

## Special Comment

# Moody's Global Credit Policy

November 2007

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

### Summary:

- Basel II mandates that banks' Loss Given Default (LGD) parameters reflect economic downturn conditions. Moody's LGD assessments, however, are calibrated to match long-term averages (or "through-the-cycle" measures) of expected LGD. As such, Moody's LGD assessments do not necessarily meet the Basel II downturn requirement.
- In this *Special Comment*, we outline a method for adjusting the LGD assessment of any debt so that it should meet the Basel II downturn requirement. The adjustment method is relatively simple to implement and requires only knowledge of the debt's position in the firm's liability structure.
- The magnitude of the adjustment for any given debt can vary from zero to eight percentage points, with the precise adjustment depending on the absolute priority position of the obligation in the firm's liability structure; (i.e., the amount of debt above or below the obligation.) The required adjustments are larger for mezzanine debts than for either senior or junior debts.
- Historical LGD rates from Moody's Ultimate Recovery Database (URD) serve as the foundation for the adjustment method and support the view that downturn conditions have a larger impact on the LGD rates of mezzanine debt than they do on the LGD rates of senior or junior debt.
- For banks not adopting internally-based estimates of downturn LGD, the Federal Reserve has proposed a mapping rule that adjusts through-the-cycle LGD rates to meet the downturn requirement. Similar to the Moody's approach, the adjustments vary between zero and eight percentage points. In contrast to Moody's approach, however, the precise magnitude of the adjustment varies inversely with the level of the through-the-cycle LGD rate, implying that senior debts are subject to the largest upward adjustments. The Federal Reserve has not presented their rationale for this proposed mapping rule.

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## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

### Overview

Basel II guidelines for banks' capital-requirements mandate that LGD parameters "reflect economic downturn conditions where necessary to capture the relevant risks."<sup>1</sup> In other words, LGD estimates on banks' credit exposures need to reflect the losses banks would expect to incur if all defaults occur during the downturn part of an economic cycle.

In contrast, Moody's LGD assessments for debts issued by corporate speculative-grade issuers are measures of expected LGD rates that creditors can expect to incur over the course of the entire economic cycle and, therefore, do not necessarily satisfy the Basel downturn requirement. In this *Special Comment*, we outline a method for adjusting Moody's published LGD assessments that should satisfy the Basel downturn requirement.

Under Moody's current LGD methodology, LGD rates for individual security classes are based on two factors: 1) a probability distribution of the issuer's firm-wide LGD rate and 2) the position of the security class in the firm's expected liability structure at default resolution (i.e., the percentage of total debt above it in priority and the percentage of total debt below it in priority).<sup>2</sup> The probability distribution of firm-wide LGD rates is derived from historical LGD rates obtained from firms that defaulted across the entire economic cycle, not just downturn periods.

The adjustment to Moody's LGD assessments to meet the downturn requirement outlined in this *Special Comment* entails constructing "downturn LGD assessments" derived from a probability distribution of firm-wide LGD rates that reflects only firms that defaulted during times of downturn economic conditions. These downturn LGD assessments can then be compared with Moody's LGD assessments to derive the necessary adjustment.

The adjustment method, which is explained in detail below, yields the results in Exhibit 1 showing the upward adjustments to Moody's LGD assessments as a function of the priority-of-claim position of the debt.<sup>3</sup> For example, the LGD assessment of a debt that has twenty-five percent of the firm's total liabilities above it in priority and twenty-five percent below it in priority (i.e. the debt therefore comprises fifty percent of the firm's total liabilities) needs an upward adjustment to the point estimate of the published Moody's LGD assessment of 6.8 percentage points.

As can be seen from the results in Exhibit 1, the upward adjustments are relatively modest in size, ranging from zero to eight percentage points. Additionally, as we show below, the magnitudes of the adjustments are a function only of the debt's priority-of-claim position with adjustments to mezzanine debts larger than those for either junior or senior debts. As a result, in order to adjust a Moody's LGD assessment to reflect downturn conditions, only knowledge of the debt's position in the firm's liability structure is required.<sup>4</sup>

