4	6	10	4	177
10 - 14	9	17	24	30	41	38	33	34	35	47	51	65	36	67	62	63	34	43	36	33	49	8	868
15 - 19	14	10	27	65	62	56	72	63	76	86	114	121	127	144	116	76	53	50	49	51	92	23	1563
20 - 24	15	12	29	39	48	65	44	54	63	68	81	75	90	91	87	76	61	52	45	46	48	9	1214
25 - 29	19	12	27	47	40	38	40	58	44	61	56	80	69	74	62	65	55	48	36	52	56	8	1061
30 - 34	18	16	30	46	46	45	37	48	51	42	53	72	57	91	64	69	42	41	44	40	55	8	1025
35 - 39	27	26	35	40	66	52	51	49	58	47	70	55	61	72	75	72	48	55	46	48	36	10	1116
40 - 44	20	22	45	50	63	62	72	68	78	82	78	87	76	63	80	71	85	73	58	59	67	11	1388
45 - 49	12	33	35	56	59	75	62	76	87	93	91	80	103	103	79	101	119	89	98	90	58	17	1638
50 - 54	27	35	63	69	66	90	93	87	90	110	108	118	99	104	124	120	125	104	107	80	96	10	1953
55 - 59	48	59	82	89	81	120	144	125	119	137	138	134	133	119	130	147	177	145	134	133	110	12	2566
60 - 64	70	63	93	98	136	137	152	176	173	173	169	143	152	122	172	188	176	198	178	159	133	17	3136
65 - 69	90	95	121	113	132	200	229	206	236	211	210	226	194	191	209	189	179	218	226	204	140	21	3922
70 - 74	102	93	121	111	169	152	196	246	267	278	250	232	239	203	155	150	179	186	214	195	173	22	4035
75 - 79	116	100	118	130	128	124	141	173	172	173	163	143	190	127	96	93	110	126	133	138	104	9	2891
80 - 84	52	66	88	83	59	62	69	87	85	94	72	81	85	56	44	52	52	81	74	70	61	10	1525
85 - 89	11	14	13	14	17	17	29	21	17	23	37	28	22	15	22	16	17	18	23	26	25	1	428
90 - 94	0	0	0	2	1	1		0	2	1	2	4	2	1	3	3	4	2	1	3	0	0	33
95+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	653	674	956	1090	1221	1338	1465	1575	1659	1734	1760	1757	1743	1657	1606	1562	1522	1536	1506	1433	1313	200	30540

Panel B – Within-year distributions of firms' Financial Health Ratings (%)

FHR	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	Sum
0 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 9	0	0	1	1	1	0	0	0	0	0	1	1	0	1	2	1	0	0	0	0	1	2	1
10 - 14	1	3	3	3	3	3	2	2	2	3	3	4	2	4	4	4	2	3	2	2	4	4	3
15 - 19	2	1	3	6	5	4	5	4	5	5	6	7	7	9	7	5	3	3	3	4	7	12	5
20 - 24	2	2	3	4	4	5	3	3	4	4	5	4	5	5	5	5	4	3	3	3	4	5	4
25 - 29	3	2	3	4	3	3	3	4	3	4	3	5	4	4	4	4	4	3	2	4	4	4	3
30 - 34	3	2	3	4	4	3	3	3	3	2	3	4	3	5	4	4	3	3	3	3	4	4	3
35 - 39	4	4	4	4	5	4	3	3	3	3	4	3	3	4	5	5	3	4	3	3	3	5	4
40 - 44	3	3	5	5	5	5	5	4	5	5	4	5	4	4	5	5	6	5	4	4	5	6	5
45 - 49	2	5	4	5	5	6	4	5	5	5	5	5	6	6	5	6	8	6	7	6	4	9	5
50 - 54	4	5	7	6	5	7	6	6	5	6	6	7	6	6	8	8	8	7	7	6	7	5	6
55 - 59	7	9	9	8	7	9	10	8	7	8	8	8	8	7	8	9	12	9	9	9	8	6	8
60 - 64	11	9	10	9	11	10	10	11	10	10	10	8	9	7	11	12	12	13	12	11	10	9	10
65 - 69	14	14	13	10	11	15	16	13	14	12	12	13	11	12	13	12	12	14	15	14	11	11	13
70 - 74	16	14	13	10	14	11	13	16	16	16	14	13	14	12	10	10	12	12	14	14	13	11	13
75 - 79	18	15	12	12	10	9	10	11	10	10	9	8	11	8	6	6	7	8	9	10	8	5	9
80 - 84	8	10	9	8	5	5	5	6	5	5	4	5	5	3	3	3	3	5	5	5	5	5	5
85 - 89	2	2	1	1	1	1	2	1	1	1	2	2	1	1	1	1	1	1	2	2	2	1	1
90 - 94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	2	2	3	4	4	4	5	5	5	6	6	6	6	5	5	5	5	5	5	5	4	1	100

