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Avoiding the rating bounce:
Why rating agencies are slow to react to new information

AVOIDING THE RATING BOUNCE: WHY RATING AGENCIES ARE SLOW TO REACT TO NEW INFORMATION

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Abstract

Rating agencies state that they take a rating action only when it is unlikely to be reversed shortly afterwards. Based on a formal representation of the rating process, I show that such a policy provides a good explanation for the empirical evidence: Rating changes occur relatively seldom, exhibit serial dependence, and lag changes in the issuers' default risk. In terms of informational losses, avoiding rating reversals can be more harmful than monitoring credit quality only twice per year.

Key words: credit rating, rating agencies, conservatism, rating migration.

JEL classification: G2; G21

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1 Introduction

Moody's Investors Service, one of the leading credit rating agencies, takes a rating action only "when it is unlikely to be reversed within a relatively short period of time" (Cantor, 2001, p. 175). As an explanation for this rating policy, Cantor cites the market's "expectation for stable ratings". Intriguingly, rating agencies are often accused of being too slow to adjust their ratings.[1] Could it be that the criticism rating agencies receive is the outcome of their desire to meet the market's preferences? This is the question I am going to address.

My analysis is built on a formal representation of the rating process. I model ratings as a mapping of a continuous variable, called credit quality, into discrete categories. Unmanaged, the discreteness produces dependencies in rating changes. The mechanics behind this feature, which is reminiscent of discreteness effects in stock price returns (see Campbell, Lo and MacKinlay, 1997), is as follows: If credit quality follows a probability distribution whose density declines monotonically towards the tails, a threshold triggering a rating change is more likely to be crossed by a small amount than by a large one. The closer the credit quality is to the rating boundary just crossed, however, the larger is the probability of a subsequent rating reversal relative to the probability of observing another rating change in the same direction. This bias towards rating reversals can be avoided by managing ratings as described in the above quote.

In this paper, rating management is implemented by setting tolerance regions around rating boundaries. If credit quality surpasses a boundary, but lies within the tolerance regions, the rating change is suppressed. Through simulations, I show that a policy of rating bounce avoidance could explain many of the empirical rating characteristics that have been interpreted as evidence of informational inefficiencies. With rating management, ratings are relatively stable, while rating changes are serially correlated and preceded by substantial changes in default probabilities.

Apart from rating bounce avoidance, the agencies' rating systems are characterized by another peculiarity. Most rating agencies employ a through-the-cycle approach, that is, neglect cyclical variations in credit quality when assigning ratings.

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[1] Cf., for example, the Economist (1997, p. 70) on the Asian crisis: "The raters, firms such as Moody's Investors Service, Standard & Poor's, Duff & Phelps and IBCA, are supposed to be the financial markets' early warning system. Instead, the agencies have spent the past few months belatedly reacting to events."

Though related, the two features are distinct. They both lead to a decrease in rating volatility, but the problem of rating reversals arises even if credit quality is not cyclical.[2] Löffler (2001) shows that the through-the-cycle method, while able to explain important stylized facts like rating stability, fails to account for the predictability of rating changes.

Another possible explanation for the stylized facts is a slow processing of new information. Such an underreaction could be of a psychological nature, reflecting a common human trait (Edwards, 1968). It could also be due to infrequent revisions of ratings. The fact that rating agencies do not monitor ratings continuously is evident from their placing issuers on watchlists. Agencies would not have to devote special attention to individual issuers if all issuers were under continuous review anyway.

One could suspect that putting an issuer on credit watch indicates a situation in which the credit quality is no longer in line with the current rating but where the rating change is suppressed in order to avoid its likely reversal. If used in this way, credit watch could mitigate informational losses from rating bounce avoidance because it would signal the true credit quality to outside observers. However, this is not what agencies claim to do:

> "These Watchlists list the names of credits whose Moody's ratings have a likelihood of changing. These names are actively under review because of developing trends or events which, in Moody's opinion, warrant a more extensive examination."[3]

> CreditWatch highlights the potential direction of a short- or long-term rating. It focuses on identifiable events and short-term trends that cause ratings to be placed under special surveillance by Standard & Poor's analytical staff. These may include mergers, recapitalizations, voter referendums, regulatory action, or anticipated operating developments.[4]

Putting a borrower on watch indicates a situation in which the probability of a change in

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[2] Consistent with this view, Cantor (2001) states that the avoidance of rating reversals supports the through-the-cycle approach in reducing rating volatility.