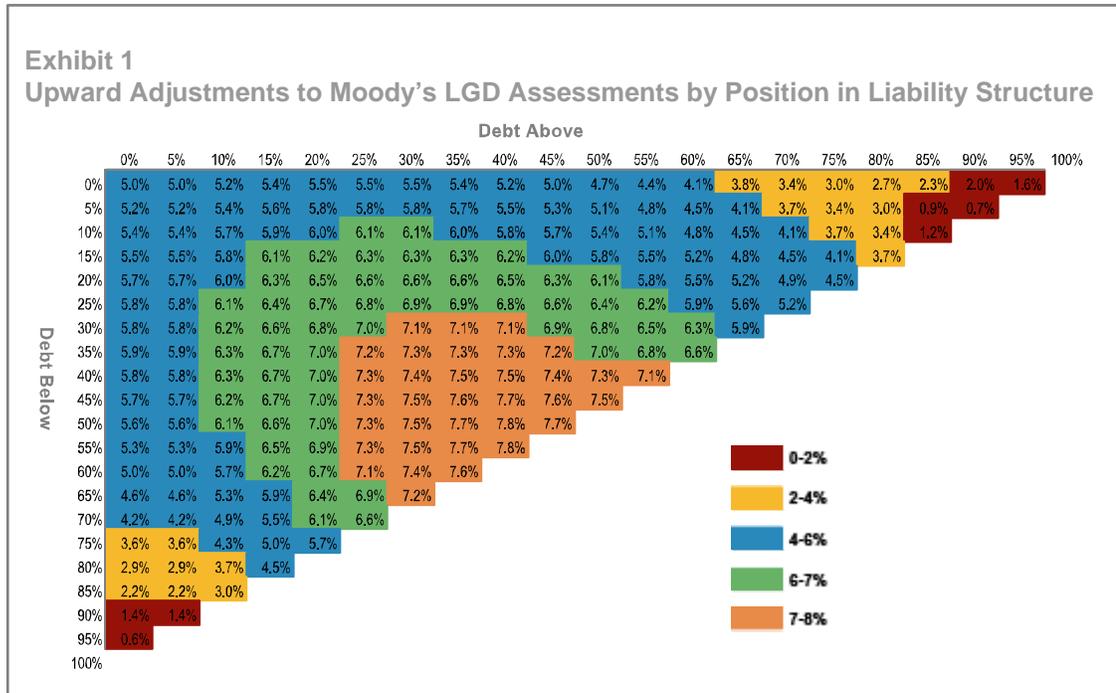
1 See BIS Guidance on Paragraph 468 (2005).

2 See Moody's Rating Methodology "Probability of Default Ratings and Loss Given Default Assessments for Non-Financial Speculative-Grade Corporate Obligors in the US and Canada" (August 2006). See also Moody's Special Comment "Back-Testing Moody's LGD Methodology" (June 2007).

3 The possible priority-of-claim positions in Exhibit 1 are shown in 5% increments. Alternatively, a similar Exhibit could be created using 1% increments.

4 The adjustment method outlined in this Special Comment applies to the majority of firms for which Moody's analysts use the standard approach to specifying the distribution of the firm's firm-wide LGD rate, which is a beta distribution with a mean equal to 50% and standard deviation equal to 26%.

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements



### Basel II Downturn LGD Requirement

As stated above, Basel II requires that estimated LGD parameters reflect economic downturn conditions where necessary to capture the relevant risks. The stated rationale is that LGD rates may be higher during economic downturns than during more normal conditions and, therefore, capital requirement guidelines need to guarantee sufficient capital to cover losses during economic downturns.

Furthermore, in elaborating on this requirement, a Basel LGD working group determined that a principles-based approach to meeting this requirement would be most appropriate given data limitations and a lack of consensus within the banking industry regarding appropriate methods for incorporating downturn conditions in LGD estimates.

The principles are that banks must have a rigorous and well documented process for assessing, if any, economic downturn's impact on LGD rates and that this process must consist of the following integrated components:

1. identification of appropriate downturn conditions for each supervisory asset class,
2. identification of adverse dependencies, if any, between default rates and LGD rates, and
3. incorporation of the adverse dependencies, if identified, to produce LGD parameters.

Additionally, the recovery cash flows should utilize a discount rate that reflects the costs of holding defaulted assets over the workout period, including an appropriate risk premium. In specifically citing the stream of cash flows over the restructuring period, the BIS endorsed the use of ultimate recoveries and not recoveries at the time of default.

