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Back-Testing Moody's LGD Methodology

Summary

The introduction of Moody's LGD assessments has increased the transparency, consistency, and rigor underlying Moody's credit loss-based speculative-grade loan and bond ratings. In the end, however, LGD assessments are forecasts of losses that investors will incur at the resolution of a default event. As such, a major consideration as to the usefulness of LGD assessments is their accuracy relative to actual losses that creditors incur. While a rigorous examination of the accuracy of Moody's LGD assessments will require the accumulation of additional data on real-time LGD assessments, in this *Special Comment* we use US data from *Moody's Ultimate Recovery Database* to back-test the accuracy of Moody's LGD assessments had they been assigned to historical defaulted loans and bonds.

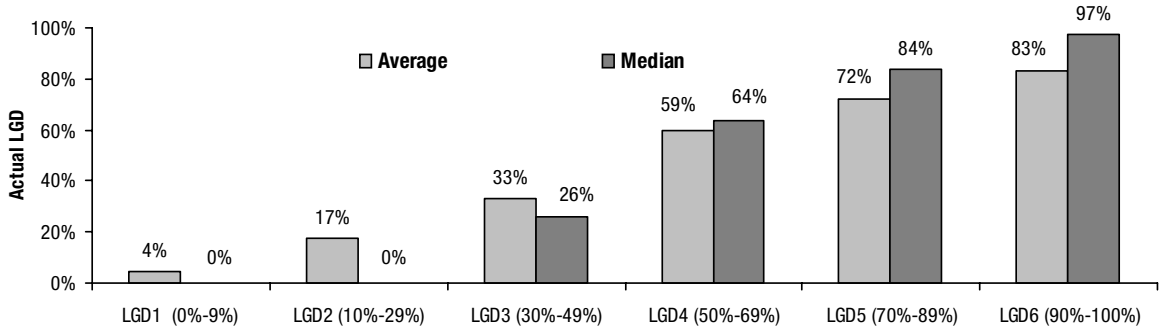
Our main findings are:

- The realized ultimate LGD rates on approximately 3500 US bonds and loans that defaulted between 1987 and 2006 were on average consistent with the LGD assessments that would have been assigned based on Moody's LGD assessment methodology. (See Exhibit 1.)
- The LGD point estimates implied by the LGD methodology would have been substantially more accurate predictors of realized ultimate LGD rates, compared to the use of historical average LGD rates by debt type as predictors of instrument-level LGD rates.
- The LGD point estimates also would have had substantial predictive power in explaining prices of loans and bonds measured shortly after default.

We also characterize a number of other aspects of the relationship between Moody's LGD assessments and realized LGD rates. As discussed in an Appendix, the historical data lend support to Moody's approach to estimating the enterprise value of a company at default resolution, a key determinant of the expected LGD rates on individual debt obligations. Variations in the ratio of enterprise value at default to total debt appear largely uncorrelated with traditional credit metrics that help predict default, such as leverage and coverage. We recognize, however, that forecasts of instrument-level LGD rates could be made more accurate if it were possible to improve our estimates of enterprise value at default resolution for individual firms. Moody's continues to conduct additional research on this topic.

Exhibit 1

Realized LGD Rates Fall Within LGD Assessment Ranges



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Overview

Moody's loss-given-default (LGD) assessments provide market participants with rigorous estimates of expected LGD rates on loans and bonds of speculative-grade non-financial corporate issuers. Since the introduction of these assessments in North America in September 2006, the response from market participants has largely been positive with many participants citing the increased transparency, consistency, and rigor that now underlie Moody's LGD estimates and, as a result, its credit-loss-based issue ratings which incorporate both expectations of LGD and probability of default.[1,2]

While Moody's LGD assessments do offer the important benefits cited above, LGD assessments are in the end forecasts of the recoveries that investors will receive at the resolution of a default event. As such, a major consideration as to the usefulness of these assessments is their accuracy relative to actual recoveries that creditors receive. While a rigorous examination of the predictive content of Moody's LGD assessments will require the accumulation of additional data on real-time LGD assessments, in this *Special Comment* we use US data from *Moody's Ultimate Recovery Database (URD)* to back-test the accuracy of Moody's LGD assessments had they been assigned to the loans and bonds included in *URD*. While there are several important caveats with respect to this back-testing analysis, the results indicate that Moody's back-tested LGD assessments provide more accurate LGD forecasts than do other traditional LGD forecasting approaches that typically rely on historical average LGD rates by debt type. In addition to helping explain historical ultimate LGD rates, Moody's back-tested LGD assessments also appear to provide useful information about the expected trading prices of debts at the time of their defaults.

Additionally, as discussed in an Appendix, the historical data from *URD* lend support to Moody's approach to estimating the enterprise value of a company at default resolution, a key determinant of the expected LGD rates on individual debt obligations. Variations in the ratio of enterprise value at default to total debt appear largely uncorrelated with traditional credit metrics that help predict default, such as leverage and coverage. We recognize, however, that forecasts of instrument-level LGD rates could be made more accurate if it were possible to improve our estimates of enterprise value at default resolution for individual firms. Moody's continues to conduct additional research on this topic.