[3] http://www.moodys.com/moodys/cust/watchlist/watchlist.asp, 23/01/2001.

[4] http://www.standardandpoors.com/ResourceCenter/RatingsDefinitions.html#creditwatch, 23/01/2001.

credit quality is - due to imminent events - relatively high, not one where credit quality has already changed.

This paper cannot answer the question whether it is the raters' policy or a combination of informational inefficiencies that underlie the stylized facts. What it does show, for example, is that the effects of rating bounce avoidance can lead to substantial informational losses, similar to those brought about by infrequent monitoring. Any critique of the rating agencies runs the risk of being partial as long as it does not take the official rating policy into account. In consequence, market participants should ask rating agencies to reveal their rating policy in sufficient detail. Otherwise the market will not know what it gets, nor will it be able to evaluate the quality of rating agencies.

The related literature includes papers on empirical characteristics of agency ratings. Carey and Hrycay (2001) and Kealhofer, Kwok and Weng (1998) find that agency ratings are relatively stable compared to alternative rating systems. Altman and Kao (1998) and Lando and Skødeberg (2002) document the existence of serial dependence in rating changes. Delianedis and Geske (1999) show that rating changes lag changes in default probabilities. Their evidence is in line with previous findings that stock prices and stock analyst forecasts predict rating changes (e.g. Holthausen and Leftwich, 1986, and Ederington and Goh, 1998). Extant normative or descriptive papers on rating systems do not address the problem of rating bounces. Krahnen and Weber (2001) propose general standards for good rating practice. A report by the Basel Committee on Banking Supervision (2000) provides a comprehensive overview of rating practices. Crouhy, Galai and Mark (2001) describe the rating system of Moody's and Standard & Poor's and propose a proytotype rating system for bank internal ratings. Kuhner (2001), finally, presents a signaling game in which rating agencies can have incentives to misrepresent credit quality in times of enhanced systemic risk.

The remainder of the paper is organized as follows. Section 2 presents a formalization of rating processes. Section 3 uses simulations to quantify the effects of rating policies on rating dynamics. Section 4 concludes.

2 Formalizing rating policies

Credit ratings can be viewed as a mapping of credit quality into discrete categories $i=1,..., N$. A borrower is assigned rating grade i if the credit quality z lies within the boundaries for that grade, b_{lower}^i and $b_{upper.}^i$ Many, but not all rating systems take this credit quality to be the probability of default.[5] I consider a rating system with 17 rating categories ($N=17$) excluding default, which is the number of (modified) rating grades for which Moody's and Standard & Poor's publish default rate statistics.

The credit quality z is assumed to follow a random walk with normally distributed innovations:

$$z_t = z_{t-1} + e_t, \quad e_t \sim iid \ N(0, s^2) \tag{1}$$

In the simulations, periodicity is one month; the annual variance of credit quality changes is set to unity, which implies $\sigma^2 = 12^{-0.5}$. For the purpose of the paper, the random walk specification is useful because it leaves no role for a through-the-cycle approach. It introduces an inconsistency because credit quality diverges to extreme levels as time passes, but the robustness checks show that choosing a mean-reverting process does not change conclusions. One could also object that the empirical dynamics of agency ratings are difficult to replicate with structural models that rely on a normally distributed state variable (Gordy and Heitfield, 2001). As demonstrated in section 3.4, however, such apparent departures from normality can be due to rating management.

For borrowers situated right in the middle between the boundaries of their rating category, the probability that the rating remains stable on a one-year horizon is set to 35%.[6] To obtain a rating stability of 35% for these median borrowers, the width of a rating class has to be set equal to $2\Phi^{-1}(1-(1-0.35)/2)$, with $\Phi(\cdot)$ denoting the standard normal cumulative distribution function. Arbitrarily setting the lower boundary of the worst grade to zero, rating boundaries are as follows:

$$b_{lower}^i = 2(i-1)\Phi^{-1}(1-(1-0.35)/2), \quad i=1,...,17$$

$$b_{upper}^i = 2i\Phi^{-1}(1-(1-0.35)/2), \quad i=1,...,16 \tag{2}$$

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[5] Cf. Basel Committee on Banking Supervision (2000) for a description of rating systems.