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

### Supervisory Mapping Rule Proposal for Downturn LGD

To implement the internal-rating-based Basel approach, banks need to determine downturn LGD rates for a wide variety of asset classes. In recognition that banks may be unable to derive their own downturn LGD estimates, the Board of Governors of the Federal Reserve System proposed the following generic formula for deriving downturn LGD from long-term-average or through-the-cycle LGD estimates:

$$\text{LGD}_{\text{Downturn}} = .08 + .92 \text{ LGD}$$

where LGD equals the long-term average LGD and  $\text{LGD}_{\text{Downturn}}$  equals expected downturn LGD.<sup>5</sup> Under this rule, downturn LGD can be anywhere from zero to eight percentage points higher than the long-term average LGD. For example, a debt with a long-term average LGD of 100% would have a corresponding downturn LGD also equal to 100%, while an instrument with a LGD of 0% would have a corresponding downturn LGD equal to 8%. For a debt with LGD equal to 50%, the corresponding downturn LGD equals 54%.

This proposed supervisory rule implies that debts with relatively low historical LGD rates (e.g., senior secured bank loans) should have relatively large adjustments to their long-term average LGD rates, while debts with high historical LGD rates (e.g., subordinated bonds) should have relatively small adjustments. In other words, the gap between LGD and  $\text{LGD}_{\text{Downturn}}$  varies inversely with LGD. Additionally, it is worth noting that the magnitudes of the proposed adjustments to LGD are relatively modest, with a maximum adjustment of only eight percentage points. The Federal Reserve has offered no justification for this formula except perhaps its intuitive appeal that debts with the lowest historical average LGD rates receive the largest upward downturn LGD adjustments.

### Moody's Approach to Downturn LGD

Under Moody's LGD methodology, LGD rates for individual security classes are based on two factors: 1) a probability distribution of the firm's firm-wide LGD rate<sup>6</sup> and 2) the position of the security class in the firm's expected liability structure at default resolution (i.e., the percentage of total debt above it in priority and the percentage of total debt below it in priority).

For example, consider a firm with total liabilities that consist of a \$100 million secured bank loan, a \$100 million senior unsecured bond and a \$100 million subordinated bond. Moody's LGD methodology entails calculating expected LGD rates for each of these debts by considering what their LGD rates would be under 120 alternative scenarios for the outcome of the firm-wide LGD rate (i.e. enterprise value divided by total liabilities), while assuming absolute priority in each scenario.<sup>7</sup> The probability distribution of firm-wide recovery rates (i.e., 1-LGD) shown in Exhibit 2, and represented by the red line, defines the 120 alternative scenarios. This distribution is a beta distribution with mean equal to 50% and standard deviation equal to 26% and is a proxy for the distribution of historical LGD rates obtained from firms that defaulted across the entire economic cycle using Moody's Ultimate Recovery Database (URD), represented by the blue bars in Exhibit 2.<sup>8</sup> The final expected LGD rate for each debt, which is the point estimate of the published LGD assessment, equals the probability-weighted average of the 120 LGD rates.

5 See Board of Governors "Basel II Capital Accord—Notice of Proposed Rulemaking" (September 2006).

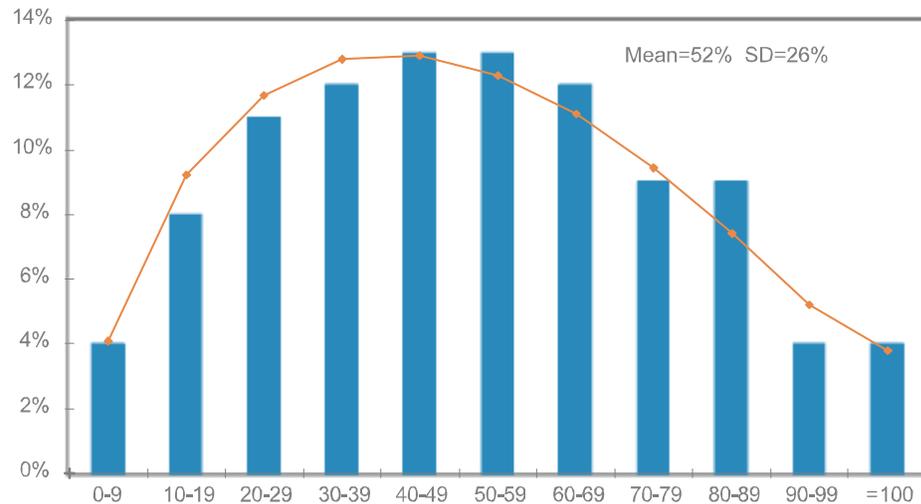
6 A distribution of LGD rates, rather than a point estimate, is used because it allows explicit consideration of the high level of uncertainty around expectations for ultimate firm-wide LGD rates. See Federal Reserve Board Working Paper "The Bank as Grim Reaper: Debt Composition and Recoveries on Defaulted Debt" (March 2007) on the difficulty of forecasting firm-wide LGD rates.

