Rating Methodology

Probability of Default Ratings and Loss Given Default Assessments for Non-Financial Speculative-Grade Corporate Obligors in the United States and Canada

Summary

- Moody's expected loss (EL) based security ratings and corporate family ratings (CFRs) are supplemented with loss given default (LGD) assessments on speculative grade loans, bonds, and preferred stocks, as well as probability of default ratings (PDRs) on speculative grade corporate families for issuers domiciled in the US and Canada. This Special Comment outlines Moody's methodology for applying LGD and PDRs to this issuer group.

- PDRs will rank order speculative grade corporate families by their relative likelihood of default, irrespective of the expected LGD rates on their defaulted instruments. PDRs will also alert investors to situations in which two corporate families with the same CFR (and therefore the same EL rates) have different probabilities of default and different average expected LGD rates across their liabilities.

- LGD assessments will evaluate expected loss severity rates for loans, bonds, and preferred stocks. LGD assessments will be expressed through a six point symbol system that orders expected loss severity from lowest to highest. In addition, the whole percent point estimate for each rated liability, though subject to considerable uncertainty, will be made available by Moody's.

- The methodology used to derive the expected LGD rates underlying the LGD assessments on individual instruments will be a function of the probability distribution of different potential outcomes for the company's firm-wide recovery rates at default, its expected liability structure at default, and the expected security and priority of those claims in bankruptcy. While this Rating Methodology provides a broad overview of Moody's approach to LGD assessments and PDRs, a subsequent Special Comment will provide greater detail on the priority of claim analysis used in the methodology.

- Implementation of the LGD rating methodology is not expected to affect existing CFRs. However, issue ratings may be affected to the extent that implementation of this methodology alters the LGD assumptions embedded in current ratings. As suggested by previous Moody's research that showed realized credit losses on loans have tended to be lower than loss rates on similarly rated bonds, application of a rigorous estimation model for LGD rates will lead to higher ratings on a large number of corporate loans. Bond rating changes are expected to be more balanced and less numerous.

- LGD assessments will be rolled out initially to non-financial corporate speculative-grade issuers in the US and Canada in the third quarter of 2006.

Moody's Investors Service
Global Credit Research

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Introduction

There is broad market interest in disaggregating the components of credit risk. This has been reinforced by the Basel II framework, which conceptualizes credit risk as composed of probability of default, loss given default, exposure at default, and effective maturity. Along with other market participants, Moody's has participated in this trend.[1]

We will extend our efforts to provide information on the components of credit risk by introducing probability-of-default ratings (PDRs) and loss-given-default assessments (LGDs) to be assigned to corporate obligors and their loans, bonds, and preferred stock issues in the US and Canada[2]. Using this methodology, LGD assessments will be selectively applied to other market segments over time, with such modifications as appropriate for differences in bankruptcy law or practice, to be publicly communicated by Moody's.

LGD assessments and PDRs will initially be assigned only to the obligations of speculative-grade issuers because the uncertainty about a firm's expected liability structure and value at default is more difficult (because more remote) to estimate for investment grade firms.[3] For speculative-grade firms, however, meaningful distinctions can often be made because an approximate liability structure at default can be extrapolated from existing (already relatively high default risk, by definition) liability structures. Careful analysis of the terms and conditions underlying bank credit agreements and bond indentures -- including an analysis of the adequacy of any underlying collateral -- enable a more readily-estimable rank ordering of these obligations in the event of bankruptcy proceedings. Moreover, for companies already in default or for companies facing a significant probability of default, fundamental cash flow or liquidation analyses can be useful in estimating the expected value of firm assets available for distribution to creditors in bankruptcy.

Our methodology further extends our existing expected loss approach to rating corporate obligations with varying levels of seniority and security. Our historical notching guidelines for investment grade credits remain unchanged; however, the methodology here provides greater rigor for rating the obligations of speculative grade issuers and thereby supersedes previously issued notching guidelines for such issuers.[4]

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1. *For instance, in 2002 we introduced liquidity ratings, one component of overall corporate credit risk. For banks, we assign financial strength ratings which assess intrinsic financial strength absent support from the government or affiliates. For government-related issuers, we also report stand-alone risk assessments which assess issuers' intrinsic strength. In emerging markets, we publish local currency ratings, which assess a company's risk of default after stripping out the risk that a foreign currency transfer moratorium will be imposed by its government.*
2. *We have chosen to label LGD assessments as "assessments" rather than "ratings" in order to make clear that they are only components of the more inclusive risk aggregations – the corporate family rating at the enterprise level and bond, loan, and preferred stock ratings at the instrument level.*
3. *Expected LGDs for securities issued by investment-grade firms are likely best estimated by the historical averages for bonds of each security class, and thus would be the same across all firms.*
4. *See "Notching for Differences in Priority of Claims and Integration of the Preferred Stock Rating Scale," Moody's Rating Methodology, November 2000, and "Summary Guidance for Notching Secured Bonds, Subordinated Bonds, and Preferred Stocks of Corporate Issuers," Moody's Special Comment, September 2001.*

PDR Definition and Proposed Methodology

Like Moody's long-term security ratings, corporate family ratings (CFRs) are opinions about expected credit loss rates, i.e., the family's likelihood of default times its estimated average loss given default (LGD) over a blend of time horizons. A CFR is assigned to a family as if it had a single class of debt and a consolidated entity structure. Once the CFR has been assigned, ratings are assigned to specific debt and preferred stock obligations in consistent fashion that ensures the liability-weighted average of underlying EL and LGD rates for all a firm's obligations equals that associated with the CFR.

