Divergence in Credit Ratings

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Abstract

During the recent credit crisis credit rating agencies (CRAs) became increasingly lax in their rating of structured products, yet increasingly stringent in their rating of corporate bonds. We examine a model in which a CRA operates in both the market for structured products and for corporate debt, and shares a common reputation across the two markets. We find that, as a CRA's reputation becomes good enough, it can be optimal for it to inflate its ratings with probability one in the structured products market, but inflate its ratings with a probability zero in the corporate bond market.

Key words:
Reputation, spillovers, divergence, rating agencies.
JEL classification:
G24; D82; C73; L14.

1. Introduction

A striking feature of the period prior to the 2008 crisis is the divergence of rating behavior between the bond and structured product markets: structured product ratings becoming more lax, bond ratings becoming more conservative. For instance, Blume et al. (1998) find a trend over the period 1978-1995 towards increasingly conservative ratings in bond markets, and

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Baghai et al. (2011) confirm that this trend continued throughout the period leading up to the 2008 crisis. Meanwhile, studies of structured product markets find evidence of the opposite trend. In particular, Ashcraft et al. (2009) document how, between 2005 and 2007, subordination levels on mortgage-backed securities remained flat while objective risk measures increased (see also Stanton and Wallace, 2010).

This divergent rating behavior across markets is not explained by existing theory. The analysis closest to ours, Mathis et al., (2009), MMR hereafter, models a monopoly credit rating agency (CRA) that operates in both the corporate bond and structured product markets. However, MMR do not model CRA rating behavior in the bond market; instead, this market is captured only through the inclusion in the CRA's payoff function of an exogenous term capturing its constant revenue from rating bonds. Their model is, therefore, unable to shed light on the divergence phenomenon. Opp et al. (forthcoming) present a model in which, as in ours, the incidence of rating inflation is linked to the complexity of the underlying securities. Both models are able to explain a cross-sectional difference in rating standards between (simple) bonds and (complex) structured products, but the Opp et al. model does not account for the time series pattern of divergence in rating standards across markets, i.e., why bond market ratings became strictly more conservative at the same time as structured product ratings were becoming increasingly lax.

We propose an explanation of the divergence in credit ratings based on the role of reputational spillovers between markets. In our model, a CRA operates sequentially in a bond market and a structured product market. The two markets are interdependent as CRAs acquire a common reputation across both markets that is jointly influenced by rating quality in each. Realized outcomes in each market generate bidirectional reputational spillover effects, which can be either positive or negative. This extends the model of MMR, which allows only for a one-off unidirectional spillover from the structured product market to the bond market: bond market revenue is forfeited if the CRA loses its reputation in the structured products market.

To emphasize the role of reputational spillover effects, we assume the only difference between the two markets is that, in the relatively simple bond market, investors can observe project quality ex post, and so infer the CRA's type (truthful or opportunistic) with certainty when a (bad) project that receives a good rating fails, i.e. perfect monitoring. However, in the (complex) structured product market, project failure does not fully reveal the CRA's type, i.e. imperfect monitoring.

Over the decades preceding the 2008 crisis, the major CRAs built substantial reputations for providing informative ratings (White, 2010). When, accordingly, we examine CRAs with sufficiently good reputation, our model predicts that divergent rating behavior between markets may pertain: an opportunistic CRA that is sufficiently far-sighted would find it optimal to lie about bad projects with probability one in the less informative market (structured products), but truth-tell about bad projects with probability one in the informative (corporate bonds) market. This result suggests an explanation based on reputational spillovers for the observed differences in rating behavior across markets in the pre-crisis period: CRAs may choose to stiffen rating standards in the informative market (bonds) to reduce the likelihood of a loss of reputation that would jeopardize their growing revenues (arising from increasing lax rating standards) in the less informative market (structured products).

Our findings also have implications as to whether the concern for reputation is sufficient incentive for CRAs to provide independent and objective credit-risk analysis, rather than accommodate the interests of issuers. The literature has not, so far, provided a clear answer. Part of the reason, we argue, is a failure to account for the divergent rating behavior of CRAs in the corporate bond and structured product markets. Hence, Covitz and Harrison (2003) examine the US bond market between 1997 and 2002 and conclude that reputation concerns effectively discipline CRAs. However, analyses that instead consider the market for structured products reach the opposite conclusion (Ashcraft et al., 2009; Stanton and Wallace, 2010; He et al., 2011). Our findings suggest a resolution: a concern for reputational effects may discipline a CRA's operations in markets where monitoring is perfect (ex post), but fail to do so when monitoring is imperfect.