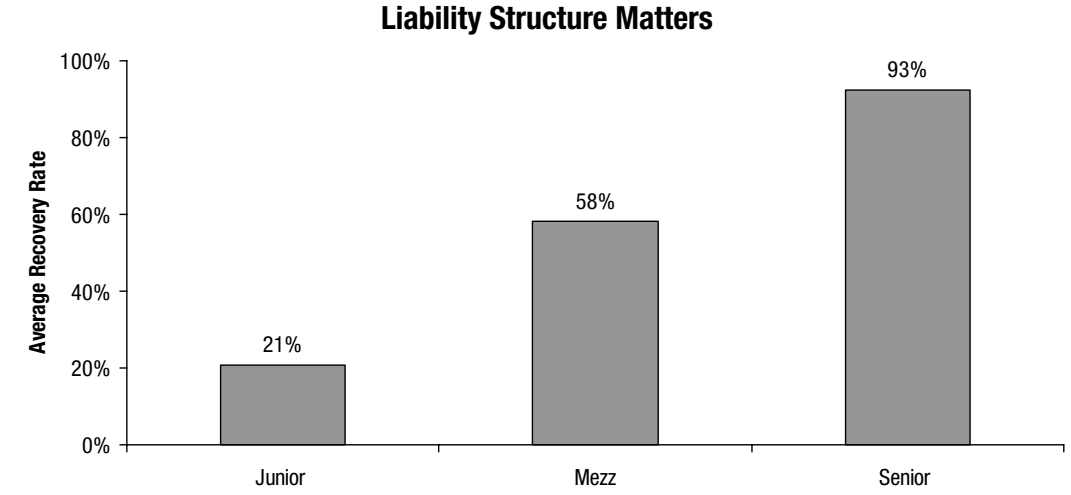
Back-Testing Moody's LGD Methodology

LIABILITY STRUCTURE MATTERS

Expected liability structure at default resolution is, in most cases, the key determinant of Moody's LGD assessments (see Appendix A: "Moody's LGD Methodology"). Specifically, a Moody's LGD assessment for a particular security class of a given issuer is a function of the percentage of total liabilities of the issuer that are higher than it in priority and the percentage of total liabilities that are below it in priority. Consequently, historical validation assessment of Moody's LGD methodology should include an examination of the extent to which liability structure matters in influencing actual LGD rates. In Exhibit 2, we use the *URD* to examine average recovery rates for "junior", "mezzanine", and "senior" debts as defined by their position within an issuer's liability structure.[3] The results clearly indicate that liability structure is an important determinant with junior, mezzanine and senior debts recovering an average of 21 percent, 58 percent, and 93 percent, respectively.

1. *Moody's LGD assessments were subsequently introduced in Europe in March 2007. Prior to the introduction of LGD assessments, Moody's analysts used "notching rules" whereby analysts distributed individual loan and bond ratings around the corporate family rating (CFR) on the basis of perceived differences in expected LGD rates relative to the expected LGD rate for the entire corporate family.*
2. *Under the new speculative-grade rating methodology, expected credit loss-based issue ratings are assigned using idealized LGD and PD tables associated with Moody's alpha-numeric ratings.*
3. *Security classes where more than 70 percent of total liabilities are senior to it are defined as junior, mezzanine debts are defined as those where at least 25 percent of total liabilities are both junior and senior to it, and senior debts are defines as those where at least 70 percent of total liabilities are junior to it.*

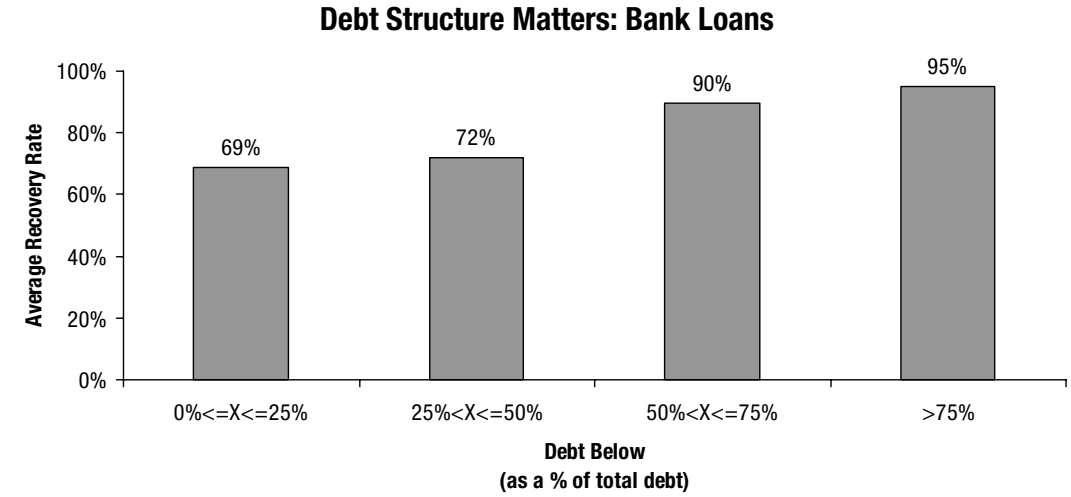
Exhibit 2



Junior: >70% of total debt above, Mezzanine: 25% above and 25% below, Senior: >70% of below

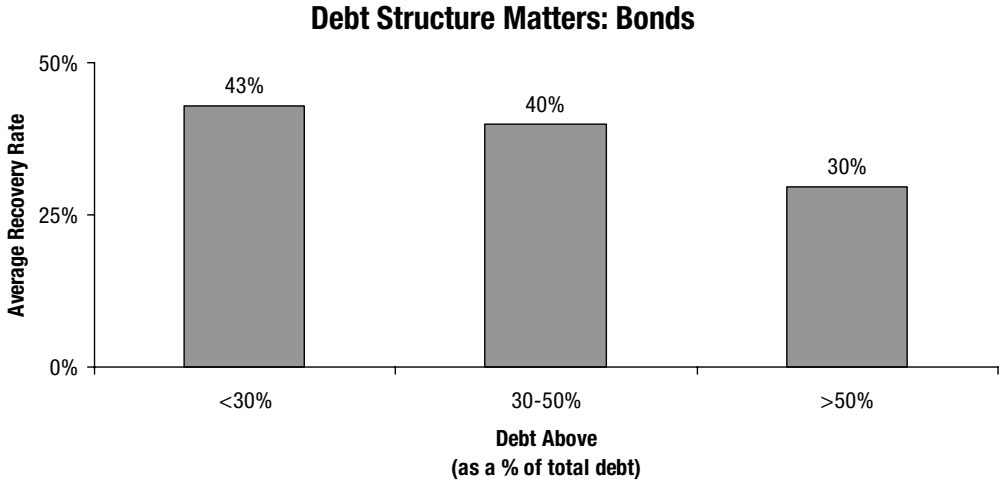
In a similar manner, Exhibits 3 and 4 demonstrate that a debt's position in the liability structure matters across particular debt types as well. In Exhibit 3, as the percentage of total debt junior to the bank loan increases, the average recovery rate increases. Loan recovery rates average 95 percent when junior debt equals at least 75 percent of total liabilities, compared to an average of 69 percent for loans with junior debt less than or equal to 25 percent of total liabilities.

Exhibit 3



For senior unsecured bonds, Exhibit 4 shows that average recovery rates decline as the percentage of total liabilities senior to the bonds increases. Recovery rates average only 30 percent for those bonds with senior debt equal to at least 50 percent of total liabilities, compared to 43 percent for bonds with senior debt equal to less than 30 percent of total liabilities.