Table III – Comparison of Firm Characteristics by Rating Agency(s) Providing Coverage

This table displays firm-year summary statistics for characteristics of issuers receiving credit ratings. The characteristics include Total Assets, Leverage (the ratio of Long Term Debt and Debt in Current Liabilities to Total Assets), Revenue, and Net Income. The data are from Compustat. Respectively, columns 1, 2, and 3 display these characteristics for issuers that receive credit ratings from Moody's, only; both Moody's and Rapid Ratings; and Rapid Ratings, only. We perform two-tailed t-tests for differences in means. *** indicates the difference is significant at the 1% level.

	Ratings provided by:					
	Moody's, only (1)	Moody's and Rapid Ratings (2)	Rapid Ratings, only (3)	(2) – (1) (p-value)	(2) – (3) (p-value)	(1) – (3) (p-value)
Total Assets ($mil)						
N firm-years	12,039	25,332	40,186			
Mean	12,546	18,085	1,896	5,539***	16,189***	10,650***
Median	1,087	1,972	200	(0.000)	(0.000)	(0.000)
SD	78,024	110,925	25,046			
Leverage (%)						
N firm-years	11,909	25,232	39,928			
Mean	31	32	22	0.93	9.90***	8.97***
Median	26	28	10	(0.449)	(0.000)	(0.000)
SD	182	50	379			
Revenue ($mil)						
N firm-years	11,957	25,272	40,019			
Mean	2,696	6,480	857	3,784***	5,623***	1,839***
Median	516	1,406	127	(0.000)	(0.000)	(0.000)
SD	8,169	17,799	5,631			
Net Income ($mil)						
N firm-years	11,988	25,303	40,098			
Mean	151	370	38	219***	332***	113***
Median	28	54	5	(0.000)	(0.000)	(0.000)
SD	1,235	1,791	795			

Table IV – Moody's Credit Ratings within Firm-Years

Panel A displays summary statistics for the number of bonds outstanding within firm-years and the distribution of Moody's credit ratings within firm-years. *Multiple bonds outstanding indicator* takes a value of one if a firm has more than one bond outstanding as of January 1 of a given year and zero if the firm has only one bond outstanding at that time. *Number of bonds outstanding* represents the number of bonds outstanding for a given firm and a given year. *Notch spread* represents the difference between the highest- and lowest-rated outstanding bond for a given firm and a given year, measured in credit rating notches. *Notch spread* takes a value of zero if the firm has only one bond outstanding. Panel B displays characteristics of the highest- and lowest-rated bonds belonging to firms with more than one bond outstanding. *Face value* is the face value of the bond expressed in millions of US dollars. *Coupon rate* is the coupon rate expressed as a percentage. *Years to maturity* is the number of years remaining until the bond matures. Face values, coupon rates, and years until maturity come from Moody's Default and Recovery Database. The sample, which runs from 1988 to 2009, includes firms with Financial Health Ratings assigned by Rapid Ratings and bonds rated by Moody's Investors Service. *, **, and *** indicate the difference is significant at the 10%, 5%, or 1% level, respectively. We cluster standard errors at the firm level.

