



Editorial

An introduction to recent research on credit ratings

Credit risk has been one of the most active areas of recent financial research, driven by advances in portfolio risk measurement and management techniques, growth in credit derivatives trading, the anticipated adoption of the revised Basel Capital Accord, and regulatory concerns emanating from the US corporate credit meltdown in 2001 and 2002. Within this broader literature, a growing body of research analyzes the meaning, role, and influence of credit ratings. The papers collected in this Issue summarize much of the literature on this topic, answer important research questions, and suggest interesting avenues for new research.

1. Understanding rating transitions

Rating transitions are of interest for a number of reasons. One, many portfolio risk models update value-at-risk or capital adequacy numbers on a periodic basis to reflect changes in a portfolio's rating distribution. Long-term capital budgeting, therefore, requires knowledge of the probability distribution of future potential rating distributions. Two, since defaults are infrequent events and historical data sets generally do not go back very far in time, researchers study rating transition statistics with the goal of extrapolating long-term default predictions from short-term credit risk dynamics. Three, rating transition data can be used to understand the rating process and how credit ratings relate to alternative measures of credit risk.

Two papers in this Issue – [Christensen et al. \(2004\)](#) and [Jafry and Schuermann \(2004\)](#) – parameterize rating transition matrices for use in portfolio risk models or for default rate forecasts. Two other papers – [Amato and Furfine \(2004\)](#) and [Altman and Rijken \(2004\)](#) – seek to better understand the rating process by modeling the determinants of ratings and compare their models' predicted ratings to observed rating changes.

Christensen et al. note that compared to classical multinomial/cohort techniques, continuous-time/duration estimation methods (as developed by Lando and Skødeberg, 2002) can extract more information about the probabilities of rare transitions, even if such transitions are not actually observed in the data. However, Lando and Skødeberg's computational method assumes – contrary to overwhelming evidence, some of which they present – that the rating transition process is Markov.¹

Christensen et al. deal with this problem by expanding the state space of the rating process to make the Markov assumption more palatable. They estimate a Markovian model in which firms which are downgraded into certain categories enter into an “excited state” in which they stay for a stochastic amount of time. They compare the estimates obtained in the larger model with those obtained by using a model that does not include excited states. They find that firms in the excited states have higher default probabilities over a one-year horizon than firms in the normal state. Moreover, using the extended model increases default probabilities from normal states compared to what is obtained in the basic model.

Increasing the number of states, unfortunately, increases the number of parameters to be estimated exponentially. As a result, Christensen et al. limit the number of additional states they consider: in particular, they do not recognize upgraded issuers or issuers downgraded to Aa or to single-A issuers as being in excited states. Given this limitation, it is hard to evaluate the relative benefits of the continuous-time approach relative to standard cohort approach for long-horizon transition predictions. The authors point out, however, that another potentially promising approach may be to expand the data set to incorporate rating outlooks and Watchlists. As shown in a recent study by Hamilton and Cantor (2004), rating transitions conditional outlook and Watchlist status may indeed be independent of rating history.

Jafry and Schuermann (2004) compare the implications of the two estimation methods – the cohort/multinomial and continuous-time/duration methods – and evaluate the importance of relaxing time homogeneity assumption common to both. They develop a new metric for comparing transition matrices and show that the migration matrices have been increasing in “size” since the mid-1990s. They demonstrate that different estimation techniques can imply large differences in portfolio risk capital requirements, larger even than differences implied by moving between a recessionary and expansionary environment. They conclude that ignoring the efficiency gained through duration estimates (relative to cohort methods) is more valuable than the error introduced by imposing a (possibly false) assumption of time homogeneity.

2. Rating determinants and stability

Amato and Furfine (2004) investigate the cyclical patterns of rating changes. Rating agencies maintain that their ratings should generally be stable through credit cycles.² Prompted, however, by the large number of rating downgrades during the

¹ See Altman and Kao (1992), Carty and Fons (1993), and Hamilton and Cantor (2004).

² See Cantor and Mann (2003a) for background.

2001–2002 period and the enhanced role proposed for ratings in bank regulation under Basel II, market participants have expressed concern about the stability of ratings over the credit cycle. Cantor and Mann (2003b) do, in fact, demonstrate that credit ratings have been remarkably stable over past credit cycles, particularly in comparison to market-based credit measures. Amato and Furfine, however, go further in demonstrating that rating changes exhibit very little cyclical behavior even after controlling for many of the financial and economic determinants of ratings.