In contrast, probability of default ratings (PDRs) address only the likelihood that any entity within a corporate family will default on one of its debt obligations, without reference to expected LGD.[5] Like the CFR, the PDR is not horizon specific, but rather can be thought of as addressing a whole schedule of investment horizons. In particular, the expected default and loss rates of Aaa issuers are lower on average than those of Aa at all horizons, and Aa loss and default rates are lower than single A at all horizons, etc.

PDRs will use the same rating scale used to rate long-term securities and CFRs, with the exception that a new rating of "D" will be introduced to highlight issuers in default, and a new rating of "LD" will signal a limited default on one or more (but not all) securities within a corporate family. However, the meaning of PDRs is not directly comparable to the meaning of EL-based instrument and corporate family ratings because the former ranks credits with respect to default risk and the latter ranks them with respect to expected credit losses inclusive of both default risk and severity (for LGD).[6]

Since two firms with the same CFR have the same enterprise-wide expected credit loss rates, it is necessarily the case that firms with above average firm-wide expected LGDs have lower default probabilities than other firms with the same CFR. Based on this reasoning, given a CFR and an expected firm-wide LGD rate, PDRs are derived in a straightforward manner via idealized loss and default tables. (See Appendix 1.)

As discussed below, the enterprise-wide expected LGD rates of most non-distressed firms will likely fall into one of three categories – "high", "medium", and "low" – with the majority being in the middle. Firms with "medium" expected LGDs will have PDRs that are the same as their CFRs because Moody's idealized loss and default rates are based on this "medium" LGD rate. Firms with high expected LGDs, however, will have higher PDRs (lower probability of default), usually one notch above the CFR. Firms with low expected LGDs will have lower PDRs, usually one notch below the CFR.

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5. *Moody's definition of default includes three types of credit events:*
   - *A missed or delayed disbursement of interest and/or principal;*
   - *Bankruptcy, administration, legal receivership, or other legal blocks (perhaps by regulators) to the timely payment of interest and/or principal; or*

   A distressed exchange occurs where: (i) the issuer offers bondholders a new security or package of securities that amount to a diminished financial obligation (such as preferred or common stock, or debt with a lower coupon or par amount, lower seniority, or longer maturity); or (ii) the exchange had the apparent purpose of helping the borrower avoid default.

   The definition of a default is intended to capture events that change the relationship between the bondholder and bond issuer from the relationship which was originally contracted, and which subjects the bondholder to an economic loss. Technical defaults (covenant violations, etc.) are not included in Moody's definition of default.

   Corporations usually, but not always, default on all their obligations when they default on one. Moreover, corporate families usually, but not always, default across all their affiliates when any one of their legal entities defaults. Default correlation across the debt instruments of individual firms and across affiliates of individual corporate families is explored in the following Special Comments, "Relative Default Rates On Corporate Loans And Bonds," September 2003 and "Default Correlation among Non-Financial Corporate Affiliates," June 2005.

   The LGD assessment methodology recognizes the possibility that, in a default situation, some "senior" corporate obligations (or some affiliates in their entirety) may avoid default altogether by modeling those situations as defaults with zero loss severity.

6. *Both the PD rating and EL corporate rating scales measure ordinal credit risk, not cardinal credit risk. That is, they do not indicate specific target default or loss rates. However, our best "guess" of the likely expected future default and loss rates associated with a specific rating category is generally the same as that observed historically and summarized in our annual historical corporate bond default and loss studies.*

LGD Assessments Definition

Moody's LGD assessments are opinions about expected loss given default on fixed income obligations expressed as a percent of principal and accrued interest at the resolution of the default.[7] LGD assessments are assigned to individual loan, bond, and preferred stock issues. The firm-wide or enterprise expected LGD rate is a weighted average of the expected LGD rates on its constituent liabilities (excluding preferred stock), where the weights equal each obligation's expected share of the total liabilities at default.

The following scale is used in the assignment of LGD assessments:

LGD Assessment	Loss Range
LGD1	≥0% and < 10%
LGD2	≥10% and < 30%
LGD3	≥30% and < 50%
LGD4	≥50% and < 70%
LGD5	≥70% and < 90%
LGD6	≥90% and ≤100%

Framework for Deriving Expected LGD Assessments

A firm's obligation-specific expected LGD rates are derived from the probability distribution of its firm-wide recovery rates at default resolution and the expected security and priority of claim in bankruptcy of its expected liabilities at default.

The probability distribution of its firm-wide recovery rates at default resolution assigns a specific probability to each conceivable firm-wide recovery rate scenario. That is, it specifies the likelihood the firm's overall recovery rate will be 0% or 1% or 2%, etc., all the way to 100% (representing full recovery for all debts) and beyond, in recognition of the possibility that firm value will be large enough at resolution that preferred and even common shareholders may receive some proceeds.

The expected liability structure at default includes both debt and non-debt obligations and assesses the quality of security for secured obligations with less than an "all assets" pledge. Expected priority of claim is determined by the prevailing bankruptcy regime.