Panel A – Number of Bonds Outstanding and Distributions of Moody's Credit Ratings within Firm-Years

	N firm-years	Mean	Minimum	5%	Median	95%	Maximum
Multiple bonds outstanding indicator	9,112	0.54	0	0	1	1	1
Number of bonds outstanding	9,112	10.83	1	1	2	18	2,034
Notch Spread	9,112	0.27	0	0	0	2	15

Panel B – Descriptions of Highest- and Lowest-Rated Bonds for Firm-Years with Multiple Bonds Outstanding

	Highest-rated bond within firm-year					Lowest-rated bond within firm-year					Difference in means
	N bond-years	Mean	5%	Median	95%	N bond-years	Mean	5%	Median	95%	
Moody's credit rating	4,963	12.9 (≈Baa2)	5 (=Caa1)	13 (=Baa2)	20 (=Aa1)	4,963	12.4 (≈Baa3)	5 (=Caa1)	13 (=Baa2)	19 (=Aa2)	-0.5***
Face value	4,829	303	15	200	1,000	4,848	313	23	200	1,000	-10
Coupon rate	4,431	7.35	3.00	7.25	11.50	4,467	7.49	3.50	7.31	11.75	-0.14***
Years until maturity	4,872	11.9	2.1	10.0	30.0	4,803	12.7	3.0	10.0	30.0	-0.8***

Table V – Advanced Notice

This table displays summary statistics for the number of days prior to bonds' defaults for several benchmarks. *Rapid Ratings downgrades for the first time* represents the date when the bond's issuer's Financial Health Rating migrates below 65 for the first time. *Rapid Ratings downgrades permanently* represents the date when the bond's issuer's Financial Health Rating migrates below 65 and remains below 65 for the remaining life of the bond. *Moody's downgrade* represents the date the bond's credit rating migrates below the investment grade threshold. *Peak stock price* represents the date that the bond's issuer's stock price reaches its highest level over the life of the bond. *Stock drops 50% off peak for the first time* represent the date that the bond's issuer's stock price drops 50% off its peak value over the life of the bond for the first time. *Stock drops 50% off peak permanently* represents the date the bond's issuer's stock price drops below 50% of its peak value over the life of the bond and never again moves above this value. *** indicates the two-tailed t test is significant at the 1% level. We cluster standard errors at the firm level.

	Rapid Ratings downgrades first time (1)	Rapid Ratings downgrades permanently (2)	Moody's downgrade (3)	(1) – (3)	(2) – (3)	Peak stock price	Stock drops 50% off peak first time	Stock drops 50% off peak permanently
Mean	2,142 (5.9 yrs)	850 (2.3 yrs)	1,105 (3.0 yrs)	2.8 years***	-0.7 years***	2,485 (6.8 yrs)	2,397 (6.5 yrs)	1,448 (4.0 yrs)
SD	1,453	1,068	1,577			1,964	1,985	1,279
5%	169	102	11			512	397	248
Median	2,303	505	197			1,817	1,678	1,046
95%	5,223	3,566	4,632			6,848	6,853	4,273
N bonds	849	849	849			849	849	849

Table VI – Granger Causality Tests following Logistic Vector Autoregressions

This table displays F-statistics from Granger causality tests following logistic vector autoregressions. The vector autoregressions use issue-level observations with one, two, three, or four quarterly lags. The observations are based on bonds' issuers' Financial Health Ratings bins and bonds' credit ratings issued by Moody's (MCR). Columns 1 and 2 display results featuring tests with *FHR bin change* and *MCR change*. *FHR bin change* takes a value of one if the bond's issuer's FHR changes bins (migrates up or down) since the last quarter and zero if it does not. *MCR change* takes a value of one if the issue's MCR changes (migrates up or down) since the last quarter and zero if it remains the same since the last quarter. Columns 3 and 4 (5 and 6) display results featuring tests with *FHR bin upgrade* and *MCR upgrade* (*FHR bin downgrade* and *MCR downgrade*). *FHR bin upgrade* (*FHR bin downgrade*) takes a value of one if the bond's issuer's FHR migrates up (down) since the last quarter and zero if it stays the same or migrates down (up). *MCR upgrade* (*MCR downgrade*) takes a value of one if the issue's MCR migrates up (down) since the last quarter and zero if it remains the same or migrates down (up). *, **, and *** indicate the F-statistic is significant at the 10%, 5%, or 1% level, respectively. We cluster standard errors at the firm level.