Exhibit 4



HISTORICAL MOODY'S LGD ASSESSMENTS

While the data in the *URD* illustrate that liability structure matters in determining security class LGD rates, a more precise evaluation of Moody's LGD methodology is possible by using it to assign LGD assessments to the loans and bonds included in the *URD*. We carry out this analysis by using each corporate family's liability structure at the date of default and assuming that family recovery rates are governed by the beta distribution with mean 50 percent and standard deviation 26 percent, as in the standard application of the methodology. Once we generate LGD point estimates they are compared against the actual LGD rates incurred by creditors.

Several caveats need to be highlighted with respect to this back-testing analysis. First, analysts assigning LGD assessments would not necessarily know the liability structure at default for the issuers they are rating today. Therefore, the use of the liability structure at default could impart an artificial advantage to the assigned LGD assessments.[4] Second, however, the liability structure at default included in the *URD* does not include non-debt liabilities which can be important in assessing the true relative priority position of the loans and bonds within the corporate families' total liability structures. Moody's analysts assigning LGD assessments in real time do have knowledge of these non-debt liabilities and include them in their expected liability structures at default. Third, for family recovery rates, if company-specific situations so dictate, analysts may not choose to use the beta distribution with mean equal to 50 percent and standard deviation of 26 percent. Both the use of the standard beta distribution parameters and the *URD*'s lack of data on non-debt liabilities may lead to an understatement of the accuracy of the LGD assessments constructed for this back-testing analysis.

In Exhibit 1, we show the actual average and median LGD rates for loans and bonds assigned to each assessment category on the basis of its' back-tested LGD assessments.[5] For example, for all loans and bonds with back-tested LGD1 assessments (point estimates between zero and nine percent), the actual average LGD rate was four percent and the median was zero percent. Examining the other assessment categories, the respective actual average LGD rates all fall within their defined assessment category ranges (LGD1-LGD6) with the exception of LGD6 where the actual average of 83 percent is below its' defined lower cutoff of 90 percent. Overall, these back-testing results indicate that Moody's LGD assessments have significant forecasting power and that actual average LGD rates generally fall within their defined LGD assessment ranges.

We can also use regression analysis to examine the forecasting power of the LGD assessments, as well as compare them to the power of other LGD forecasting models. Regressing the LGD assessment point estimates on the actual LGD rates of the loans and bonds in *URD* yields an adjusted R-square of 47 percent, indicating the LGD assessments explain approximately 47 percent of the variation in actual LGD rates.[6]

In Exhibit 5, we plot the adjusted R-squares for two alternative traditional LGD forecasting models that are based on historical average LGD rates by debt type. The "in-sample" model uses the actual average LGD rates by debt type

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4. Moody's is currently conducting research on the evolution of liabilities as an issuer migrates to distress and default. Note that what is relevant for Moody's LGD methodology are not the levels of liabilities in each security class but the shares of liabilities in each security class relative to total liabilities.

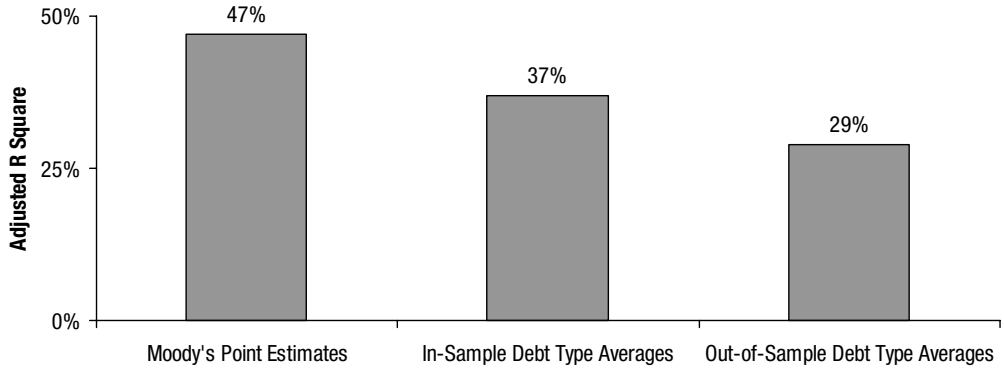
5. Although the URD contains LGD data on more than 3500 loans and bonds, there are often multiple loans and bonds in the same security class of a given issuer. As a result, we only construct back-tested LGD assessments for the 1735 unique loans and bonds in the URD.

6. The OLS estimation yields: Actual recovery rate = .09 + .90 (1 - LGD point estimate)

obtained from Moody's *URD*.[7] This model is considered "in-sample" because it uses LGD data on all of the loans and bonds in the *URD* to calculate average LGD rates by debt type, which includes data that would not be available to forecasters in real time. The adjusted R-square of this model is 37 percent versus 47 percent for Moody's LGD point estimates. Alternatively, an "out-of-sample" model, which uses average LGD rates by debt type based on an earlier Moody's study using an alternative database, yields an adjusted R-square of only 29 percent.[8]