[6] The robustness checks will consider different values of rating stability, and allow stability to differ across rating categories.

A rating stability of 35% is below the figures reported in Standard & Poor's (2001), where the median stability across grades AAA to CCC is equal to 74.1%. However, the empirical stability of agency ratings is likely to be affected by the rating policy. Kealhofer, Kwok, and Weng (1998) report a transition matrix for ratings which are based on statistical estimates of default probabilities, that is, a transition matrix not affected by active rating management. There, the median stability is 44.4%. Since I use 17 rating grades instead of seven as in Kealhofer, Kwok and Weng, I regard a value lower than 44.4% to be appropriate.

To associate a given credit quality with a default probability, I set the one-year default probabilities of median borrowers equal to the historical default rates of the corresponding S&P rating categories. In particular for ratings better than BBB, historical default rates are imprecise estimates of the underlying default probabilities; sometimes they are zero. I therefore depart from the historical default rates and let the model default probabilities decline linearly from 0.1% for category 6 (~ A) to 0.04% for category 1 (~AAA). The model default probabilities as well as the empirical default rates for S&P and Moody's rating grades are listed in Table 1.

Having specified the default probabilities for median borrowers, the default probability for any given z is obtained through linear interpolation.[7] In the simulations, default is modeled as an exogenous event whose probability depends on credit quality. In month t, the probability of default is one twelfth of the default probability associated with the previous credit quality z_{t-1}. Due to the non-linear relationship between credit quality and default probabilities, the resulting one-year default frequencies need not be equal to the specified one-year default probabilities. Differences are negligible, however: I simulate 100,000 one-year paths to determine default frequencies. They amount to 0.224% (0.988%) for borrowers with an initial model default probability of 0.22% (0.94%). Despite the large sample size, these differences are not statistically significant. Note, too, that the conclusions of this paper do not rest on an analysis of realized default rates.

Even though the state variable z follows a random walk, the rating derived from this variable will not be. Consider a borrower whose credit quality crosses a rating boundary. Since credit quality changes follow a bell-shaped distribution, the boundary

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[7] The minimum default probability is set to 0.04%; for credit qualities at or below zero, the monthly default probability is set to 100%.

is more likely to be exceeded by a small than by a large amount. Conditional on a rating change, the probability that the rating change is reversed is thus larger than the probability that the rating change is followed by another change in the same direction. In the limit, when the credit quality just hits the boundary, the probability of a reversal is 50%, while the probability of observing another change in the same direction is, on a one-year horizon, equal to $\Phi\left(2\Phi^{-1}(1-(1-0.35)/2)\right) = 18.21\%$.

As noted in the introduction, Moody's claims to take a rating action only when it is unlikely to be reversed within a relatively short period of time. The description does neither specify the time horizon nor what is exactly meant by unlikely. Assume that, at each rating review date, the rating agency wants to keep the probability of a reversal within the next m years below p^*. Within the rating model described above, such a policy can be formulated as follows. The probability p that a rating change is reversed in the next m years depends on the difference between the credit quality and the rating boundary just crossed:

$$\text{Prob(reversal)} = p = \begin{cases} \text{Prob}\left(z_{t+m} \leq b^{crossed\,in\,t}\right) = \Phi\left(\left(b^{crossed\,in\,t} - z_t\right)/\sqrt{m}\right) & \text{after upgrades} \\ \text{Prob}\left(z_{t+m} > b^{crossed\,in\,t}\right) = \Phi\left(\left(z_t - b^{crossed\,in\,t}\right)/\sqrt{m}\right) & \text{after downgrades} \end{cases} \quad (3)$$

The rating policy prescribes that the probability of reversal p is smaller than a target value p^*.[8] It can be implemented by requiring credit quality to exceed a rating boundary by at least $\left|\Phi^{-1}(p^*)\sqrt{m}\right|$ in order for a rating change to occur. What happens if credit quality crosses two boundaries, but fails to exceed the second boundary by the critical amount? In this case, the rating will be adjusted by one grade rather than two. Figure 1 shows the various possibilities for a single-period change in credit quality.