Null hypothesis:	Changes in FHR do not Granger cause changes in MCR (1)	Changes in MCR do not Granger cause changes in FHR (2)	Upgrades in FHR do not Granger cause Upgrades in MCR (3)	Upgrades in MCR do not Granger cause upgrades in FHR (4)	Downgrades in FHR do not Granger cause downgrades in MCR (5)	Downgrades in MCR do not Grange cause downgrades in FHR (6)
Number of lags used	F-statistic (p-value)	F-statistic (p-value)	F-statistic (p-value)	F-statistic (p-value)	F-statistic (p-value)	F-statistic (p-value)
1	4.81** (0.0283)	0.71 (0.4002)	15.34*** (0.0001)	0.21 (0.6484)	41.43*** (0.0000)	9.37*** (0.0022)
2	12.26*** (0.002)	2.58 (0.2758)	16.45*** (0.0003)	3.34 (0.1887)	33.95*** (0.0000)	12.43*** (0.0020)
3	11.08** (0.0113)	7.71* (0.0525)	21.67*** (0.0001)	4.39 (0.2221)	36.52*** (0.0000)	12.99*** (0.0047)
4	11.08** (0.0257)	6.76 (0.1489)	26.56**** (0.0000)	6.54 (0.1621)	41.29*** (0.0000)	12.35** (0.0150)

Table VII – Wealth Effects of Delayed Sales of Defaulting Bonds

This table displays characteristics of 72 defaulted bonds for which Rapid Ratings downgraded the bond's issuer's Financial Health Rating below 65 prior to the default, and Moody's downgraded the bond to speculative grade prior to the default. *Moody's downgrade* represents the date Moody's downgraded the bond. *Moody's downgrade*$_{t-7}$ represents the date seven calendar days before Moody's downgraded the bond. *Rapid Ratings downgrades for the first time* represents the date when the bond's issuer's Financial Health Rating migrates below 65 for the first time. *Rapid Ratings downgrades permanently* represents the date when the bond's issuer's Financial Health Rating migrates below 65 and remains below 65 for the remaining life of the bond. *, **, and *** indicate the two-tailed t test is significant at the 10%, 5%, or 1% level, respectively. We cluster standard errors at the firm level.

	Moody's downgrade (1)	Moody's downgrade$_{t-7}$ (2)	Rapid Ratings downgrades for the first time (3)	Rapid Ratings downgrades permanently (4)	(1) – (3)	(1) – (4)	(2) – (3)	(2) – (4)
Years prior to default								
Mean	1.6	1.6	3.1	2.1	-1.5***	-0.5*	-1.5***	-0.5*
SD	2.1	2.1	2.6	1.9				
Minimum	0.0	0.0	0.0	0.0				
Maximim	8	8	12.1	8.6				
End-of-day price ($)								
Mean	79.9	78.5	93.9	91.6	-14**	-11.7*	-15.4***	-13.1***
SD	23.1	23.8	22.1	25.4				
Minimum	8.9	4.9	13.2	13.2				
Maximum	112.1	112.1	151	151				
Yield to maturity (%)								
Mean	18.5	20.5	10.8	12.6	7.8**	5.9**	9.7**	7.9**
SD	22.5	25.8	13.4	15.7				
Minimum	4.4	4.8	3.7	3.7				
Maximum	162.9	173.1	101.6	101.6				

Table VIII – Reversals

This table displays frequency information for firms and bonds that migrate above investment grade thresholds after having migrated below investment grade thresholds in the past. *Rapid Ratings reversal* represents the number of firms with Financial Health Ratings that migrate above 65 after having migrated below 65 in the past. *Rapid Ratings N* represents the number of firms for which Rapid Ratings provides a Financial Health Rating. *Moody's firm reversal* represents the number of firms holding at least one bond that Moody's upgrades to investment grade (a credit rating of Baa3 or higher) after having downgraded to speculative grade (a credit rating of Ba1 or lower) in the past. *Moody's firm N* represents the number of firms with bonds for which Moody's provides credit ratings. *Moody's bond reversal* represents the number of bonds that Moody's upgrades to investment grade after having downgraded to speculative grade in the past. *Moody's bond N represents* the number of bonds for which Moody's provides credit ratings.