This information is sufficient to calculate each obligation's likely expected LGD rate. For each possible enterprise value at resolution, the pay-outs for each obligation are determined by the priority of claim "waterfall." Each obligation's expected LGD rate is determined by the probability-weighted average of its LGD rates across these scenarios.

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7. *Expected LGD is the difference between value received at default resolution (either through bankruptcy resolution, distressed exchange, or outright cure) and principal outstanding and accrued interest due at resolution. The expected LGD rate is expected LGD divided by the expected amount of principal and interest due at resolution. Equivalently, the expected LGD rate is expected LGD discounted by the coupon rate back to the date the last coupon payment was made.*

Determining the Probability Distribution of Firm-Wide Recovery at Default

Moody's rating committees will determine the probability distribution of firm-wide recovery rates at default for each firm by estimating an average family LGD rate and standard deviation around that average to incorporate uncertainty. In many instances, particularly when firms are not at risk of imminent default, rating committees will likely rely on one of the few base-line probability distributions that the historical data suggest are appropriate for firms in specific industries or firms with particular liability structures. In other cases, particularly when firms are nearer to default or already in default, Moody's rating committees may estimate an expected enterprise value at default using a 'bottom-up," distressed firm analysis and assign a band of uncertainty (a standard deviation) around that assessment. The distressed firm analysis (discussed in Appendix 2) will determine which of the two methods – "going concern" or "liquidation" – produces the higher valuation for each particular firm.

In estimating expected LGD rates on individual instruments, it is important to model the uncertainty surrounding the firm-wide LGD rate. Modeling this uncertainty is critical to obtaining security-level expected LGD rates that are consistent with the market pricing and actual losses typically observed for these instruments. If one ignores uncertainty and assumes that the precise enterprise-wide LGD rate is known, then the application of strict priority of claim analysis inevitably implies exaggerated "bar-bell" results – with senior-most debt claims often experiencing no loss and junior-most claims often experiencing 100% loss. In general, the introduction of uncertainty into the analysis reduces the difference in expected recovery rates between the most senior and the most junior debt classes, while its effect on mezzanine classes will depend on the particular situation being examined.[8]

For most firms, we will assume that potential realizations of the firm-wide recovery rates at default resolution are drawn from a beta distribution for enterprise values that can vary between 0% and 120% of total liabilities.[9] With the (0% and 120%) endpoints specified, the appropriate beta distribution can be inferred with the addition of two additional pieces of information, the mean and the standard deviation.

Moody's database on ultimate recoveries from over 400 US bankruptcies and distressed exchanges suggests that historical variation in firm-wide average recovery rates is well characterized by a 50% mean and a 26% standard deviation, which is consistent with a beta distribution for firm-wide recovery rates bounded between 0% and 120% of liabilities that has a mean of 50.21% and a standard deviation of 26.46%. The findings are consistent with statistics reported elsewhere, calculated from different data sets.[10]

Initially, we expect to vary from the baseline assumptions infrequently. However, we recognize that firms with very little bank debt in their capital structure have historically experienced higher than average LGD rates (about 65%); whereas, firms with only bank debt have experienced lower than average LGD rates (about 35%).[11] In addition, regulated utilities have historically experienced below average enterprise LGD rates (again about 35%), probably because default has sometimes been used by firm managers strategically and in advance of severe financial distress to obtain more supportive regulatory treatment from rate setting authorities. Future research should provide additional basis for distinctions in expected enterprise-wide LGD rates.

For firms in default or facing a significant probability of default, some of the uncertainty about expected liabilities at default and expected enterprise-wide LGD may have been resolved. For such firms, typically those rated B2 or lower, rating committees may use one of a number of common valuation methods to forecast expected enterprise value at default. However, for firms that are not in default nor facing a significant probability of default, we do not plan to pursue a "fundamental" approach to valuing firms in distress.

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8. *Potential violation of absolute priority of claim is another reason why senior debt can trade at prices less than 100 while junior debt trades at positive prices. The empirical evidence on the historical magnitude of such violations, however, suggests that expected violations alone are much too small to explain the relative pricing we observe for senior and junior debt. Since, however, uncertainty about the total amount to be distributed to different claimants has similar effects on relative expected LGD rates as violations of absolute priority of claims, the uncertainty in our model can also proxy for violations of priority of claims.*

9. *We allow for the (generally low probability) outcome that firm value in default will exceed firm liabilities to capture those circumstances in which debt recoveries are so strong the firm's preferred and common stockholders emerge from bankruptcy with some recoveries. We limit potential asset values to 120% of liabilities since that exceeds all cases of which we are aware, although in specific instances this assumption could be relaxed.*

10. *While these parameters are drawn from a newly created database, they are also consistent with;*

   1.) A Moody's study of firm-wide ultimate recovery rates from defaults in the late 1980s and early to mid-1990s, "Debt Recoveries for Corporate Bankruptcies," Moody's Special Comment, June 1999; and

   2.) Carey, Mark and Michael Gordy, "Measuring Systematic Risk in Recoveries on Defaulted Debt: Firm-Level Ultimate LGD," Federal Reserve Board of Governors, unpublished paper, December 2004.