In the process of examining the determinants of credit ratings, Amato and Furfine also clear up some puzzling findings in the literature. Using a similar model, Blume, Lim, and MacKinlay (1998) [BLM] reported a secular tightening of rating agency standards, concluding that it became more difficult for firms to obtain high ratings in the mid-1980s and early 1990s. This result contradicts earlier findings by Cantor and Packer (1995) that coverage and leverage ratios deteriorated and default rates rose within rating categories from the mid-1980s through the early 1990s. The apparent contradiction between the default rate experience by rating category and BLM's findings is discussed further by Zhou (2001). Amato and Furfine show that BLM's results were driven by the particular way they specified their model. BLM's panel regression of the determinants of ratings includes annual dummies and a measure of firm size (market capitalization) but does not include a variable to control for the trend growth in firm size. Rather than identifying a secular change in standards, the annual dummies in BLM's model are more likely picking up the effects of an omitted variable, such as secular growth in market capitalization.

Why do models of ratings determination, such as those of BLM and Amato and Furfine, do a good job of explaining rating levels but a poor job predicting rating changes, implying more volatility than actually seen in practice? Altman and Rijken (2004) answer this question as well as many others. In particular, they note that panel regression estimates of rating determinants implicitly assume that ratings adjust instantaneously to new information. In fact, the rating migration policies of the agencies do not follow these "point-in-time" rating practices. As discussed by Cantor (2001), Fons (2002) and Cantor and Mann (2003a), agency ratings are stable because they are intended to measure the default risk over long investment horizons *and* because they are changed only when observed changes in a company's risk profile are likely to be enduring. It is in this sense that ratings are sometimes said to "look through the cycle".

To evaluate the impact of the agencies' rating migration policies, Altman and Rijken compare actual rating transitions to those implied by various point-in-time rating models. Using a fixed set of explanatory variables, they estimate one-year-ahead and six-year-ahead default prediction models and a rating prediction model. Consistent with the agencies' stated objectives, the coefficients on the rating prediction model more closely resemble those of the long-term default prediction model than those of the short-term default prediction model.

Altman and Rijken then demonstrate that the agencies' focus on long-term investment horizons only partly explains the relative stability of agency ratings. The other aspect of the "through-the-cycle" rating methodology is an even more important

factor underlying agency-rating stability. They find that a rating change is triggered when the difference between the actual agency rating and the rating predicted by the agency-rating model exceeds a certain threshold level. And, if triggered, ratings are only partly adjusted by agencies, which is consistent with the known serial dependency of rating changes.

3. Understanding the role of credit ratings as tools for portfolio governance

Picking up on a theme implicit in the Altman and Rijken paper, Löffler (2004) explores the usefulness of credit rating agencies' rating systems (and their rating migration policies) as tools for formulating governance rules. Such rules, which consist of buy and sell restrictions, are predicated on rating stability and are commonly used in investment management.

The purpose of ratings-based governance rules is to mitigate the problems that arise due to the different interests and incentives of investors and the portfolio managers they employ.³ Investors impose ratings-based portfolio governance rules on managers because limited liability leaves portfolio managers with insufficient incentive to avoid risk. At the same, investors recognize that a direct market-based risk governance rule – e.g., do not purchase bonds with spreads over treasuries in excess of 200 basis points – could force portfolio managers to miss desirable investment opportunities. Moreover, market-based governance rules may lead to high transactions costs because market prices are volatile. Furthermore, though it is possible to reduce portfolio churning by imposing a governance rule based on a smoothed filter of market price, the quality of the credit signal derived from market prices will presumably be reduced.

Based on data from 1983 to 2002, Löffler finds support for the agencies' claim that their policy of reducing rating volatility, which builds on the through-the-cycle approach and the avoidance of frequent rating reversals, is beneficial to bond investors. While he identifies cases in which market-based governance rules may offer higher returns to investors, his results suggest there may be many circumstances where credit ratings-based governance rules may be more effective. More generally, he finds that many statistical measures that are currently used to assess rating quality may be insufficient to judge the economic value of rating information in a specific context. These themes are further discussed in Cantor and Mann (2003a).