2. Model

There are two markets for finance: a market for corporate bonds (market A) and a market for structured products (market B). In each period $t = 0, 2, 4, \ldots$ a firm wishes to issue corporate bonds in market A to finance an investment project, and, for the same reason, in each period $t = 1, 3, 5, \ldots$ a firm wishes to issue a structured product in market B. Thus markets A and B operate in sequence. Project quality is a priori unknown, including to the issuer. Irrespective of the means of finance, a project can be good with probability λ, or bad with probability $1 - \lambda$. There is a monopoly CRA that operates in both markets. The CRA perfectly observes the quality of each project financed in market A (corporate bonds) but imperfectly observes the quality of each project financed in market B (structured products). In market B, a project of good (bad) quality is successful with probability $p_G \in (0, 1)$ ($p_B \in (0, 1)$), where $p_G > p_B$. The CRA communicates a rating (good or bad) to the market; no investment takes place if a project is rated as bad. MMR provide a detailed discussion of these assumptions.

The CRA can be of two types: committed (truthful) or opportunistic (profit-maximizing). We assume (as in MMR) that an opportunistic CRA will never give a bad rating to a good project, but might choose to give a good rating to a bad project. Issuers and investors observe, in both markets, whether past projects have been financed, and whether they have succeeded. This information is summarized by the posterior probability investors and issuers assign to the event that the CRA is truthful. This probability is denoted q, and measures the CRA's shared reputation across markets A and B. A (stationary) Markov strategy for an opportunistic CRA is a mapping

$$x_i : [0,1] \mapsto [0,1] \qquad i = A, B,$$

where $x_i(q)$ is the probability that an opportunistic CRA will give a good rating to a bad project in market i, when its reputation is q.

Investor's and issuer's behavior is described by the belief function

$$a_i : [0,1] \mapsto [0,1] \qquad i = A, B,$$

where $a_i(q) \equiv 1 - (1-q)\, x_i(q)$ is the probability investors and issuers assign to a bad project in market i obtaining a bad rating, given the reputation q of the CRA. The rating fee in market i, $I(a_i)$, is a strictly increasing and continuous function of the perceived rating accuracy in market i:

$$I : [0,1] \mapsto [0, I(1)] \,.$$

We assume that the fee is paid only if the issue takes place.

At the end of each period, one of three possible outcomes is observed: Success (S) when a good project is financed; Failure (F), when a bad project is financed; or No financing (N). If we denote q as the prior probability that the CRA is truthful, the posterior beliefs $\psi_i(q|z)$ following an outcome $z \in \{S, F, N\}$ in market i are

$$\psi_A(q|S) \equiv q_A^S = q; \qquad \psi_B(q|S) \equiv q_B^S = \frac{\lambda q p_G}{\lambda p_G + (1-q) x_B (1-\lambda) p_B};$$

$$\psi_A(q|F) \equiv q_A^F = 0; \qquad \psi_B(q|F) \equiv q_B^F = \frac{\lambda q (1-p_G)}{\lambda(1-p_G) + (1-q) x_B (1-\lambda)(1-p_B)};$$

$$\psi_A(q|N) \equiv q_A^N = \frac{q}{a_A}; \quad \psi_B(q|N) \equiv q_B^N = \frac{q}{a_B}.$$

Failure in market A exposes an opportunistic CRA to investors, as this outcome will never be observed if the CRA is truthful. In market B, however, investors are unable to ascertain whether Failure is due to an opportunistic CRA or a truthful CRA having observed an incorrect signal.

As discussed in the Introduction, CRAs enjoyed considerable reputations in the years prior to the 2008 crisis. Our interest, therefore, is in the (stationary) Markov-perfect equilibrium of this model for q sufficiently large. In such an equilibrium, the CRA maximizes profits, investors' and issuers' expectations are correct, and investors and issuers rationally update their beliefs. The Bellman equations for an opportunistic CRA operating in both markets are given by

$$\begin{aligned} V_A(q) = \max_{x_A \in [0,1]} \; & [(\lambda + (1-\lambda) x_A) I(a_A^*) + \delta\{\lambda V_B(q_A^S) \\ & + (1-\lambda) x_A V_B(0) + (1-\lambda)(1-x_A) V_B(q_A^N)\}]; \end{aligned} \tag{1}$$