   In our previous "Request for Comment," we originally proposed a standard deviation of 20%, rather than 26%. The lower number was derived from the historical distribution of firm value based on bond and loan prices at default, rather than ultimate recovery values. Our subsequent analysis of ultimate recovery data revealed, as should have been expected in hindsight, that ultimate recoveries are more widely distributed than valuations of liabilities at default. Moody's will continue to study the empirical distribution of corporate family recovery rates, as well as their determinants, and modify our statistical assumptions over time as appropriate.

11. *In a sample of 42 firms with only loans in their debt structure, 13 were resolved with recovery rates of 100% or greater and a mean recovery rate of 64%. In our larger sample of firms with a mix of bonds and/or loans in a liability structure, we do not observe a correlation between the loan share of the mix and firm-wide recovery rates, although Carey and Gordy, op cit., do report finding a positive relationship in their data.*

As discussed above, rating committees may deviate from these baseline assumptions when they have reason to do so. We believe that such deviations are more likely, the closer firms are to default, since uncertainty about their valuation in default and the magnitude of their liabilities in default may be less at that time. However, for many firms, we believe the expected ratio of enterprise value to liabilities can best be modeled as a draw from a random distribution of potential LGD rates based on the historical experience.

A more fundamental approach may often not be practical because today's enterprise value is unlikely to be a strong predictor of enterprise value at default. Firms that currently have strong enterprise values relative to liabilities are clearly far away from default, with low default probabilities, and subsequently high credit ratings. Such firms, however, do not necessarily have low expected loss severity conditional on the event of default because their financial condition must deteriorate dramatically before they will default. The evidence suggests that corporate family ratings well in advance of default, which themselves are strongly correlated with firm value relative to liabilities, are in fact uncorrelated with firm-wide LGD rates at bankruptcy resolution.[12]

To date, Moody's internal analysis and academic research have been unable to identify industry-specific or firm-specific variables that can be used to help predict family recovery rates, other than the prevalence of loans in the liability structure or the firm's status as a regulated utility, as already mentioned.[13] Moody's will, of course, continue to study the empirical determinants of firm-wide recovery rates and modify our assumptions over time as appropriate.

Priority of Claim Analysis Across Expected Liabilities at Default

In most cases, we will assume the company's current liability structure will remain in place at the time of default. Bank lines will be assumed to be drawn in amounts consistent with recent borrowing experience, amounts permitted by their covenant structure, and in consideration of the likely evolution of both borrowings and facility availability as a company approaches default. Non-debt liabilities, such as trade credit, pension obligations and lease rejection claims, will also be estimated. Adjustments to the capital structure may also be made to reflect anticipated future debt retirements and issuance if they are near term and highly certain.[14] Priority ranking and adequacy of collateral will also be assessed.

SECURED DEBT

If secured claims have less than an "all assets" pledge, then it becomes important to determine how much of the secured claims need to be treated as unsecured claims. We consider the debt to be fully collateralized when the stressed collateral value is sufficient to cover the debt.[15] We adopt a similar approach in valuing the collateral package securing second or third lien debt, also treating the unsecured portions of these debts as unsecured claims, ratable with other senior unsecured claims.[16] If secured claims carry an all-assets pledge, then they can simply be treated as the most senior claim. After distinguishing secured from unsecured claims, rating committees will document which unsecured credit claims will benefit in priority from subordinated issues.

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12. As indicated by the table below.

Firm-Wide LGD Rates and CFRs Prior to Default

(Sample consists of 405 bankruptcies, with >2000 bonds & loans)

	Ba	B	Caa	Unrated
At Default	53%	56%	48%	55%
1-Year Prior	48%	48%	53%	56%
2-Years Prior	50%	50%	50%	53%
3-Years Prior	50%	52%	48%	51%
4-Years Prior	48%	51%	52%	52%

13. See Carey and Gordy, 2004, op. cit., and S. Chava, C. Stefanescu, and S. M. Turnbull, "Modeling Expected Loss with Unobservable Heterogeneity," unpublished paper, 2006.

14. Moody's industry groups will periodically comment on specific adjustments and analysis they consider in adjusting the current liability structure. Additionally, Moody's plans to engage in further empirical research to better understand the evolution of liabilities in transition to distress and default.

15. We use company supplied appraisals, or similar reports, to value real property such as plant or land.

16. We examine the terms of the inter-creditor agreement among the first and second/third lien holders. Typically, the security interest of the second lien lenders is subordinated to that of the first lien holders. However the second lien holders do not typically subordinate their debt claim. To the extent that the debt claim is subordinated, then we would view any deficiency claim attributable to the second/third lien debt as junior in priority to any deficiency claim attributable to the first lien debt.

TRADE CREDIT

Changes to the US Bankruptcy Code that went into effect on October 17, 2005 have improved a trade creditor's position in bankruptcy, likely to the detriment of banks and bondholders. In particular, the Bankruptcy Abuse and Consumer Protection Act of 2005 provides that any claim for goods received by a debtor in the ordinary course of business within 20 days before the bankruptcy filing will be entitled to administrative expense priority status for the value of the goods rather than just general unsecured status. Additionally, a seller that has sold goods that the debtor receives within 45 days before bankruptcy may give a written reclamation demand to the debtor within 45 days after the debtor receives the goods or within 20 days after bankruptcy, whichever is later. To reflect these factors, we assume that in most cases trade payables equal to 20 accounts payable days (for material goods but not for services) will be treated as administrative priority claims, and the balance will be considered to be a general senior unsecured claim.