The following example illustrates the conservatism that can be introduced by such a rating policy. Assume $p^*=0.2$ and $m=1$, that is, the rating agency wants to avoid situations where rating changes are reversed with a probability of 20% within one year. A rating boundary then has to be exceeded by $\left|\Phi^{-1}(0.2)\right|=0.842$. This tolerance region is almost as wide as the interval pertaining to one rating grade, which has a width of 0.908

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[8] Strictly speaking, the probability of reversal examined here is the probability that credit quality moves to a level consistent with the previous rating. Since rating management influences not only current but also subsequent rating decisions, this is different from the probability of actual rating reversals prevailing under a volatility-reducing rating policy.

for a rating stability of 35%. In effect, such a rating policy would blur differences between neighboring rating grades.

3 Rating bounce avoidance as an explanation of stylized facts

In this section I use the rating model described above to assess whether the desire to avoid frequent rating reversals could underlie the peculiarities of agency ratings that have been documented in the literature. Notably,

- agency ratings appear relatively stable compared to other rating systems;

- ratings exhibit drift. Subsequent rating changes in the same direction are more frequent than subsequent rating changes in opposite directions;

- ratings lag changes in issuers' default probabilities.

These stylized facts will be addressed one after another within the framework laid out in the previous section. I assume that rating agencies pursue a policy of avoiding rating reversals. The tolerated probability for rating reversals p^* is set at 0.1, 0.2 or 0.3; the time period m is chosen to be 0.25, 0.5 and 1, corresponding to time intervals of three, six and twelve months respectively.

The effects of rating bounce avoidance are assessed through Monte Carlo simulations. Periodicity is one month. In one run of the simulations, I generate a random path for the credit quality z. According to the mapping rules from section 2, the credit quality z is translated into ratings. Since the assumed credit quality dynamics are independent of the current and past credit qualities, and the width of rating categories is uniform across grades, the starting value for the credit quality is not decisive for the results. I choose the initial credit quality to be the one of a median borrower within rating category BB. On a one-year horizon, the associated default probability is 0.94%. One run of the Monte Carlo simulations extends over a period of ten years. I perform 10,000 replications for each parameterization.

3.1 Ratings are relatively stable

Kealhofer, Kwok and Weng (1998) and Carey and Hrycay (2001) find that agency ratings are significantly less volatile than alternative ratings. Kealhofer, Kwok and Weng estimate default probabilities based on the default model of Merton (1974) and categorize borrowers according to these probabilities. Carey and Hrycay use a logit

model to assign borrowers to rating grades. Typically, 40% to 50% of these ratings remain stable over a one-year horizon, compared to 80% to 90% in the case of agency ratings. The ratings constructed in Kealhofer, Kwok and Weng and in Carey and Hrycay are based on seven and five categories, respectively. Since I use 17 grades in this paper, rating stability will generally be lower. However, the simulation results and the empirical evidence can still be compared with respect to relative differences in rating stability.

Table 2 summarizes simulated one-year transition probabilities for various assumptions about the acceptable reversal probability $p*$ and the time horizon m used to compute this probability. If there is no rating bounce avoidance, that is, $p*$ is equal to the maximum value of 0.5, rating stability is equal to the 35% that were used to calibrate the model. For $p*<0.5$, rating stability increases. It ranges from 38% to 87%. With a tolerated reversal probability of 0.2 and a time horizon of six months, the rating stability is 55%. Rating bounce avoidance can thus lead to a considerable increase in the stability of credit ratings. The simulated figures largely mirror the empirical differences between agency ratings and rating systems that are known not to be influenced by ratings management. Since the precise rating policy of the agencies is unknown, it is difficult to judge whether rating bounce avoidance completely explains the empirical evidence. For the intermediate parameter combination $p*=0.2$ and $m=0.5$, for example, one could argue that it does not. Both in Kealhofer, Kwok and Weng (1998) and in Carey and Hrycay (2001), the stability of agency ratings is up to twice the one of alternative rating systems; in Standard & Poor's (2001), the maximum empirical stability for modified grades is 90%, the median across the 17 grades is 78%. This would not leave us with a puzzle, though. The agencies' policy of rating through the cycle, which is not modeled here, can also lead to a significant increase in rating stability (Löffler, 2001). Together, the two peculiarities of the agencies' rating approach could well explain the empirical facts, even if rating bounce avoidance alone did not.