$$V_B(q) = \max_{x_B \in [0,1]} \left[(\lambda + (1-\lambda) x_B) I(a_B^*) + \delta \{ (\lambda p_G + (1-\lambda) p_B x_B) V_A\left(q_B^S\right) \right.$$
$$\left. + (\lambda (1-p_G) + (1-\lambda)(1-p_B) x_B) V_A\left(q_B^F\right) + (1-\lambda)(1-x_B) V_A\left(q_B^N\right) \} \right]; \tag{2}$$

where a_i^* is investors' equilibrium beliefs in market i. We assume the value functions V_A,V_B to be continuous and non-decreasing in q. As discussed in MMR (p. 662), it is straightforward to show that $V_A(0) = V_B(0) = 0$. Using (1), the one-stage deviation principle for infinite-horizon games implies that $x_A = 1$ is part of an equilibrium strategy if and only if

$$I(a_A^*) \geq \delta V_B\left(q_A^N\right); \tag{3}$$

$x_A = 0$ is part of an equilibrium strategy if and only if

$$I(a_A^*) \leq \delta V_B\left(q_A^N\right); \tag{4}$$

and $x_A \in (0,1)$ is part of an equilibrium strategy if and only if

$$I(a_A^*) = \delta V_B\left(q_A^N\right). \tag{5}$$

Analogous conditions for x_B may be derived from (2) according to whether $I(a_B^*) + \delta\left[p_B V_A\left(q_B^S\right) + (1-p_B) V_A\left(q_B^F\right)\right]$ exceeds, is less than, or equals $\delta V_A\left(q_B^N\right)$.

Proposition 1. *For a sufficiently good reputation, an opportunistic CRA will inflate its rating of a bad project in market B with certainty, i.e.* $x_B = 1$.

Proof. $x_B = 1$ is part of an equilibrium strategy if and only if

$$I\left(a_B^*\right) \geq \delta\left[V_A\left(q_B^N\right) - p_B V_A\left(q_B^S\right) - \left(1 - p_B\right) V_A\left(q_B^F\right)\right]. \tag{6}$$

For $q = 1$, $q_A^S, q_B^S, q_B^F, q_A^N, q_B^N = 1$, so $V_A\left(q_B^N\right) = V_A\left(q_B^S\right) = V_A\left(q_B^F\right)$. Therefore, (6) holds with strict inequality at $q = 1$ as the right side of (6) is zero, and the left side is $I(1) > 0$. As $I(\cdot)$ and $V_A(\cdot)$ are continuous in q, (6) holds for q sufficiently close to 1. Hence $x_B = 1$ for q sufficiently close to 1. ■

Proposition 1 is consistent with the increasingly lax rating behavior observed in the structured products market as CRA reputation grew in the pre-crisis era. MMR reach a similar finding in their Proposition 4.

We now investigate rating behavior in market A:

Proposition 2. *For a sufficiently good reputation, an opportunistic CRA that is sufficiently far-sighted ($\delta > 2/\left(1+\sqrt{4\lambda+5}\right)$) will never inflate its rating of a bad project in market A, i.e. $x_A = 0$.*

Proof. $x_A = 0$ is part of an equilibrium strategy if and only if (4) holds. We now examine $\delta V_B\left(q_A^N\right)$ at $q = 1$. When $q = 1$, equations (1) and (2) reduce to

$$V_A(1) = \max_{x_A \in [0,1]} \left[\begin{array}{c} \left(\lambda + (1-\lambda) x_A\right) I(1) \\ +\delta\left(\lambda + (1-\lambda)\left(1 - x_A\right)\right) V_B(1) \end{array}\right]; \tag{7}$$

$$V_B(1) = \max_{x_B \in [0,1]} \left[\left(\lambda + (1-\lambda) x_B\right) I(1) + \delta V_A(1)\right]. \tag{8}$$

As $x_B = 1$ from Proposition 1, (8) reduces to

$$V_B(1) = I(1) + \delta V_A(1), \tag{9}$$

in which case (7) yields

$$V_A(1) = I(1) \max_{x_A \in [0,1]} \left[\frac{\lambda + \delta + x_A (1-\delta)(1-\lambda)}{1 - \delta^2 (\lambda + (1-\lambda)(1-x_A))} \right]. \tag{10}$$