SUBORDINATED DEBT

An additional step in estimating and prioritizing the corporate family's expected liabilities at default is to analyze the depth and breadth of the subordination clauses contained in the indentures covering subordinated debt. This is accomplished through close inspection of the terms of the indenture to specifically identify those obligations to which the subordinated debt is contractually subordinated. While subordinated debt is typically subordinated to "senior debt" as defined in the indenture, it is important to determine whether or not the subordinated debt is subordinated to other obligations including trade claims of the issuer. It is likely that the subordinated note indenture will contain a fairly narrow provision limiting subordination only to other debt, but the language needs to be carefully reviewed. We consider subordinated debt to be on parity with trade debt and other obligations to the extent not otherwise specified in the indenture.

PREFERRED STOCK AND HYBRID SECURITIES

The priority of claim analysis must also accommodate securities which have characteristics of both debt and equity. Hybrid securities will be added to the waterfall in accordance with the type of underlying instrument which forms the security's foundation. That is, a hybrid consisting of a subordinated debt instrument with other features creating some degree of equity characteristics would be treated as standard subordinated debt in the priority of claim without regard to the specific equity characteristics it may contain. Preferred stock – whether or not it contains provisions increasing its equity characteristics – will likewise be treated as straight preferred stock. That is, it will be junior to all classes of debt, and senior only to common equity, and will benefit from any enterprise value only after all senior claims have been met.

OTHER OBLIGATIONS

Our assessment of the corporate family's other expected liabilities at default also includes the estimate of two non-debt obligations, contract rejection claims for leases and underfunded pension obligations under defined benefit programs. For contract rejection claims we use as a proxy the amount of lease commitments for the upcoming year, which captures obligations for both capital leases and operating leases. For underfunded pension obligations, we use the amount derived through use of Moody's standard analytic adjustment for obligations of this type.[17] Both of these obligations are treated as general unsecured claims.

There are many other obligations which a company may face. We generally consider these "other obligations" after they are material and expected to continue to exist in a default scenario. But as many other claims may arise as a company defaults, we use our best judgment to make estimations and normally only look at them when a company approaches default and we are using a fundamental analysis approach. With the exception of certain tax obligations that might be considered as an administrative priority claim, the bulk of these obligations are considered to be general unsecured claims. Some other examples are:

- Litigation / judgments
- Tort claims
- Tax obligations
- Environmental obligations
- Reclamation claims
- Reimbursement obligations under letters of credit that are drawn and not self liquidating

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17. For more detail see "Moody's Approach to Global Standard Adjustments in the Analysis of Financial Statements for Non-Financial Corporations - Part I," February 2006.

UNDERSTANDING THE IMPACT OF LEGAL ORGANIZATION ON THE CLAIM STRUCTURE

The fact that corporate families possess different legal organizational structures introduces an element of complexity in estimating a firm's expected liabilities at default resolution. We do not typically assume a simple consolidation of all companies under the corporate family umbrella, but rather analyze a firm's obligations by legal entity, subject to having sufficient information. Our analysis also takes into consideration the flow of inter-company guarantees into the liability structure and distinguishes whether such guarantees have been issued on a senior versus subordinated, and secured versus unsecured basis. For example, an upstream guarantee issued on a senior secured basis by an operating company to cover the debt of its parent holding company would be viewed as senior secured debt of the operating company.

Instrument Ratings, LGD Assessments and PDRs: An Example

Having identified the probability distribution of firm-wide recovery rates and the expected liability structure at default, we can apply absolute priority of claim analysis to determine expected LGD rates by security class. An expected LGD rate for each instrument is determined by probability weighting across every possible scenario. We allow for 121 scenarios, in which the firm-wide value can take any value between 0% and 120% of total liabilities. The enterprise value for each scenario is distributed across the debt instruments based on the "waterfall" established by the priority of claims, and the resulting instrument-specific and scenario-specific LGDs are recorded. The expected instrument-specific LGDs are then obtained by calculating the probability-weighted average of all of the scenario-specific LGDs. LGD assessments are obtained from the direct mapping of expected LGD rates to Moody's LGD assessment scale as previously outlined. The model that implements this analysis and its underlying parameter assumptions will be made publicly available.

Once instrument-specific expected LGD rates are estimated, instrument-specific EL rates can then be derived from the PDR and, subsequently, EL-based instrument-specific ratings can be derived via mapping to Moody's idealized loss rates which underlie Moody's ratings as outlined in Exhibit 2. As a result, the methodology provides for EL-based instrument ratings, as well as explicit assessments of the LGD and PD components that comprise those ratings.

An Example

The following example illustrates how the proposed LGD assessment and PDR methodology would be applied in practice. Exhibit 1 presents the basic inputs panel of the model. In this example, the rating committee assigned a B1 rating to the corporate family. The corporate family rating (CFR) represents the committee's expectation of total credit losses for the corporate family as a whole. The other key inputs in Exhibit 1 are the expected firm-wide LGD rate and total liabilities at default, which in this example the committee estimates to be 50% and $400 million, respectively.[18] The final input in Exhibit 1 is the standard deviation of the firm-wide LGD rate, which will normally be set at 26%, although the committee may vary this assumption when they believe the uncertainty around the expected enterprise value at default is unusually large or small.