3.2 Rating changes are serially dependent

Empirical studies of rating changes have documented significant positive serial dependence (Altman and Kao, 1992, and Lando and Skødeberg, 2001). Such a dependence can arise even if ratings are continuous and rating analysts efficiently use available information. An analyst who learns that the default probability of a firm will decrease over time will not completely incorporate this information into the current

rating if the rating horizon is shorter than the time span in which the firm's restructuring is completed. Partial responses to new information, however, will create positive serial dependence. Since I model credit quality as a random walk, this explanation can be ruled out for the simulation experiments conducted here.

Altman and Kao (1992) examine the rating dynamics of 1970-1985 new bond issues. They measure serial dependence through a statistic defined as the frequency of subsequent rating changes in one direction divided by the frequency of subsequent rating changes in opposite directions. If ratings exhibit positive drift, the statistic is larger than one. If an upgrade is more likely to be followed by a downgrade, and vice versa, the statistic is smaller than one. I compute the statistic within the simulated samples. In each run, which spreads over ten years, I take only the first two rating changes to compute the statistic; this is appropriate because Altman and Kao (1992) examine rating changes of newly rated bond issues. If a simulation run contains less than two rating changes, it does not enter the calculation of the test statistic.

The results are reported in Table 3. If raters do not try to avoid rating reversals (p^*=0.5), the statistic is 0.39, meaning that the probability of observing rating changes in opposite directions is more than twice the one of observing rating changes in identical directions. This is the reflection of the rating bounce. If ratings are set to avoid this bounce, the statistics range from 0.98 to 4.01. For most of the parameter values chosen here, rating bounce avoidance thus leads to positive serial dependence in rating changes. The values are in line with the ones reported by Altman and Kao (1992) separately for issuer groups, and for up- and downgrades. The mean (median) of their statistics is 1.752 (1.475), with a range of 0.2 to 3.83.

The rating policy modeled here could thus account for the existing evidence. This is important as an another peculiarity of agency ratings, the through-the-cycle approach, cannot (see Löffler, 2001). Lando and Skødeberg (2001) document that the rating drift is especially pronounced for downgrades. This is sometimes explained by noting that agencies "dole out the bad news in small doses rather than savaging the bond issuer – who is, after all, their customer – all in one go" (Economist,1997, p. 71). But it could also be explained through avoidance of rating reversals. It seems likely that rating changes entail costs for the issuers, and that these costs are larger for downgrades. After a downgrade, investment restrictions may force investors to sell bonds, and covenants may restrict the flexibility of the borrower. If rating agencies act, at least partly, in the interest of their clients, they will try to avoid rating reversals particularly for

downgrades.[9] In the framework of this paper, such a policy is not the same as "doling out bad news in small doses" because rating changes are suppressed rather than handed out piecemeal. Rating drift arises because rating changes are only made when the credit quality is relatively close to the boundary triggering a further rating change.

In a related experiment, I examine whether serial dependence could be due to infrequent rating reviews. Assume that agencies monitor ratings only in six month intervals. In the simulation, monitoring dates are thus t = 0, 6, 12 and so forth. At a monitoring date, the rating is set according to the credit quality, that is, there is no rating bounce avoidance. With such an infrequent monitoring, the simulated autocorrelation statistic is 0.80. If the frequency is further reduced to one rating review per year, the statistic increases to 0.89. It is thus difficult to explain the empirical evidence on serial correlation with infrequent monitoring

3.3   Ratings lag changes in default probabilities

Based on the option-theoretic models of Merton (1974) and Geske (1977), Delianedis and Geske (1999) use balance sheet data, equity values and equity volatilities to compute risk-neutral default probabilities for borrowers rated by Standard & Poor's. They examine how these default probabilities evolve before a rating change, and find that they rise (fall) several months before a downgrade (upgrade).