³ Ratings are also used as tools for mitigating principal-agent problems in other areas within credit markets. For example, based on a borrower's credit rating, credit committees/credit officers often require varying levels of review before approving underwriter/loan officer recommendations. Moreover, lenders often offer borrowers more favorable terms if they are willing to commit to ratings-based covenants that trigger debt repricing, refinancing, or collateralization. Furthermore, some financial regulators vary capital requirements with the riskiness of an institution's assets, as measured in part by the credit ratings assigned to its investments.

4. Relating bond prices and spreads to credit ratings

One of the earliest branches of the literature explores the relationship between credit ratings and bond prices or spreads. That literature has generally found that ratings are strongly correlated with credit spreads, but many other factors are also important.⁴

Elton et al. (2004) make some additional contributions to this large literature. They analyze a large data set of secondary market, dealer quotes on rated, US dollar-denominated, straight bonds. They apply Nelson–Siegel curve fitting techniques to estimate term structures for bonds within different rating categories and explore liquidity and tax effects.

Their paper shows that two proxies for liquidity – quote frequency and issue size – are insignificant, whereas a third proxy – the age of the bond issue – is modestly significant.⁵ They also find strong evidence that, after controlling for ratings, bond prices are inversely related to coupon rates. They interpret this finding as evidence that investors prefer low coupon securities because they imbed a tax deferral or tax timing option.⁶

Perraudin and Taylor (2004) further examine these issues using a similar data set, except, rather than US issues, they focus on Eurobonds. Their results on liquidity and coupon effects are similar, if not stronger, than those of Elton et al. Perraudin and Taylor are also concerned about the frequency with which market prices and credit ratings give rise substantially different classifications of risk within broad rating categories. They find that, although at first glance it might appear that ratings and market-based credit opinions are at great variance, much of the difference disappears if one controls for non-credit factors and allow for dynamic adjustments between ratings and market prices over time. They find that a large portion of bonds which the bond market suggests is “mis-rated”, experience rating changes within the following six months, thereby eliminating the misclassification. This result is intuitive given the deliberative process used by rating agencies to implement rating changes. Perhaps more surprisingly, they also find that a substantial portion of such misclassifications are resolved by changes in bond prices over time. Overall, they conclude that bond prices and credit ratings generally imbed similar views on relative credit risk, and any differences in views that do arise are often temporary.

⁴ The early literature on this topic is reviewed in Cantor et al. (1997).

⁵ In Perraudin and Taylor, the *t*-statistic is marginally significant, in Elton et al. the effect is limited to the first year of issuance.

⁶ However, there are reasons to question the tax-based interpretation of the observed coupon effect. One, the potential tax advantage of low coupon securities is hardly uniform across regional jurisdictions or across classes of investors, and yet the coupon effect appears pervasive. Two, the effect appears driven (in Elton et al.) by very large differences in coupon rates within the same rating category – under 5% versus over 11% for Baa issuers. This suggests that either certain issues were entirely mis-rated at issuance or they were issued during periods of radically different prevailing levels of interest rates.

5. Relating changes in market prices to changes in credit ratings

A large literature has explored the relationship between bond prices, bond spreads, and equity prices on the one hand and changes in credit ratings on the other. Some of the principal findings of this literature are:

- In the months prior to rating events, bond and equity prices decline or rise sharply in “anticipation”. These patterns do not necessarily imply that investors are focused on ratings, per se, or attempt to forecast rating changes. Rather, investors may simply be concerned about the same factors that determine ratings.⁷
- Market price changes, prior to rating events, are generally larger than theoretically implied by the subsequent rating event itself (although studies do not generally draw attention to this finding).
- Negative rating events (announcements of downgrades and reviews for possible downgrade) generally give rise to statistically significant contemporaneous price or spread movements.
- Positive rating events give rise to smaller, less significant, contemporaneous price or spread movements.
- Though not emphasized in the literature, even when rating events do give rise to statistically significant contemporaneous price changes, the changes are often economically insignificant – much smaller than would be suggested by the magnitude of the rating change itself.