Exhibit 1		
Analyst Inputs		
A	Corporate Family Rating	B1
B	Expected Firm-Wide LGD Rate	50%
C	Expected Total Liabilities at Default	400
D	Standard Deviation in Enterprise LGD Rate	26%
Implied Values		
E	Expected Enterprise Value at Default (=B*C)	200
F	Implied 4-Year Cumulative Default Rate	15.2%

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18. *As discussed in the body of the text, we expect that for issuers rated B2 and above, analysts will usually assume that the expected firm-wide recovery rate is 50%. However, for lower rated issuers, they may use one of a number of common valuation methods to forecast expected enterprise value at default.*

Two important statistics can be inferred from the inputs to Exhibit 1. First, the implied expected enterprise value at default, in this case 200, is calculated by multiplying the expected firm-wide LGD rate by the expected liabilities at default, or in this case 50%*400. Second, by using information that maps expected credit loss rates to different corporate family ratings over different investment horizons, corporate family default rates can be inferred from the corporate family rating and the expected firm-wide LGD rate (50% in this case). For example, using the information in Exhibit 2 which reports the four-year expected loss rates used by Moody's to rate four-year average life structured finance securities, it can be inferred that the four-year default probability for this B1-rated issuer is 15.2% (=7.6%/50%).[19]

Exhibit 2			
4-Year Idealized Loss Rates Used to Model Structure Finance Ratings			
Aaa	0.00%	Ba1	2.31%
Aa1	0.01%	Ba2	3.74%
Aa2	0.03%	Ba3	5.38%
Aa3	0.06%	B1	7.62%
A1	0.10%	B2	9.97%
A2	0.19%	B3	13.22%
A3	0.30%	Caa1	17.86%
Baa1	0.46%	Caa2	24.13%
Baa2	0.66%	Caa3	36.43%
Baa3	1.31%	Ca	50.00%
		C	100.00%

Under the assumptions that the enterprise value at default is described by a beta distribution bounded between 0% and 120% of liabilities, the mean firm-wide LGD rate of 50% and its standard deviation of 26% imply the distribution of potential firm-wide recovery rates shown in Exhibit 3.[20] The distribution indicates that though the expected enterprise LGD rate is 50%, the actual realization at default resolution may vary widely from that value. Many empirical studies show that market measures provide only weak guidance to ultimate recoveries even during the bankruptcy process. It is extremely difficult to predict firm-wide LGD rates well in advance of default.

Exhibit 3

Enterprise Value at Default / Liability Ratio (%)

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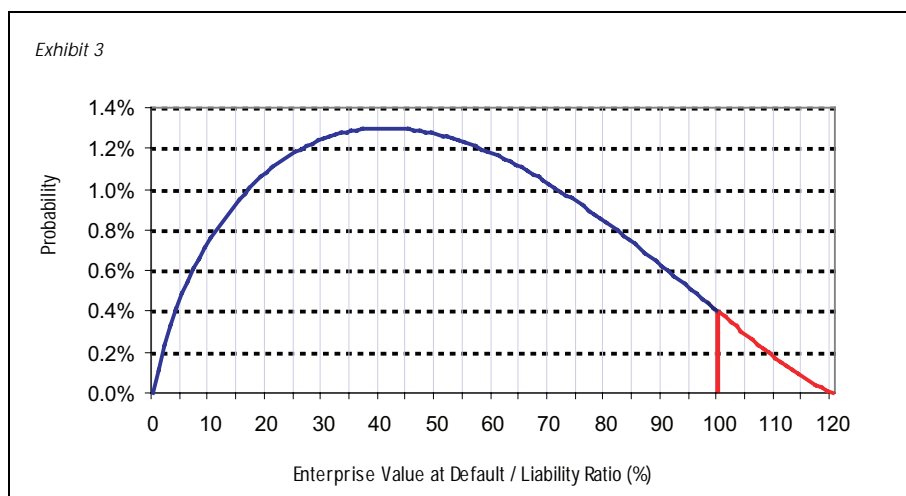
19. An expected loss table is necessary to implement the methodology; however, only relative expected loss rates- not their absolute values - matter to the analysis. For example, the critical feature of this table is that issuers rated Caa1 are expected to experience about 35% more in credit losses than those rated B3, and not that the respective expected loss rates are 17.86% and 13.22%, per se. This particular table represents four-year idealized expected loss rates as shown in "The Binomial Expansion Method Applied to CBO/CLO Analysis," Moody's Structured Finance Rating Methodology, December 1996.

20. A beta distribution for asset values bounded between 0% and 120% of liabilities with a mean of 50.21% and a standard deviation of 26.46% is consistent with a 50% expected firm-wide LGD rate and a 26% standard deviation of firm-wide LGD. That is, if one calculates the expected value and standard deviation of the assets just over the range of this beta distribution from 0% to 100%, one obtains a mean of 50% and a standard deviation of 26%. The range of the distribution of assets in excess of 100% of liabilities is only relevant for calculating expected recoveries on preferred and common stock.

Exhibit 4 presents a liability structure at default which would be developed by the analyst. In this case, we have assumed a very simple structure, with no non-debt liabilities and no second lien loans or preferred stock; however, adding these instruments to the analysis is very straightforward. We have also assumed that the bank loans benefit from an all assets pledge, so it is not necessary to assign a component of the loan facility to the unsecured debt portion of the exhibit. We have also assumed the bank line is fully drawn at default.