Solving the maximization problem on the left side of (10) gives

$$V_A(1) = \begin{cases} \frac{\delta+\lambda}{1-\delta^2} I(1) & 1 - \delta - \delta^2 (1+\lambda) < 0; \\ \frac{1+\delta\lambda}{1-\delta^2\lambda} I(1) & \text{otherwise;} \end{cases}$$

so (9) implies

$$\delta V_B(1) = \begin{cases} \frac{\delta(1+\delta\lambda)}{1-\delta^2} I(1) & 1 - \delta - \delta^2 (1+\lambda) < 0; \\ \frac{\delta(1+\delta)}{1-\delta^2\lambda} I(1) & \text{otherwise.} \end{cases}$$

Note that for $1 - \delta - \delta^2 (1+\lambda) < 0$, $\delta V_B(1) > I(1)$. This implies that, since $V_B(\cdot)$ and $I(\cdot)$ are continuous and non-decreasing in q and $a_A^* \leq 1$, there exists a large enough $q < q_A^N < 1$ such that $\delta V_B(1) > \delta V_B\left(q_A^N\right) > I(1) \geq I(a_A^*)$ holds. Hence (4) holds, so $x_A = 0$ for q sufficiently close to 1. ■

Proposition 2 implies that an opportunistic CRA that is also sufficiently far-sighted will never give a good rating to rate bad projects in market A, but will always do so in market B, for a sufficiently good reputation. As $\lambda < 1$, the far-sightedness requirement is always satisfied for $\delta \geq 2/\left(1+\sqrt{5}\right) \approx 0.62$.

3. Conclusion

A striking feature of the years leading up to the crisis of 2008 is the divergence of rating behavior between the bond and structured product markets: structured product market ratings became more lax, bond market ratings became more conservative. We offer a theoretical model consistent with this phenomenon based on the role of reputation spillovers between markets. In particular, we have shown that an opportunistic CRA that is sufficiently far-sighted, and with a sufficiently good reputation, reaches an equilibrium in which it is optimal to lie about bad projects with probability one in the less informative market (structured products), but, so as to prolong its revenues from the less informative market, truth-tell with probability one in the informative (corporate bond) market.

Our findings suggest that a concern for reputation may discipline a CRA's operations in markets where monitoring is perfect (ex post), but fail to do so when monitoring is imperfect. We therefore echo the sentiments of Mariano (2012) and Opp et al. (forthcoming) in suggesting that one way to generate more accurate ratings might therefore be to increase the transparency of the underlying securities.

References

[1] Ashcraft, A., Goldsmith-Pinkham, P., Hull, P., Vickery, J., 2011. Credit ratings and security prices in the subprime MBS market. American Economic Review: Papers & Proceedings 101, 115–119.

[2] Ashcraft, A., Goldsmith-Pinkham, P., Vickery, J., 2009. MBS ratings and the mortgage credit boom. CentER Discussion Paper No. 2010-89S.

[3] Baghai, R., Servaes, H., Tamayo, A., 2011. Have rating agencies become more conservative? Implications for capital structure and debt pricing. CEPR Discussion Paper No. DP8446.

[4] Blume, M.E., Lim, F., MacKinlay, A.C., 1998. The declining credit quality of U.S. corporate debt: myth or reality? Journal of Finance 53, 1389–1413.

[5] Covitz, D.M., Harrison, P., 2003. Testing conflicts of interest at bond rating agencies with market anticipation: evidence that reputation incentives dominate. FEDS Working Paper No. 2003-68.

[6] He, J., Qian, J., Strahan, P.E., 2011. Credit ratings and the evolution of the mortgage-backed securities market. American Economic Review 101, 131–135.

[7] Mariano, B., 2012. Market power and reputational concerns in the ratings industry. Journal of Banking & Finance 36, 1616–1626.

[8] Mathis, J., McAndrews, J., Rochet, J.C., 2009. Rating the raters: are reputation concerns powerful enough to discipline rating agencies? Journal of Monetary Economics 56, 657–674.

[9] Opp, C.C., Opp, M.M., Harris, M., forthcoming. Rating agencies in the face of regulation. Journal of Financial Economics.

[10] Stanton, R., Wallace, N., 2010. CMBS subordination, ratings inflation, and the crisis of 2007-2009. NBER Working Paper No. 16206.

[11] White, L.J., 2010. The credit rating agencies. Journal of Economic Perspectives 24, 211–226.