Year	Rapid Ratings reversal	Rapid Ratings N	%	Moody's firm reversal	Moody's firm N	%	Moody's bond reversal	Moody's bond N	%
1988	2	575	0.35%	11	575	1.91%	24	3550	0.68%
1989	22	636	3.46%	7	636	1.10%	22	3902	0.56%
1990	27	713	3.79%	3	713	0.42%	9	4142	0.22%
1991	40	969	4.13%	6	969	0.62%	10	4380	0.23%
1992	75	1113	6.74%	3	1113	0.27%	8	4838	0.17%
1993	112	1243	9.01%	6	1243	0.48%	14	5145	0.27%
1994	111	1339	8.29%	3	1339	0.22%	8	5253	0.15%
1995	155	1445	10.73%	5	1445	0.35%	10	6433	0.16%
1996	137	1541	8.89%	3	1541	0.19%	6	8605	0.07%
1997	161	1631	9.87%	11	1631	0.67%	24	11183	0.21%
1998	148	1704	8.69%	13	1704	0.76%	27	14217	0.19%
1999	173	1742	9.93%	22	1742	1.26%	84	17288	0.49%
2000	198	1716	11.54%	7	1716	0.41%	30	18531	0.16%
2001	118	1673	7.05%	25	1673	1.49%	69	21586	0.32%
2002	149	1601	9.31%	5	1601	0.31%	9	22606	0.04%
2003	168	1556	10.80%	12	1556	0.77%	39	24127	0.16%
2004	174	1549	11.23%	19	1549	1.23%	49	24437	0.20%
2005	183	1530	11.96%	18	1530	1.18%	59	25696	0.23%
2006	205	1516	13.52%	21	1516	1.39%	43	27007	0.16%
2007	154	1465	10.51%	15	1465	1.02%	39	29218	0.13%
2008	123	1396	8.81%	10	1396	0.72%	41	29805	0.14%
2009	46	1289	3.57%	12	1289	0.93%	169	23156	0.73%
Full sample	2681	29942	8.95%	237	29942	0.79%	793	335105	0.24%

Table IX – Wealth Effects of Delayed Sales (Including Non-Defaulting Bonds)

This table examines 2,244 bonds that, at the time of issuance, have investment grade MCRs and FHRs. Panel A describes these bonds. Prices are a percentage of face value. *Face value* is the face value of the bond expressed in millions of US dollars. *Coupon rate* is the coupon rate expressed in a percentage. Offer prices, face values, and coupon rates come from Moody's Default and Recovery Database. Panel B displays annualized returns from portfolios governed by one of two portfolio strategies. *Moody's portfolio* (*Rapid Ratings portfolio*) buys bonds on the issue date at the offer price and holds bonds until maturity or Moody's (Rapid Ratings) downgrades to speculative grade. We collect post-issuance bond prices from Bloomberg. We assume that coupon payments, as well as proceeds from the sale of bonds, when applicable, are reinvested in an index of investment grade debt. *, **, and *** indicates the difference is significant at the 10%, 5%, or 1% level. We cluster standard errors at the firm level.