Exhibit 4	
Expected Liability Structure at Default	**Amount ($)**
Secured Debt	
1st Lien Sr. Sec. Bank Loan	200
2nd Lien Sr. Sec. Bank Loan	----
Total Secured Debt	200
Trade Credit & Other Liabilities	-
Sr. Unsecured Bonds	150
Subordinated Bonds	50
Other Debt	200
Total Liabilities	400

The outputs of the analysis are LGD rates for each security class. These LGD rates are used to assign LGD assessments using a lookup table containing the LGD scale and mean LGD rates by LGD assessment category, as previously defined. The same output panel of the model, shown in Exhibit 5, also shows credit loss rates by security class (calculated by multiplying the family's probability of default by the security class's LGD or severity rate) and issue ratings (assigned using a lookup table as defined in Exhibit 2).

In our example, the simulated absolute-priority analysis results in expected severity rates of 22%, 73%, and 94% for the bank loan facilities, senior unsecured bonds, and subordinated bonds, respectively. These LGD rates imply loss-given-default assessments of LGD2, LGD5, and LGD6 and issue ratings of Ba2, B2, and B3 for these debt classes, respectively.

Exhibit 5

Estimated Severity Rates, Credit Loss Rates, Recovery Assessments, Issue Ratings*

Expected Liability Structure at Default	Amount ($mill.)	Expected LGD Rates	Expected Recovery Rates	Expected Loss Rates	LGD Assessments	Issue Ratings
Total Secured Debt	200					
1st Lien Sr. Sec. Bank Loan	200	22%	78%	3%	LGD2	Ba2
2nd Lien Sr. Sec. Bank Loan	–	--	--	--	--	--
Total Unsecured Debt	200					
Trade Credit & Other Liabilities	–	--	--	--	--	--
Other Debt	200					
Sr. Unsecured Bonds	150	73%	27%	11%	LGD5	B2
Subordinated Bonds	50	94%	6%	14%	LGD6	B3
Total Liabilities	400	50%	50%	8%	--	B1*

corporate family rating = B1

Additional Considerations

Consistent and Transparent LGD Assessments

The proposed methodology provides a rigorous and consistent way to infer differences in expected LGD rates across debt instruments from differences in capital structure, with further adjustments for those firms that have higher or lower expected firm-wide LGD rates than the norm. The LGD assessment scale will also provide a channel for Moody's analysts to communicate more directly their perspective on enterprise firm value when an issuer is in default or default is imminent.

Impact on Existing Ratings

We do not expect changes in Moody's corporate family ratings to result from this LGD assessment methodology. The greater rigor around the estimation of expected LGD will, however, facilitate a more rigorous application of the expected loss concept in the assignment of our long-term credit ratings on specific loan, bond and preferred stock securities. Issue ratings will therefore likely be affected to the extent that implementation of this methodology alters the LGD assumptions embedded in current ratings.

As suggested by previous Moody's research that showed realized credit losses on loans have tended to be lower than loss rates on similarly rated bonds, application of a rigorous estimation model for LGD rates may lead to higher ratings on a large number of corporate loans. Bond rating changes are expected to be less numerous and more balanced, with both upgrades and downgrades. In general, we believe this methodology will produce LGD estimates and security level ratings that are more closely in line with market views and market pricing on these instruments.

Maximum Gaps between CFR and Instrument Ratings

Because of the logic of the absolute priority waterfall, a strict application of the model could suggest a very high instrument rating on a senior-most obligation if the size of that obligation were very small relative to the firm's overall capital structure. We believe, however, that extremely low expected LGD rates are unrealistic because of potential violations of absolute priority of claim and uncertainty about how the courts will treat accrued interest during the bankruptcy period. In addition, though we use the existing capital structure as a starting point for the analysis, we cannot be sure that the relative size of the different security classes (and therefore their expected LGDs) will not change prior to default. This and other potential sources of "model risk" are incorporated into the framework by adopting a guideline limiting debt ratings to no more than four rating notches difference from a CFR of Caa2 or lower, and three notches from a CFR of Caa1 or higher. For example, a Ba1-rated issuer would have at best a Baa1 rating on its senior-most rated instrument (the rated instrument with the lowest LGD rate and highest LGD assessment) and an issuer in default would have at best a B3 loan rating.

Appendix 1: Inferring the PDR from the CFR and Expected Firm-Wide LGD Rate

The following steps can be taken to derive the PDR from the CFR and expected firm-wide LGD rate. First, identify the firm's hypothetical expected loss rate from its CFR using the structured finance idealized loss table (below). [21] Second, divide the expected loss rate by the firm-wide expected LGD rate to obtain the firm's hypothetical probability of default. Then, simply look up the associated PDR. The idealized default probabilities equal the idealized expected loss rates divided by 50% (which is roughly the historical average loss severity rate across the liabilities of corporate issuers). For example, if the issuer carries a B1 CFR and its expected family-level LGD is 35%, its four-year idealized loss rate is 7.6% and its four-year idealized default probability is 21.8% (=7.6%/35%), resulting in a B2 PDR. This firm's PDR is lower than its CFR because its expected LGD rate is considerably lower than the empirical mean for most firms (and in particular those firms that are also rated B1 on a CFR basis) – and therefore its expected default rate must be higher – than that of the typical issuer with the same CFR.