Exhibit 5

Explanatory Power of Alternative LGD Models



IMPORTANCE OF FAMILY RECOVERY RATE

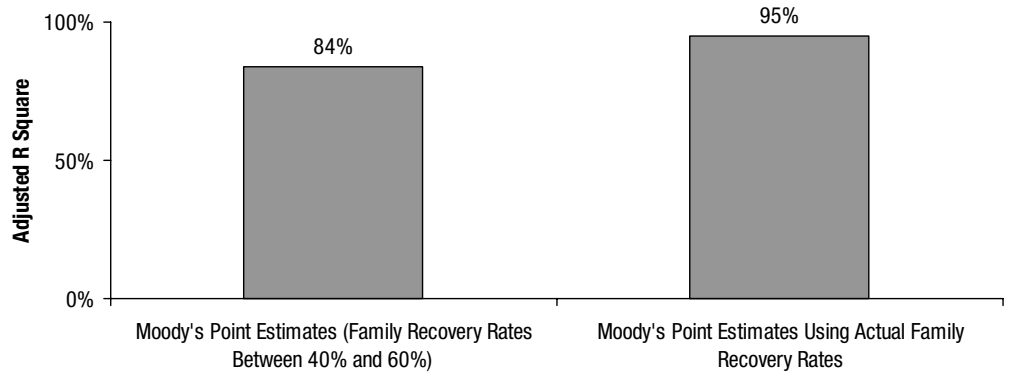
As discussed above, an important caveat to this back-testing analysis is that for all issuers it assumes the use of the historical beta distribution with an average family recovery rate of 50 percent. However, in many cases, analysts may have knowledge of company-specific factors so that they would not necessarily use the historical average of 50 percent, especially as these corporate families migrated to distress and imminent default. In order to assess how important improvements in forecasts of family recovery rates would be for improving the power of Moody's LGD assessments, we first limit our regression sample to those corporate families where the actual family recovery rate is between 40 and 60 percent. In effect, this limits our sample to those families where the family recovery rate was relatively close to the assumed mean of 50 percent implied by the historical beta distribution. For this sample, regressing the LGD point estimates on the actual LGD rates yielded an adjusted R-square of 84 percent, indicating the LGD point estimates explain 84 percent of the variation in actual LGD rates (see Exhibit 6).

We also construct loan and bond LGD point estimates for all of the corporate families in the *URD* assuming the analysts knew exactly what the family recovery rate would be. In this case, the adjusted R-square jumps to 95 percent (see Exhibit 6).[9] Evidently, the key to improving LGD forecasts is improving forecasts of corporate family recovery rates, something not easy to do given the results in Appendix B indicating a lack of correlation between fundamental credit metrics prior to default and family recovery rates.

7. *The model includes as explanatory variables dummy variables for bank loans, senior secured bonds, senior unsecured bonds, senior subordinated bonds, subordinated bonds, and junior subordinated bonds.*
8. *See Moody's Special Comment "Debt Recoveries for Corporate Bankruptcies" June 1999.*
9. *By definition, in this case the only possible errors are due to violations of absolute priority or errors in assigning security class rankings.*

Exhibit 6

Knowing Family LGD Key to Improving Loan and Bond LGD Forecasts



MEAN VERSUS MEDIAN LGD FORECASTS

As shown in Exhibit 7, the recovery rate distributions for loans and bonds are heavily skewed to the right and left, respectively. For example, over 65 percent of the loans in *URD* experience a 100 percent ultimate discounted recovery. Conversely, almost 35 percent of bonds experience 0 percent ultimate discounted recovery. As a result of the asymmetry in these distributions, the means and medians for loan and bond recovery rates do not equal each other. The median loan recovery rate is 100 percent, while the mean loan recovery rate is only 82 percent. And for bond recovery rates, the median recovery is 24 percent, while the mean is 37 percent. Importantly, since Moody's LGD assessments represent forecasts of mean (i.e. expected values) LGD rates and not median rates, the asymmetry in the distributions of loan and bond LGD rates implies that median errors (i.e. assessment minus actual LGD) will be positive for loans and negative for bonds as shown in Exhibit 8. This is not a problem for Moody's LGD assessments but simply reflects that assessments are forecasts of mean LGD rates and not median LGD rates.

Exhibit 7

Loan and Bond Recovery Rate Distributions

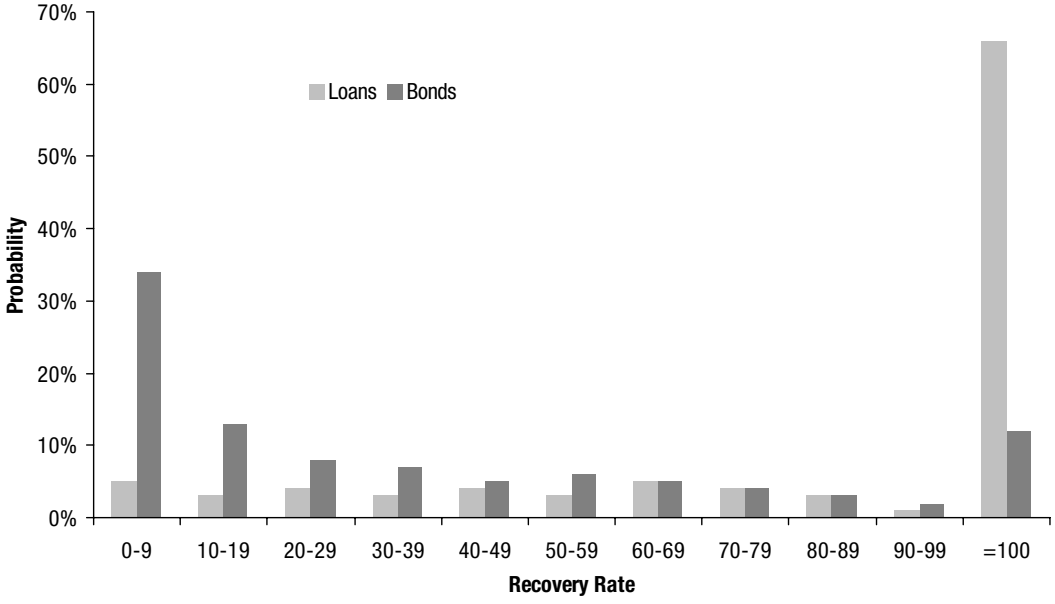
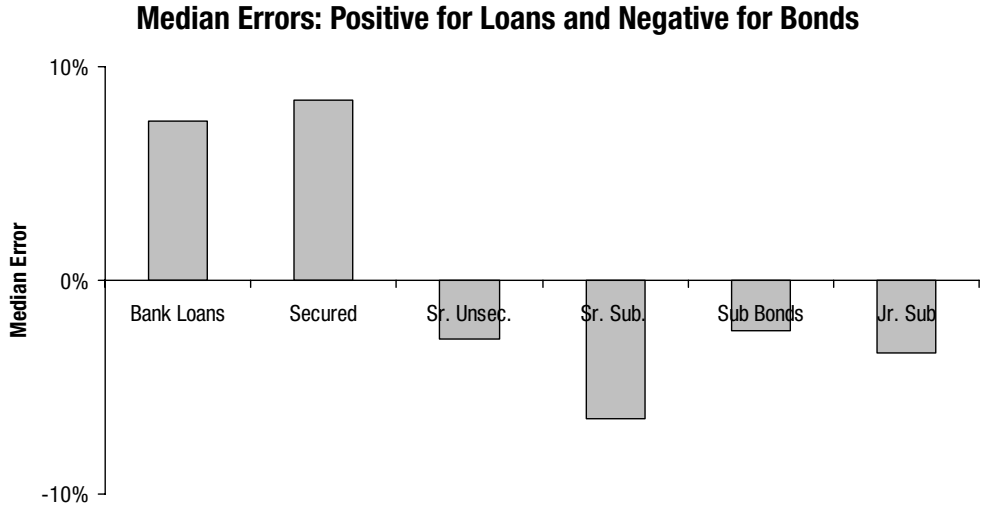
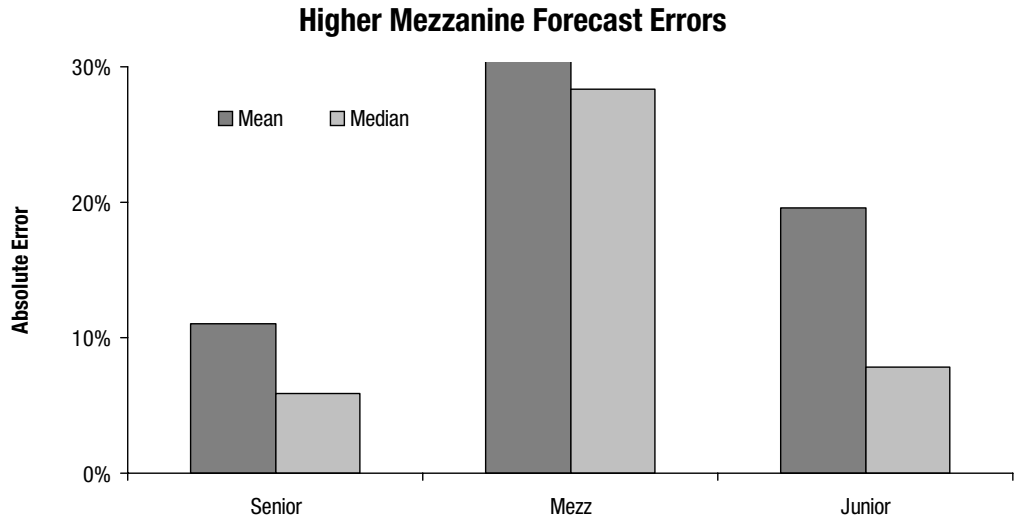