Two papers in this Issue – [Hull et al. \(2004\)](#) and [Norden and Weber \(2004\)](#) – re-examine the relationship between rating changes and market prices in the context of the CDS market. Unlike bond and equity prices which have both credit and non-credit risk determinants, CDS prices are in fact the market price of the very risk that ratings are intending to measure, the risk of default and loss given default. CDS prices, nevertheless, are not pure indicators of the market’s default and loss expectations since prices may also reflect time-varying risk premia and temporary supply and demand imbalances.

Hull et al. examine the effect of rating actions on CDS bid and offer prices posted by a CDS broker and focus primarily on negative rating actions because upgrades were infrequent during the time period of the analysis. They analyze all three types of negative rating actions – actual downgrades, negative reviews (Watchlist assignments), and (for the first time by academic researchers) negative outlook assignments. They find that the contemporaneous effect of rating actions on CDS prices

⁷ Rather than trying to measure anticipation using “ratings” implied from market prices, the literature has instead focused on changes in market prices. Efforts to measure anticipation using market-implied ratings require a bit more work, but would be much more informative. Unpublished research at Moody’s indicates that credit spreads anticipate rating changes in levels as well as changes. That is, long before rating changes, credit spreads are typically wider than suggested by the current rating. In fact, spreads are often wider than those suggested by ratings after they have been changed. Price changes in the months prior to a rating change are, therefore, probably not the best way to measure anticipation.

is significant for rating reviews, but not for rating changes or outlook changes. They do find, however, that CDS prices rise sharply – and hence predict – all three types of rating changes well in advance.⁸

Norden and Weber address many of the same issues as Hull et al., but they utilize a richer dataset. They examine both CDS and equity prices. They have data on rating changes and rating reviews from the three largest international rating agencies, with a greater number of rating events and a more European mix of issuers than the data set used by Hull et al.

First, they find that both the equity and CDS markets anticipate rating downgrades, as well as reviews for downgrade, by all three agencies. Second, a combined analysis of different rating events within and across agencies reveals that reviews for downgrade by Moody's and Standard & Poor's exhibit the largest impacts on both markets. Third, the magnitude of abnormal performance in both markets is influenced by the level of the previous rating, by previous rating events, and, only in the CDS market, by the pre-event average rating level of all agencies.

6. Relating sovereign risk and sovereign ratings

Sy (2004) revisits the question of whether sovereign ratings predict financial crises. Previous literature (Reinhart, 2002) has focused on whether or not credit ratings are good predictors of currency crises. In line with such studies, Sy finds that ratings are generally weak predictors of currency crises; rather, rating changes more often follow rather than lead currency crises. However, Sy like many previous observers note that ratings are intended to predict sovereign debt defaults, not currency crises. And, though the two may be correlated, many sovereign bond defaults in the last decade have not been related to currency crises and many countries have continued to service their debts despite experiencing currency crises.

In fact, Sy demonstrates that the likelihood of a currency crisis and the implied probability of sovereign default have not been closely linked in emerging markets since 1994. When debt crises are defined as sovereign distress – that is, when spreads are higher than 1000 basis points or 10% points – Sy finds that access to international capital markets is reduced by half. In addition, although sovereign distress events last for about five consecutive months, they can persist for up to nine quarters. Finally, lagged ratings and ratings changes, including negative outlooks and credit watches, are useful in anticipating sovereign distress.

7. Concluding remarks

Given the importance of ratings and default statistics for parameterizing portfolio risk models and pricing models for credit-related instruments, most academic and

⁸ Hull et al. also examine the relationship between credit default spreads and bond yields and reach conclusions on the benchmark risk-free rate used by participants in the credit derivatives market.

rating agency research has a strongly empirical focus. The papers in this Issue explore these empirical topics as well, but they also shed light on a variety of interesting theoretical questions and leave some others to be addressed by future research.

- How do rating system management practices make it difficult to quantify the influence of credit ratings on security prices?
- Does the fact that credit ratings are more stable and often appear to lag security prices diminish or enhance their usefulness?
- What is the correct way to measure the performance of a rating system?
- What features of credit rating systems lead to their widespread adoption as governance tools to mitigate principal–agent problems?
- What is the natural industry structure of the ratings industry? Does the use of ratings in regulation entrench existing players or subsidize marginal players?
- What is the optimal business model for the rating industry? How should agencies be paid and how can conflicts of interests be managed?