7 Under Moody's methodology, the current liability structure is used as the expected liability structure at default resolution. See Moody's Special Comment "Users' Guide to Prioritizing Claims and Applying the LGD Model," (September 2006).

8 Moody's Ultimate Recovery Database (URD) includes detailed recovery information for approximately 3500 loans and bonds from over 720 firms. See Moody's Special Comment "Moody's Ultimate Recovery Database" (April 2007).

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

**Exhibit 2**  
**Moody's LGD Methodology:**  
**Probability Distribution of Firm-Wide Recovery Rates**



In our example, Exhibit 3 shows the ultimate payoffs and LGD rates to creditors for the individual debts in 10 of the 120 scenarios actually considered. As a result of absolute priority, the LGD rate on the senior unsecured bond remains at 100% except in those scenarios where the firm-wide recovery is high enough (i.e., 33%) that the most senior instrument in the liability structure, the loan, has been paid off in full. Similarly, there is no payoff to the subordinated bond until the firm-wide recovery is high enough (i.e., 66%) so that both the loan and senior unsecured bond have been paid off in full.

### Exhibit 3

#### An Example: Select Firm-Wide LGD Scenarios

Enterprise Value	Firm LGD	Issue LGDs		
		Loan	Unsecured Bond	Subordinated Bond
\$0	0%	100%	100%	100%
\$30	10%	70%	100%	100%
\$60	20%	40%	100%	100%
\$90	30%	10%	100%	100%
\$120	40%	0%	80%	100%
\$150	50%	0%	50%	100%
\$180	60%	0%	20%	100%
\$210	70%	0%	0%	90%
\$240	80%	0%	0%	60%
\$270	90%	0%	0%	30%
\$300	100%	0%	0%	0%
<b>Expected Value</b>		<b>12.30%</b>	<b>51.70%</b>	<b>86.10%</b>
<b>LGD Assessment</b>		<b>LGD2</b>	<b>LGD4</b>	<b>LGD5</b>

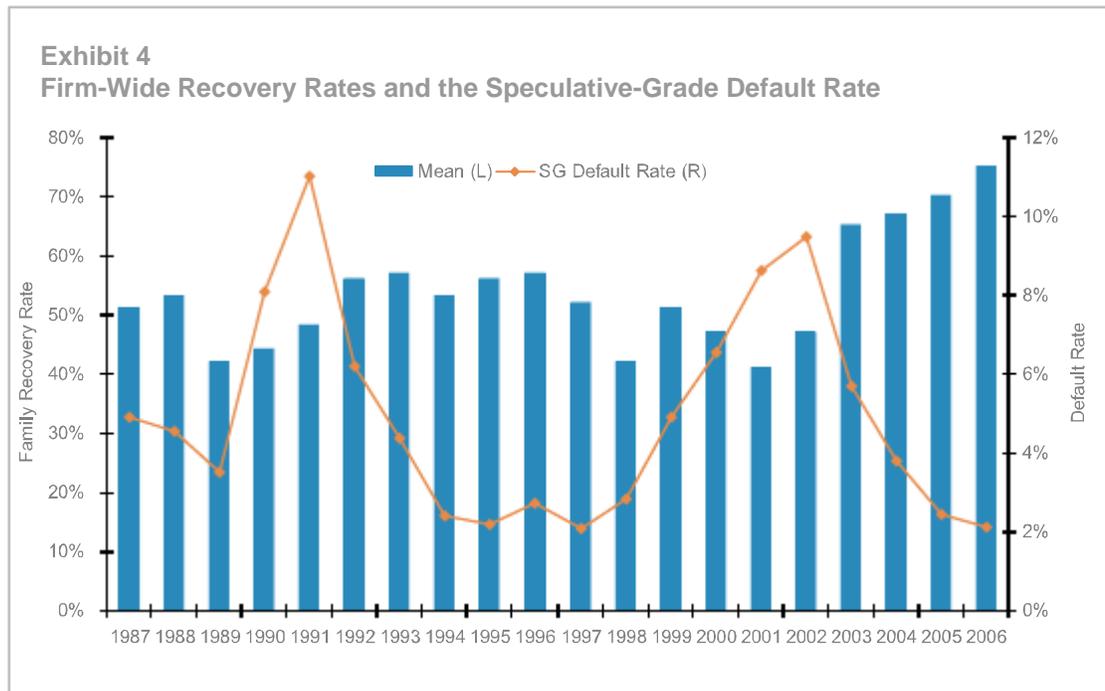
## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