Exhibit 8



Additionally, given the shape of the historical family recovery rate distribution, a theoretical implication of the methodology is that LGD rates on debts positioned in the middle of a family's liability structure, or mezzanine debts, will be more volatile and difficult to forecast than will be LGD rates of very "senior" or "junior" debts.[10] This is the case because LGD rates on mezzanine debts are more sensitive to changes in the outcomes for family recovery rates around their mean of 50 percent, while junior debts typically experience high LGD rates unless the family recovery rate is unusually high, while senior debts typically experience low LGD rates unless the family recovery rate is unusually low.[11] Indeed, for our definitions of "junior," "mezzanine," and "senior" debts as defined in Exhibit 5, the standard deviations of LGD rates as obtained from *URD* are 31 percent, 39 percent, and 20 percent, respectively, indicating higher volatility around mezzanine LGD rates. And the results in Exhibit 9 show that absolute LGD forecasting errors for Moody's back-tested LGD assessments are higher for mezzanine debts than they are for junior or senior debts.

Exhibit 9



Junior: >70% of total debt above, Mezzanine: 25% above and 25% below, Senior: >70% of below

10. More explicitly, the standard errors around Moody's mezzanine LGD assessments are larger than for senior or junior assessments.

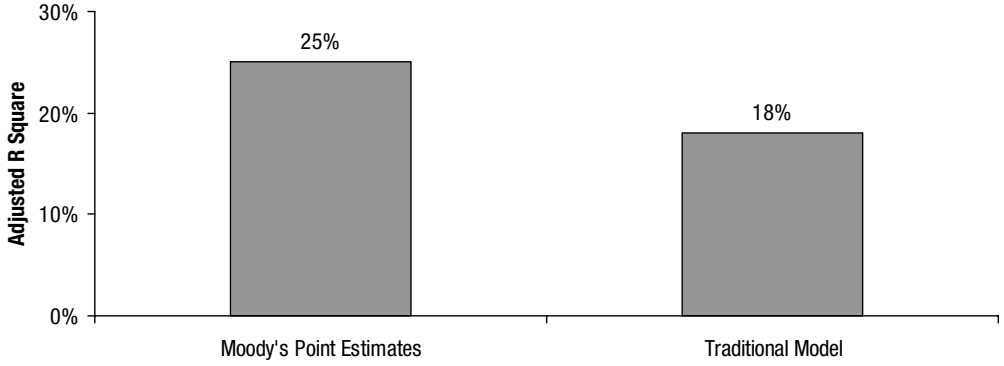
11. An analogy would be the sensitivity in value for options deeply out of the money (i.e. junior and senior debts) versus options in the money (i.e. mezzanine debts).

Moody's LGD Assessments and Post-30 Day Trading Prices

While Moody's LGD assessments represent expectations of ultimate LGD at the resolution to a bankruptcy or default, for many investors the more relevant measure of LGD is the value of defaulted debt at the default date or shortly thereafter. Because Moody's LGD assessments are available to investors usually years in advance of default, they may be useful not only for forecasting ultimate LGD but also for forecasting trading prices at default. In Exhibit 10, we show the adjusted R-squares for two alternative models used to forecast debt trading prices thirty days after default for 809 security classes from *Moody's URD* for which trading prices are available. Of the 809 security classes for which we can obtain debt prices, 700 are bonds and only 109 are loans. As a result, the forecasts are mainly for unsecured bonds and the adjusted R-squares are lower than for the ultimate LGD back-testing analysis that used the entire sample of loans and bonds in the *URD*. The adjusted R-square from the regression of Moody's LGD point estimates, constructed in the same way as in the ultimate LGD back-testing analysis above, on the post-default trading prices is 25 percent. The alternative traditional forecasting model, which regresses the average post-30 day defaulted debt prices by debt type as obtained from Moody's default database, has an adjusted R-square of 18 percent. These results indicate that Moody's back-tested LGD assessments do have predictive content for post-default trading prices and the predictive content is approximately 40 percent higher than obtained from a traditional model using average post-default debt prices by debt type.[12]