Within the simulated samples, I examine the default probabilities one month before the first downgrade, regardless of the magnitude of the downgrade. Recall from Table 1 that the initial default probability of grade 12 is 0.94%; the median default probability of the next lower rating class is 1.33%. If the rating agency does not aim at avoiding rating reversals, a downgrade occurs as soon as the default probability exceeds $0.5\,(0.94\% + 1.33\%) = 1.14\%$. Due to the discrete nature of the rating system, the default probability one month before a downgrade will not be equal to the initial one. Downgrades are more likely to be observed if the credit quality has declined within the range associated with the initial rating. This effect is documented in Table 4. Even if raters are not concerned about reversals ($p^*=0.5$), the median default probability one

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[9] "Especially in the case of downgrades, the potentially self-fulfilling nature of ratings requires that Moody's particularly endeavor to avoid 'false' negative predictions" (Moody's Investors Service (2002, p. 4).

month before a downgrade has increased relative to the initial one, from 0.94% to 1.04% The effect is relatively small, however, which is due to the rating system being relatively fine. With rating bounce avoidance ($p^*<0.5$), rating changes lag much more behind changes in default probabilities. Depending on the parameters, the median default probability one month before a rating change can be up to 2.41%, more than twice the initial default probability of 0.94%.

How do these figures compare to the results in Delianedis and Geske (1999)? For investment-grade bonds, the median risk-neutral default probability one month before any downgrade is 1.1%, while the median default probability of a benchmark sample which does not contain downgrades is 0.7%. These figures are very similar to the ones generated through intermediate assumptions on rating bounce avoidance. Setting $p^*=0.2$ and $m=0.5$, for example, the comparable figures are 1.30% and 0.94%, respectively.

Another piece of evidence against the informational efficiency of agency ratings is the study by Perraudin and Taylor (2001). They show that bond yields often lie above (below) the average yield of bonds with the next lower (higher) letter rating. In the examples presented here, tolerance regions do not spread across more than two ratings; an issuer with credit quality corresponding to AA- can have a rating of A+ or A, but not of A-. Together with pricing errors or uncontrolled factors, however, rating management can help to explain the empirical evidence.

Some empirical studies (e.g. Hand, Holthausen and Leftwich, 1992) suggest that bond price reactions to bond rating changes are relatively weak. It is therefore interesting to ask whether rating management could have such an effect. As modeled in this paper, rating management does not lead to a situation in which rating changes are associated with smaller changes in credit quality. Managed or unmanaged, ratings change when credit quality crosses a threshold; the main difference is that, under rating management, thresholds are path-dependent. However, rating management makes it more difficult for outsiders to infer the underlying credit quality from ratings. In the information aggregation process leading to market prices, managed ratings will receive a weight that is smaller than the one investors would attach to unmanaged ones. As a consequence, price reactions to rating changes do not fully reflect the information produced by rating agencies.

Finally, I compare the effects of the rating policy to the ones that would arise from infrequent rating reviews. With semi-annual monitoring, the simulated median

default probability before a downgrade is 1.16%, which is lower than some of the values that obtain with rating bounce avoidance. With p^*=0.2 and m=0.5, for example, the median default probability is 1.30% (see Table 4). This shows that rating bounce avoidance can be more harmful to the timeliness of a rating system than restricting the number of rating reviews to only two per year.

3.4   Sensitivity analyses

To examine the robustness of the results, I re-run the analyses for the parameter combination p^*=0.2 and m=0.5, making the following, non-accumulating variations:

A   The initial credit quality conforms to rating 6 (~A) rather than 12 (~BB).

B   Rating stability without rating management is set to 30% instead of 35%.

C   Rating stability without rating management is set to 40% instead of 35%.

D   Rating stability increases linearly from 30% (grade 17 ~ CCC) to 62% (grade 1 ~ AAA) instead of being constant at 35%. Stability for grade 12 (~BB) is 40%.

E   Credit quality follows a mean-reverting process instead of a random walk:

$$z_t - z_{t-1} = 0.015\,(z_0 - z_{t-1}) + u_t, \quad u_t \sim iid \ N(0,\,0.090)$$

The process has an annual variance of one. The annual speed of adjustment is $(1\text{-}0.985^{12})$=0.166, which is at the upper end of the estimates that Fama and French (2002) obtain for the speed of adjustment to target leverage ratios. The tolerance regions account for the fact that the expected change in credit quality is non-zero whenever the credit quality differs from the initial one.