Idealized Loss Rates and Default Rates Used in Rating Structure Finance Securities

Corporate Family Rating	Four-Year Idealized Expected Loss Rate	Probability of Default Rating	Four-Year Idealized Default Probability (Assumes 50% Average Expected LGD)
Aaa	0.0010%	Aaa	0.0020%
Aa1	0.0116%	Aa1	0.0232%
Aa2	0.0259%	Aa2	0.0518%
Aa3	0.0556%	Aa3	0.1112%
A1	0.1040%	A1	0.2080%
A2	0.1898%	A2	0.3796%
A3	0.2970%	A3	0.5940%
Baa1	0.4565%	Baa1	0.9130%
Baa2	0.6600%	Baa2	1.3200%
Baa3	1.3090%	Baa3	2.6180%
Ba1	2.3100%	Ba1	4.6200%
Ba2	3.7400%	Ba2	7.4800%
Ba3	5.3845%	Ba3	10.7690%
B1	7.6175%	B1	15.2350%
B2	9.9715%	B2	19.9430%
B3	13.2220%	B3	26.4440%
Caa1	17.8634%	Caa1	35.7268%
Caa2	24.1340%	Caa2	48.2680%
Caa3	36.4331%	Caa3	72.8662%
Ca	50.0000%	Ca	100.0000%
C	80.0000%	C	100.0000%

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21. *It should be noted that we present cardinal expected loss and default probability tables to implement the methodology; however, only the relative default probabilities and relative expected loss rates - not their absolute values - matter to the analysis. In particular, the critical feature of the table above is that issuers rated A1 are assumed to default at nearly twice the rate of those rated Aa3, and not that the respective expected default rates are 0.2% and 0.1%, per se. This particular table represents four-year idealized expected loss rates as shown in "The Binomial Expansion Method Applied to CBO/CLO Analysis," Moody's Structured Finance Rating Methodology, December 1996.*

Appendix 2: Estimating Expected Enterprise Value for Firms in Default or Facing Imminent Default

The starting point for estimating enterprise value for issuers in default or facing a significant probability of default (generally with CFRs of B2 and below, with negative or stable outlooks) is to assess the potential of a company to organize as an ongoing concern rather than to liquidate. This requires an explicit expected default scenario and that an enterprise be valued both as a going concern and in liquidation, with the liquidation value typically serving as a valuation floor. For the majority of issuers, the valuation methodology is based on the assumption that the existing enterprise is maintained as a going concern and is reorganized through the bankruptcy process. Though we recognize many corporate defaults are resolved through debt restructurings outside the bankruptcy process, our approach should be relevant for such issuers if outcomes under restructuring are driven, as we suspect, in large part by the expectations of the loss severity that would result from bankruptcy.

Analysts use their judgment and industry knowledge in determining the appropriate valuation technique. Valuation is determined either by discounting expected cash flows, using a multiple of adjusted EBITDA, deriving values based on revenues (more relevant when historical cash flow is not indicative of a firm's potential) or assets (more relevant for resource intensive industries), or inferring a value based on current market prices for similar assets at other companies. For some issuers, the specific valuation methodology may reflect liquidation of either part or whole of the enterprise.

Liquidation valuations are particularly relevant for enterprises that are not viable as going concerns or where a specific creditor class would receive less value in reorganization than under liquidation.[22] Analysts use a liquidation approach if the firm is incapable of generating positive EBITDA on a sustained basis due to technological obsolescence, competitive circumstance, inadequacy of physical plant, or a failed business concept. The approach considers the selling price of the firm's assets under duress, recognizing that portions might be saleable as business units with going-concern valuations.

Analysts use a "distressed" EBITDA multiple when a firm is expected to reorganize and remain a going concern and other techniques are not more appropriate. The distressed EBITDA multiple varies by industry, is based on expected EBITDA growth and required investor returns, and will typically be in the 4 to 6 times range (although analysts have the discretion to go outside of this range) given the inherent risk of investing in distressed situations and low growth rates of companies in distress. The distressed multiple also incorporates certain costs associated with the reorganization or bankruptcy.

For valuations using a distressed EBITDA multiple we first derive core EBITDA by eliminating one time expenses and unusual charges, severance, closing costs, restructuring reserves, losses of businesses to be written off, and uneconomic leases that can be rejected in bankruptcy. We then consider possible enhancements to cash flow through remedial efforts that the company may undertake in the foreseeable future. This might incorporate the benefits of plant closings, contract renegotiation or other value-enhancing steps that have been identified and which have reasonable prospects of being implemented.

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22. *Usually two valuations are prepared as part of the bankruptcy plan confirmation process. The liquidation analysis helps to satisfy the "Best interests of creditor test" which is one of twelve tests necessary for confirmation of a plan of reorganization. The plan proponent must establish that the dissenting creditor's proposed recovery under the plan must be at least as great as if the debtor had been liquidated. The standard of reference will typically be a conservative "fire-sale" liquidation analysis.*

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Rating Methodology:

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Authors   **Production Associate**

Richard Cantor   *Wing Chan*
Kenneth Emery
Pamela Stumpp