Exhibit 10

Forecasting Post-Default Trading Prices



12. *For this same sample of 809 security classes, post-default trading prices explain approximately 50 percent of the variation in these debts' ultimate LGD rates. Alternatively, Moody's LGD point estimates explain 25 percent of the variation in ultimate LGD rates, while in-sample and out-of-sample average ultimate LGD rates by debt type explain 18 percent and 12 percent, respectively.*

Appendix A: Moody's LGD Methodology

Moody's LGD assessment methodology takes as its starting point the two primary factors that determine security-class level LGD rates under most bankruptcy codes:[13]

1. Priority of claim of an individual security class defined as the percentage of total liabilities ahead of it in priority of claim and the percentage of total liabilities below it in priority of claim, and;
2. Enterprise value of the defaulted corporate family at the resolution of the default.[14]

In other words, LGD rates depend on where an individual security class sits in terms of priority of claim and how much total value is available to be distributed to all creditors.

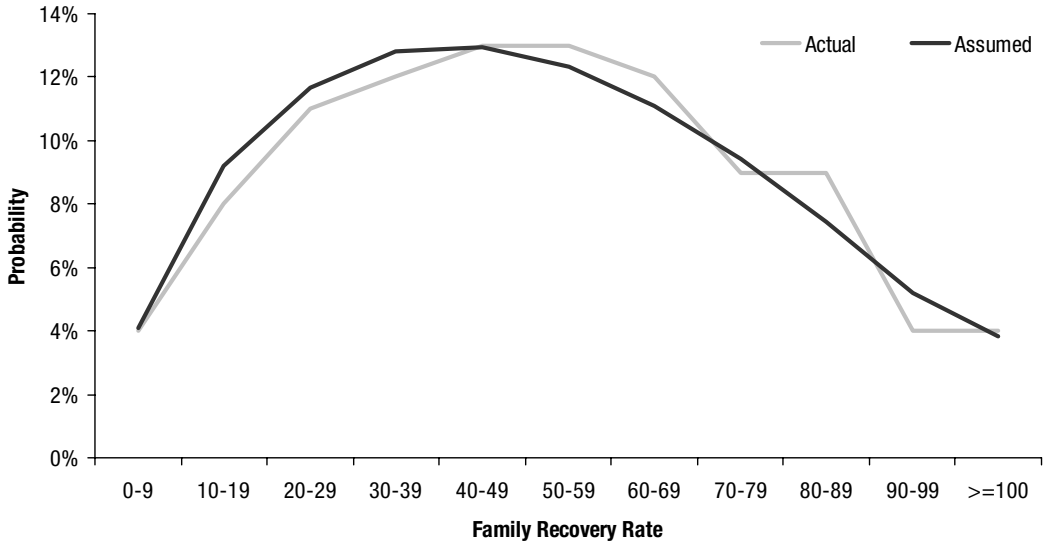
Given the importance of priority of claim in determining LGD rates, Moody's methodology entails analysts estimating a liability structure at default for each corporate family which incorporates a detailed priority-of-claim analysis across all debt and material non-debt liabilities.[15] For estimates of enterprise value at default resolution, Moody's explicitly recognizes the high degree of uncertainty inherent in such estimates for issuers that are not in imminent risk of default.[16] Specifically, for the majority of issuers, analysts assume a probability distribution of potential enterprise values that is based on the historical experience of defaulting issuers included in the *URD*. However, analysts may deviate from the historical probability distribution to incorporate situation-specific factors where there is a sound basis for doing so, especially as an issuer becomes distressed and is in imminent risk of default.

The solid line in Exhibit A1 illustrates the actual historical distribution of ultimate discounted family recovery rates drawn from the data in the *URD*. The family recovery rate is defined as the enterprise value at resolution of the corporate family divided by the total liabilities of the family. The historical mean of the family recovery rates is 52 percent with a standard deviation around that mean of 26 percent.[17] The dashed line in Exhibit A1 is a depiction of a beta probability distribution with mean 50% and standard deviation of 26 percent, which is the probability distribution used to model uncertainty about the family recovery rate in Moody's LGD methodology for the majority of speculative-grade corporate families that it rates.[18] The methodology entails evaluating the estimated liability structure at default and examining the implied expected LGD rate for each debt obligation.[19] For each potential family recovery rate, one can calculate the LGD rate for each obligation under the assumption that creditor payouts are determined by assuming absolute priority of claims. In the final step, an obligation's expected LGD rate is calculated as the probability-weighted average of the LGD rates generated across the different family recovery rates evaluated.[20]

13. *While this methodology was initially developed for US issuers, the framework of the methodology is flexible and can be applied to non-US bankruptcy regimes. Specifically, priority-of-claim and enterprise value in determining security-class LGD rates remains a key consideration in determining ultimate recoveries under most non-US bankruptcy regimes. See Moody's Rating Methodology "Probability of Default Ratings and Loss Given Default Assessments for Non-Financial Speculative-Grade Corporate Obligors in the United States and Canada" (August 2006) for a detailed discussion of the Moody's LGD methodology and the assignment of Moody's speculative-grade issue ratings.*
14. *While not all defaulting issuers file for bankruptcy (e.g. distressed exchanges), these two factors remain key determinants of LGD because both priority of claim and enterprise value influence bargaining outcomes in restructurings.*
15. *See Moody's "User Guide to Prioritizing Claims and Applying the LGD Model" (September 2006) for a detailed discussion of the policies analysts follow in estimating the liability structure at default.*
16. *As discussed below, Moody's research has found that traditional credit metrics in advance of default, such as coverage and leverage, are largely uncorrelated with enterprise value at default resolution.*
17. *The URD, however, lacks information on non-debt liabilities, the implications of which are discussed in more detail below. Recoveries are discounted from the resolution date to the default date using the debt's coupon rate.*
18. *As indicated by the historical data, all-loan corporate families are assumed to have a mean family recovery rate of 65 percent, while all-bond families are assumed to have a 35 percent mean family recovery rate. Additionally, regulated utilities are also assigned a higher mean family recovery rate of 65 percent.*
19. *In practice, all family recovery rates from 0% to 120% are examined, implying the evaluation of 121 different scenarios.*
20. *The LGD point estimates are then used to assign LGD assessments using a LGD1 through LGD6 assessment scale. Moody's publishes both the LGD point estimate and the LGD assessment.*

Exhibit A1

Family Recovery Rate Distributions (Enterprise Value / Total Liabilities)



In summary, Moody's LGD methodology generates consistent and rigorous estimates of expected LGD rates for loans and bonds based largely on the priority-of-claim position of the debts in a corporate family's liability structure.[21] In assessing the total value available to be distributed to all creditors, for families not in imminent risk of default or where analysts do not have a basis for deviating from the historical experience, the methodology represents the historical experience as given by the beta distribution with mean 50 percent and standard deviation 26 percent. For issuers in imminent risk of default, or in cases where analysts do have a basis for deviating from the historical experience, the methodology allows analysts discretion to incorporate situation-specific factors in assessing the total value available to be distributed to creditors and a range of uncertainty appropriate to that expected valuation.