Table 5 compares the simulation results with the previous ones. Differences are small, or as expected. Changing the initial credit quality from BB to A does not change rating stability or the autocorrelation statistic. The latter increases when rating stability without rating management is lowered to 30% because tolerance regions spread further into the next rating category; increasing stability to 40% leads to opposite effects. Making rating stability heterogeneous produces much the same results as a uniform stability of 40%; in both cases, the stability of the initial credit quality is 40%. With mean reversion the width of the rating categories remains the same but tolerance regions widen because mean reversion increases the probability of a rebound. In consequence, rating stability and the time-lag in rating actions increase. Since the credit quality is now negatively

autocorrelated, the autocorrelation statistic decreases. Nevertheless, previous conclusions can be upheld.

Gordy and Heitfield (2001) use a structural model similar to the one presented in section 2 to replicate empirical rating transition data. They find that choosing a fat-tailed distribution for credit quality provides a better fit than the normal. To check whether this finding can be the result of rating management, I perform an analysis similar to Gordy and Heitfield (2001). From the data simulated in section 3, I obtain one-year transition frequencies of grade 12 issuers for the case that rating policy tolerates a reversal probability of 0.2 at a six-month horizon. I take the rating thresholds defined in section 2 as given, and calibrate the credit quality distribution that best replicates the simulated transition frequencies. Specifically, I assume that one-year changes in credit quality follow a scaled t distribution, and numerically search for the variance and the degrees of freedom that minimize the sum of squared differences between simulated transition frequencies and model transition probabilities of median issuers within grade 12.[10] The best fit is obtained with 3 degrees of freedom; repeating the analysis for transition frequencies of grade 6 issuers produces the same result. Thus, empirical evidence of leptokurtosis is consistent with credit quality following a normal distribution, and agencies pursuing a policy of rating bounce avoidance.

4 Concluding remarks

The paper has shown that the wish to avoid frequent reversals of credit ratings could account for the stylized facts of agency ratings. Empirically, rating changes occur relatively seldom, they are serially dependent, and predictable using borrower fundamentals. Simulations reveal that rating bounce avoidance can explain these peculiarities very well. Moreover, predictability cannot be explained by another characteristic of the agencies' rating system, the through-the-cycle approach (Löffler, 2001). Rating bounce avoidance thus is an important candidate for explaining the stylized facts of agency ratings. Another candidate is informational inefficiency. If

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[10] The calibration does not include the transition to default because default is modeled as an exogenous event in this paper.

rating agencies are slow to react to new information, stability will increase, and rating changes will become predictable. Differentiating between these alternative explanations is difficult. The analysis has shown, however, that rating bounce avoidance can reduce the informational content of ratings by more than a rating system which reviews credit quality only twice per year. In addition, infrequent reviews cannot explain the observed serial dependence of rating changes.

Moody's claims that it manages ratings in order to "balance the market's need for timely updates on issuer risk profiles, with its conflicting expectation for stable ratings" (Cantor, 2001, p.175). It is beyond the scope of this paper to evaluate what the market really wants, and whether rating agencies act in response to these preferences, or use this to cover any deficiencies of their ratings. It seems obvious, however, that the market's preferences are not homogeneous. Rating management cannot serve all market participants alike. In addition, even if rating management meets an investor's expectation for stability, there may be situations where this particular investor might want to know the precise credit quality, not the one obscured by rating management.

There seem to be two ways of reducing informational losses due to rating bounce avoidance. One is to communicate the precise rating policy, the other is to change the rating system. A move towards greater transparency would be to state how wide the tolerance regions are in terms of rating grades. The analysis has shown that rating management can blur differences between adjacent rating categories. In effect, rating management can offset the increase in accuracy achieved through the rating modification (+ and – in the case of Standard & Poor's) introduced by the rating agencies in the early 1980s. Rating agencies could try to elicit market feedback on whether such an inaccuracy is indeed what the market wants. In the aftermath of the Enron default, Moody's has initiated a dialogue on the quality and timeliness of ratings (cf. Moody's Investors Service, 2002). The market response has confirmed Moody's in its policy of avoiding rating reversals. Even though Moody's aims at greater transparency, however, Moody's has not specified its policy in more detail.