In this example, the expected LGD rates for the loan, senior unsecured bond and subordinated bond are 12.3%, 51.7% and 86.1%, respectively. These LGD rates are a function only of the liability structure of the firm and the shape of the probability distribution for firm-wide LGD rates, which reflects firms defaulting over the course of the entire economic cycle.

In order to adjust these point estimates to help meet the Basel II downturn requirement, we can construct "downturn LGD assessments" derived from a probability distribution of firm-wide LGD rates that reflects only data on firms that defaulted during times of downturn economic conditions. In order to do this, however, we first need to define downturn conditions and estimate the probability distribution of firm-wide LGD rates for firms that default only during those downturn conditions.

### Defining Downturn Conditions

Exhibit 4, which shows annual average firm-wide recovery rates from Moody's URD plotted against Moody's annual average speculative-grade default rate, indicates there is considerable cyclicity in firm-wide recovery rates.<sup>9</sup> During years in which the speculative-grade default rate is high, firm-wide recovery rates tend to be low and vice-versa. The presence of this cyclicity indicates a downturn-only distribution of firm-wide LGD rates that would likely differ from the distribution used to calculate Moody's LGD assessments shown in Exhibit 2.

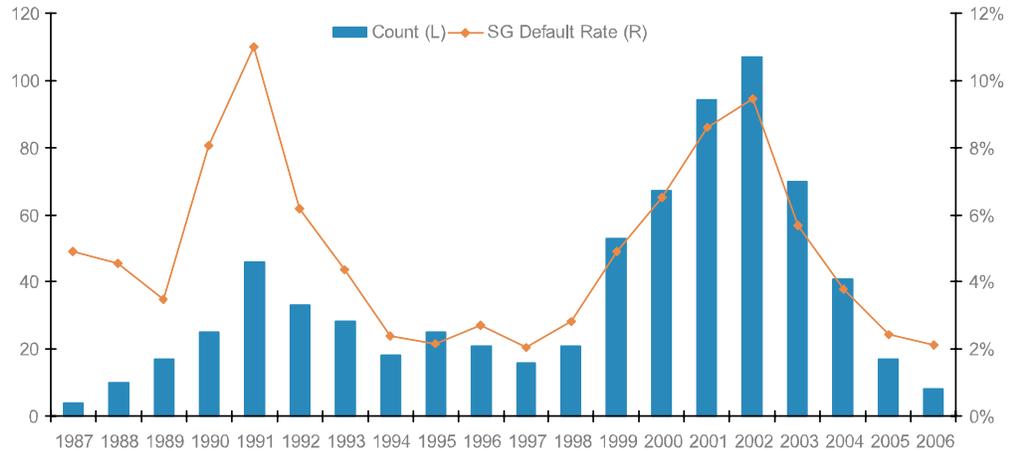


However, because the URD contains many firms that default in those years in which the default rate is high, as shown in Exhibit 5, differences between a downturn distribution of firm-wide LGD rates and the entire-cycle distribution may be relatively modest.

<sup>9</sup> Recovery rates are sorted by the firm's default date, not the resolution date.