Panel A – Description of Bonds in Portfolios

	Moody's portfolio					Rapid Ratings portfolio					Difference
	N	Mean	SD	5%	95%	N	Mean	SD	5%	95%	in means
All bonds											
Offer price	2,244	99.70	1.18	99.00	100.00	2,244	99.70	1.18	99.00	100.00	--
Coupon rate	2,244	5.70	2.23	0.00	8.50	2,244	5.70	2.23	0.00	8.50	--
Face value	2,244	421	441	30	1,346	2,244	421	441	30	1,346	--
Bonds downgraded to speculative grade											
Years between issuance and downgrade	297	3.9	3.0	0.1	9.8	1,291	2.3	2.2	0.2	7.1	1.54***
Price on downgrade date	297	92.08	15.26	59.05	104.50	1,291	98.87	9.28	89.67	108.95	-6.79***
YTM on downgrade date	186	9.06	6.37	5.05	20.15	718	6.43	6.48	2.42	9.90	2.63***
Coupon rate	297	6.73	1.69	4.25	9.00	1,291	6.13	2.01	0.00	8.75	0.60***
Face value	297	313	327	54	900	1,291	384	426	30	1,160	-72***
Bonds that mature before downgrade or 12/31/2009											
Coupon rate	6	5.93	0.97	4.80	7.75	65	5.18	3.41	0.00	10.00	0.75
Face value	6	333	82	300	500	65	348	470	14	1,600	-14
Bonds held to 12/31/2009											
Coupon	1,941	5.54	2.26	0.00	8.25	888	5.10	2.28	0.00	7.75	0.44***
Face value	1,941	438	454	29	1,500	888	480	454	35	1,500	-42**
Subsample downgraded by both FHR and MCR											
Years between issuance and downgrade	253	4.3	3.1	0.7	9.9	253	2.1	1.9	0.2	5.4	2.2***
Price on downgrade date	253	92.05	15.24	59.05	103.71	253	96.32	11.86	75.50	103.81	-4.27***
YTM on downgrade date	153	8.90	5.12	4.88	20.15	101	8.84	7.70	3.70	20.58	0.06
Coupon rate	253	6.79	1.64	5.00	8.88	253	6.79	1.64	5.00	8.88	--
Face value	253	299	334	59	750	253	299	334	59	750	--

Panel B – Returns

Portfolio cutoff date and description of bonds in the portfolio	N bonds	Mean return from Moody's portfolio	Mean return from Rapid Ratings portfolio	Difference (t-stat)
12/31/2009, all bonds with price data	2,244	0.0384	0.0223	0.0162*** (9.41)
12/31/2009, bonds downgraded to speculative by both firms	253	0.0114	0.0069	0.0046 (1.28)
12/31/2009, bonds that mature before 12/31/2009	669	0.0486	0.0297	0.0190*** (12.89)
12/31/2005, all bonds with price data	1,496	0.0720	0.0419	0.0301*** (8.93)
12/31/2005, bonds downgraded to speculative by both firms	118	0.0354	0.0167	0.0187*** (4.38)
12/31/2005, bonds that mature before 12/31/2005	205	0.0591	0.0411	0.0180*** (7.08)
12/31/2000, all bonds with price data	250	0.0736	0.0551	0.0184*** (4.30)
12/31/2000, bonds downgraded to speculative by both firms	23	0.0423	0.0334	0.0089*** (3.45)
12/31/2000, bonds that mature before 12/31/2000	35	0.0715	0.0557	0.0158*** (4.32)

Table X – Stock Returns following Updates of Rapid Ratings Financial Health Ratings

Column 1 provides descriptive information for updates of firms' Financial Health Ratings. Columns 2 through 5 describe returns generated by buying the stock of companies that experience increases or decreases of their Financial Health Rating of at least ten points. *Quarterly return* is the return generated by purchasing the stock of firms that experience changes of their Financial Health Rating (of 10 or more points) on the day of the update and holding it for 90 days. *Annual return* is the return generated by buying the stock of firms that experience changes of their Financial Health Rating on the day of the update and holding it for one year. The sample includes FHR updates between 1988 and 2009. Financial Health Ratings come from Rapid Ratings and stock prices come from CRSP. * and ** indicate the difference is significant at the 10% or 5% level, respectively.

		Returns following 10 point FHR increases		Returns following 10 point FHR decreases			
	FHR updates	Quarterly return	Annual return	Quarterly return	Annual return	(2) – (4)	(3) – (5)
	(1)	(2)	(3)	(4)	(5)	(t-stat)	(t-stat)
N	91,877	4,812	4,660	3,647	3,284		
Mean	-0.18	0.0643	0.1990	0.0373	0.1373	0.0270*	0.0617**
SD	7.42	0.7340	1.1917	0.4670	1.2315	(1.95)	(2.24)
Minimum	-70	-0.9410	-0.9711	-0.9203	-0.9781		
5%	-10	-0.3460	-0.6090	-0.4403	-0.6927		
Median	0	0.0308	0.0633	0.0081	0.0000		
95%	9	0.4879	1.2012	0.5319	1.2146		
Maximum	71	46.2619	38.9286	16.5544	41.0000		