Appendix B: Is Enterprise Value at Default Resolution Predictable?

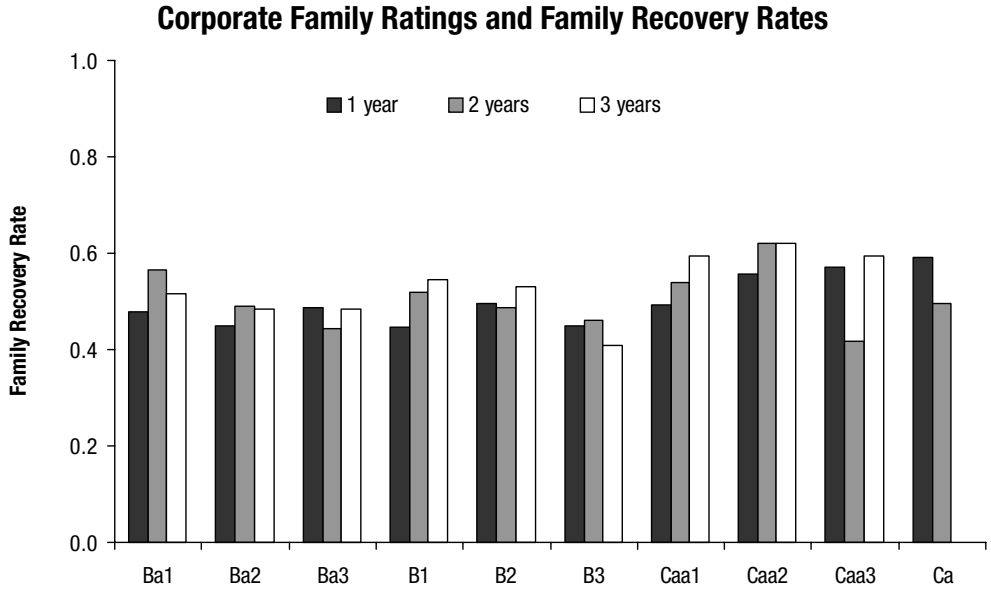
As outlined above, enterprise value at default resolution and, therefore, the corporate family recovery rate are difficult to predict far in advance of default using fundamental credit metrics such as leverage and coverage. Hence, for the majority of issuers not in imminent risk of default, Moody's LGD methodology explicitly recognizes this uncertainty by assuming a probability distribution of family recovery rates based on the historical experience. While we continue to conduct further research on this topic, Moody's own research and other academic research find that company-specific credit metrics in advance of default show little, if any, correlation with family recovery rates.[22] Therefore, there exists little empirical basis for using fundamental credit analysis to predict family recovery rates for companies not in imminent risk of default.

One way to determine whether family recovery rates are likely to be correlated with traditional credit metrics is to examine the correlation (or lack thereof) between realized family recovery rates and defaulting companies' corporate family ratings (CFRs). CFRs are highly correlated with traditional credit metrics and speak powerfully to the probability of default, but they are uncorrelated with ultimate corporate family recovery rates from the *URD*. Exhibit B1 shows corporate family recovery rates by alpha-numeric rating categories one year, two years, and three years before default, indicating no correlation between CFRs and family recovery rates.

21. Using this methodology, Moody's LGD model (available on moodys.com), calculates security-class level LGD rates once users have input an assumed liability structure at default and the parameters governing the family recovery rate distribution.

22. For example, see Carey and Gordy's Federal Reserve Board Working Paper "Measuring Systematic Risk in Recoveries on Defaulted Debt I: Firm Level Ultimate LGDs" (2004).

Exhibit B1



One way to interpret these results is that the historical financial strength of an issuer usually has little or no information content about the value of that company if it happens to lose all of its financial strength and default. Or, in other words, knowing how strong a company once was appears to have little bearing on the value of a company in default.

That historical financial strength usually has no bearing on family recovery rates should not really be surprising if we consider the types of factors that often determine when a company will default, that is, if we consider the factors that determine the "default trigger point" at which creditors will decide not to extend further credit and "allow" a default to occur.[23] Factors that often influence this decision include the degree of liquidity in the markets at the time of the issuer's distress, the risk aversion of the issuer's creditors at the time of distress, inter-creditor dynamics, the strength of covenants, and even unexpected strategic voluntary decisions by issuers themselves to choose to default.[24]These types of factors are often not predictable in advance of default and are often not related to the historical financial strength of the issuer, therefore, implying fundamental credit analysis will often be of little value in predicting family recovery rates.

Exhibit B2 highlights the role that market liquidity can play in determining default trigger points by illustrating the cyclicality embedded in family recovery rates. This cyclicality suggests that accurate forecasts of family recovery rates necessitate a consideration of when in the credit cycle a particular issuer is likely to default. However, for an issuer that is financially healthy today and has only a small probability of unexpectedly defaulting in the next five years, for example, trying to forecast economic and liquidity conditions at the time of default is difficult at best. Given this cyclicality, Moody's takes the view that it is more useful to explicitly recognize the high degree of uncertainty surrounding outcomes for family recovery rates by considering the entire probability distribution of historical outcomes experienced across all points in the economic cycle.