References

- Altman, E., Kao, D., 1992. The implications of corporate bond rating drift. *Financial Analysts Journal*, 64–75.
- Altman, E., Rijken, H., 2004. How rating agencies achieve rating stability. In: Cantor, R. (Ed.), *Recent Research on Credit Ratings* (special issue). *Journal of Banking and Finance* 28 (11), this issue.
- Amato, J., Furfine, C., 2004. Are credit ratings procyclical? In: Cantor, R. (Ed.), *Recent Research on Credit Ratings* (special issue). *Journal of Banking and Finance* 28 (11), this issue.
- Blume, M., Lim, F., MacKinlay, A., 1998. The declining credit quality of US corporate debt: Myth or reality? *Journal of Finance* 53, 1389–1413.
- Cantor, R., 2001. Moody's Investors Service's 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, R., Mann, C., 2003a. Measuring the performance of corporate bond ratings. *Moody's Special Comment* (April).
- Cantor, R., Mann, C., 2003b. Are corporate bond ratings procyclical. *Moody's Special Comment* (October).
- Cantor, R., Packer, F., 1995. The credit rating industry. *Journal of Fixed Income*.
- Cantor, R., Packer, F., Cole, K., 1997. Split ratings and the pricing of credit risk. *Journal of Fixed Income* (December).
- Carty, L., Fons, J., 1993. Measuring changes in corporate credit quality. *Moody's Special Report*, Moody's Investors Service, New York.
- Christensen, J., Hansen, E., Lando, D., 2004. Confidence sets for continuous-time rating transition probabilities. In: Cantor, R. (Ed.), *Recent Research on Credit Ratings* (special issue). *Journal of Banking and Finance* 28 (11), this issue.
- Elton, E., Martin, J., Gruber, J., Agrawal, D., Mann, C., 2004. Factors affecting the valuation of corporate bonds. In: Cantor, R. (Ed.), *Recent Research on Credit Ratings* (special issue). *Journal of Banking and Finance* 28 (11), this issue.
- Fons, J., 2002. Understanding Moody's corporate bond ratings and rating process. *Moody's Special Comment* (May).

- Hamilton, D., Cantor, R., 2004. Rating transition and default rates conditional on outlooks, Watchlists and rating history. Moody's Special Comment (February); Forthcoming in the Journal of Fixed Income.
- Hull, J., Predescu, M., White, A., 2004. The relationship between credit default swap spreads, bond yields, and credit rating announcements. In: Cantor, R. (Ed.), Recent Research on Credit Ratings (special issue). Journal of Banking and Finance 28 (11), this issue.
- Jafry, Y., Schuermann, T., 2004. Measurement, estimation, and comparison of credit migration matrices. In: Cantor, R. (Ed.), Recent Research on Credit Ratings (special issue). Journal of Banking and Finance 28 (11), this issue.
- Lando, D., Skødeberg, T., 2002. Analyzing rating transitions and rating drift with continuous observations. Journal of Banking and Finance 26, 423–444.
- Löffler, G., 2004. Ratings versus market-based measures of default risk in portfolio governance. In: Cantor, R. (Ed.), Recent Research on Credit Ratings (special issue). Journal of Banking and Finance 28 (11), this issue.
- Norden, L., Weber, M., 2004. Informational efficiency of credit default swap and stock markets: The impact of credit rating announcements. In: Cantor, R. (Ed.), Recent Research on Credit Ratings (special issue). Journal of Banking and Finance 28 (11), this issue.
- Perraudin, W., Taylor, A., 2004. On the consistency of ratings and bond market yields. In: Cantor, R. (Ed.), Recent Research on Credit Ratings (special issue). Journal of Banking and Finance 28 (11), this issue.
- Reinhart, C., 2002. Credit ratings, default, and financial crises: Evidence from emerging Markets. World Bank Economic Review 16 (2), 151–170.
- Sy, A., 2004. Rating the rating agencies: Anticipating currency crises or debt crises? In: Cantor, R. (Ed.), Recent Research on Credit Ratings (special issue). Journal of Banking and Finance 28 (11), this issue.
- Zhou, C., 2001. Credit rating and corporate defaults. Journal of Fixed Income 3 (11), 30–40.

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