The problem of rating bounces could be reduced by moving from a discrete rating system to a continuous one. This does not imply that the rating is equated with default probabilities; it could still reflect other dimensions of credit risk, e.g. recovery risk, or be based on a combination of default probabilities for various time horizons. There are various possible arguments against continuous ratings. For cognitive reasons, rating analysts might find it easier to aggregate their information into discrete

categories; rating agencies might be tempted to introduce random variation into ratings to pretend continuous monitoring activities; market participants might overestimate the accuracy of such a continuous rating. These arguments are appealing, but it has been shown in other contexts that continuously measured expectations can provide better results than qualitative ones. Batchelor (1986), for example, recommends to ask for continuous expectations of consumer price inflation rather than for qualitative responses.

The upcoming reform of capital adequacy requirements (Basel Committee on Banking Supervision, 2001) has spurred a discussion on the design of rating systems.[11] Since rating bounce avoidance appears to be a driving factor behind rating dynamics, it should receive more attention in this discussion. The issue is not confined to external rating agencies. Banks might have incentives to manage internal ratings in a way similar to rating agencies.

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[11] See, for example, Krahnen and Weber (2001).

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Table 1
One-year default probabilities (%) within the model

Rating	Default probability at midpoint of rating boundaries	Historical default rates	
		S&P	Moody's
1 ~ AAA	0.04	0	0
2 ~ AA+	0.05	0	0
3 ~ AA	0.06	0	0
4 ~ AA-	0.07	0.03	0.06
5 ~ A+	0.08	0.02	0
6 ~ A	0.09	0.05	0
7 ~ A-	0.10	0.05	0
8 ~ BBB+	0.12	0.12	0.07
9 ~ BBB	0.22	0.22	0.06
10 ~ BBB-	0.35	0.35	0.39
11 ~ BB+	0.44	0.44	0.64
12 ~ BB	0.94	0.94	0.54
13 ~ BB-	1.33	1.33	2.47
14 ~ B+	2.91	2.91	3.48
15 ~ B	8.38	8.38	6.23
16 ~ B-	10.32	10.32	11.88
17 ~ CCC	21.94	21.94	18.85

Default rates are from Standard & Poor's (2001) and Moody's Investors Service (2001).

Table 2
Simulated one-year stability of credit ratings for different rating policies

$p*$ (tolerated reversal probability)	m (time horizon for reversal probability)		
	0.25	0.5	1
0.1	0.58	0.73	0.87
0.2	0.45	0.55	0.70
0.3	0.38	0.43	0.51
0.5	0.34	0.35	0.35

Table 3
Simulated serial dependence statistics for different rating policies

$p*$ (tolerated reversal probability)	m (time horizon for reversal probability)		
	0.25	0.5	1
0.1	1.86	2.45	4.01
0.2	1.28	1.71	2.20
0.3	0.98	1.15	1.50
0.5	0.39	0.39	0.39

The statistic is defined as the frequency of observing subsequent rating changes in the same direction divided by the frequency of observing subsequent rating changes in opposite directions. It is greater than one for positive serial dependence.

Table 4
Simulated median default probabilities (%) in the month before a downgrade from grade 12 (default probability = 0.94%) for different rating policies

$p*$ (tolerated reversal probability)	m (time horizon for reversal probability)		
	0.25	0.5	1
0.1	1.32	1.76	2.41
0.2	1.23	1.30	1.65
0.3	1.16	1.21	1.27
0.5	1.04	1.04	1.04

Table 5
Sensitivity analyses (reversal probability *p**=0.2 and time horizon *m*=0.5 for each experiment)

	Base case	Variation				
		A	B	C	D	E
One-year stability	0.55	0.55	0.50	0.60	0.61	0.67
Autocorrelation statistic	1.71	1.67	1.98	1.46	1.47	1.20
Default prob. before downgrade (%)	1.30	0.10	1.33	1.28	1.29	1.60

A: Initial credit quality ~ A; B: rating stability = 30%; C: rating stability = 40%; D: rating stability decreasing from 62% to 30%; E: mean-reverting credit quality.

Figure 1
Schematic representation of the rating policy for a one-period change in credit quality of a borrower rated i in $t = 0$

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