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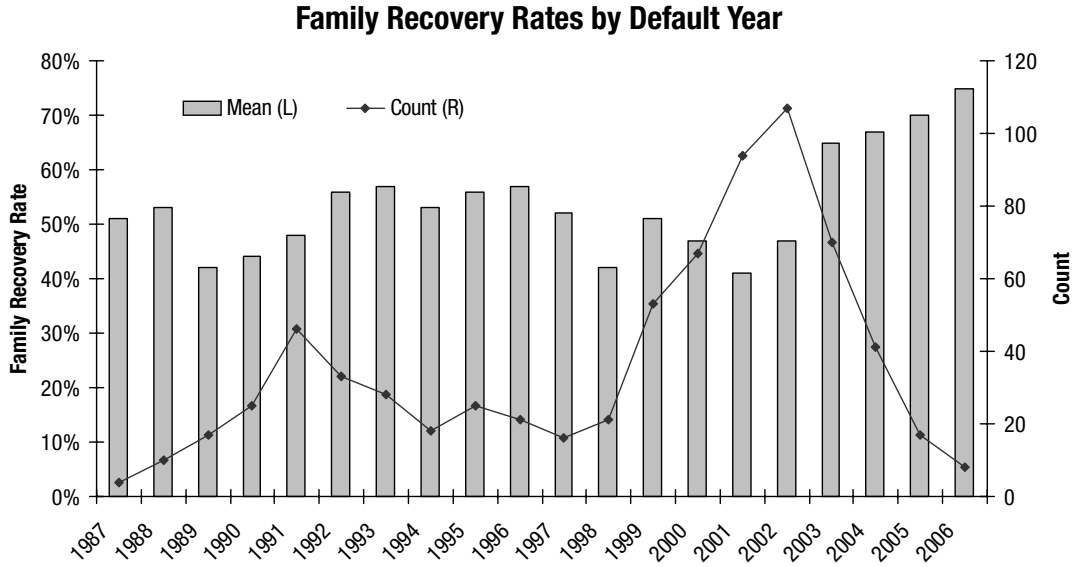
23. The implied scale for the term "default trigger point" is asset values relative to liabilities of the issuer. For example, we say a firm has an "early" default trigger point if its' asset values are high relative to liabilities, while a firm that defaults "late" implies that its' asset values are relatively low.

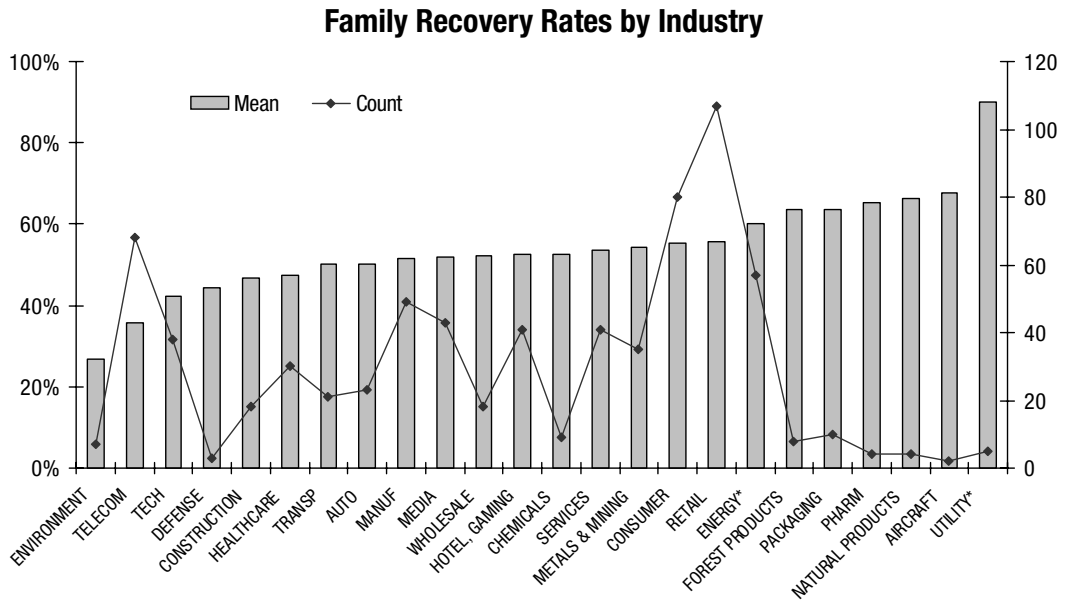
24. Moody's methodology currently incorporates the impact of covenants via the mean of the family recovery rate distribution with all-loan issuers (with meaningful financial covenants) being assigned a higher mean of 65% and all-bond issuers being assigned a lower mean of 35%. We continue to examine alternative avenues through which covenants may impact LGD and will incorporate such effects into the methodology as appropriate.
Moody's is conducting further research on LGD cyclicality, especially as it relates to Basel II downturn LGD requirements. In the near future, we will be publishing suggested guidance on meeting this downturn requirement using Moody's LGD assessments.

Exhibit B2



Moody's LGD model generally assumes that distribution of enterprise value at default resolution, hence family recovery rates, is expected to be equal across industries (with the exception of the regulated utilities industry). Moody's research indicates relatively little historical variation in average family recovery rates across industries, as shown in Exhibit B3. The data indicate the majority of industries' average family recovery rates fall in a relatively tight band around fifty percent, and for those industries where average recovery rates are materially higher or lower than fifty percent the number of defaulted issuers in the industry is very low. One exception is the telecom industry where family recovery rates are historically low as a result of the telecom distress experienced in 2001-2003. Due to these findings, Moody's LGD methodology does not distinguish across industries in setting the parameters of the family recovery rate probability distribution. The one exception is the regulated utilities industry where family recovery rates have historically been high and there is a sound economic basis for believing high family recovery rates are likely in the future.

Exhibit B3



Related Research

Special Comments:

Moody's Ultimate Recovery Database, April 2007 (102664)

Corporate Default and Recovery Rates, 1920-2006, February 2007 (102492)

Loss Given Default Analytics: Users' Guide to Prioritizing Claims and Applying the LGD Model, September 2006 (99071)

Debt Recoveries for Corporate Bankruptcies, June 1999 (46119)

Rating Methodology:

Probability of Default Ratings and Loss Given Default Assessments for Non-Financial Speculative-Grade Corporate Obligors in the United States and Canada, August 2006 (98771)

Federal Reserve Board Working Paper:

Measuring Systematic Risk in Recoveries on Defaulted Debt I: Firm Level Ultimate LGDs, December 2004

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