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

**Exhibit 5**  
Number of Firms in Ultimate Recovery Database and Speculative-Grade Default Rate

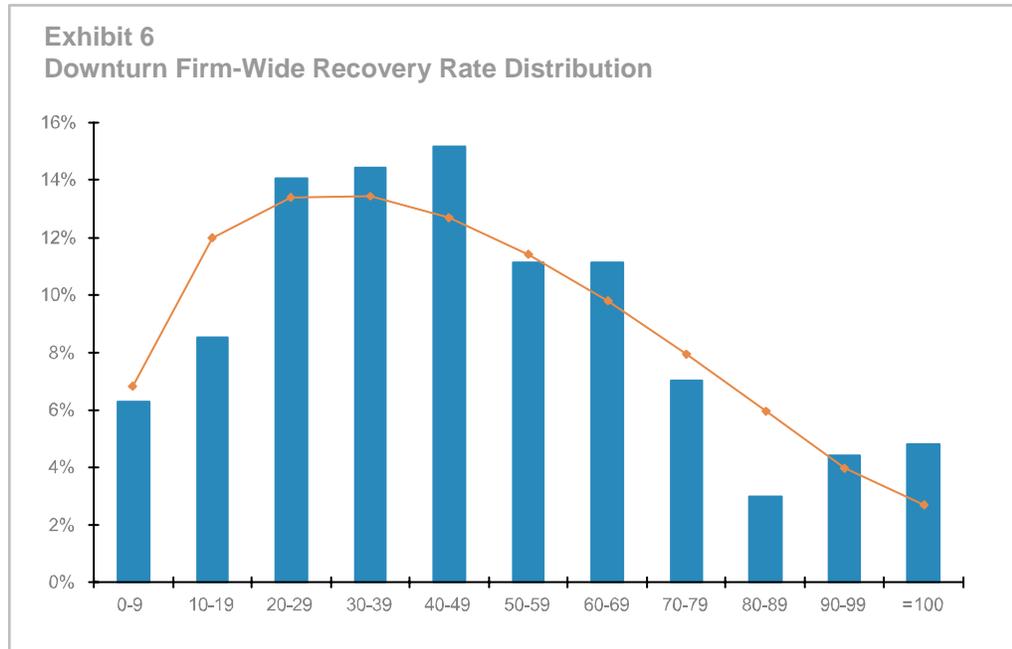


While there are many alternative definitions of downturn conditions, in examining the data in the URD, we choose to define downturn conditions as those years in which the average speculative-grade default rate is greater than six percent. Under this definition, the six years 1990-1992 and 2000-2002 are defined as downturn years from the past twenty years of data included in the URD. For perspective, the average annual speculative-grade default rate over the past twenty years is 4.9%. And of the 527 total firms in the URD that defaulted on both loans and bonds, 270 (51%) defaulted during these six downturn years.

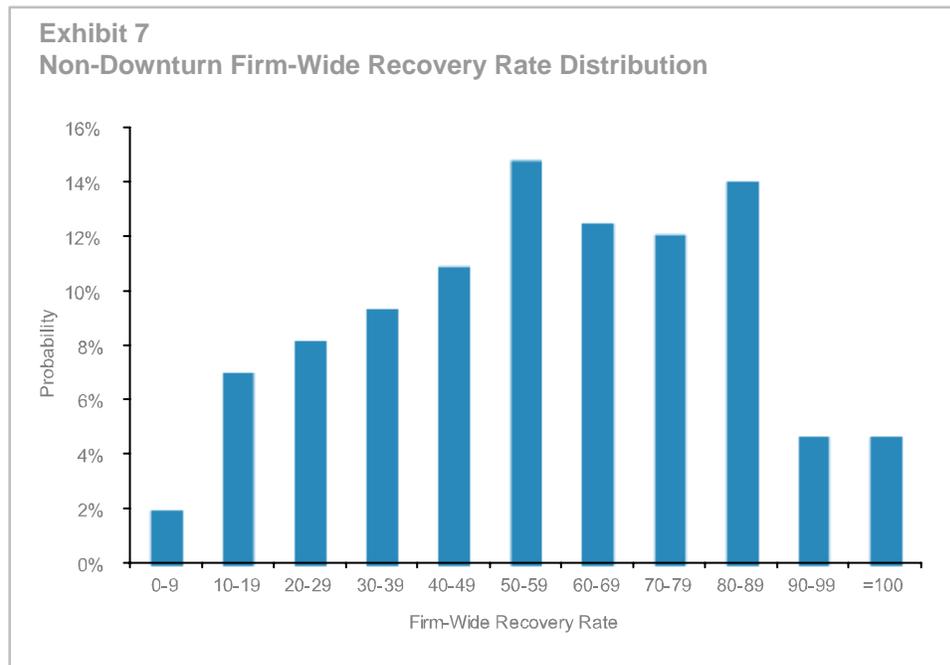
Restricting the sample to firms that defaulted during downturn conditions as we have defined them, the blue bars in Exhibit 6 show the probability distribution of firm-wide recovery rates obtained from data in the URD. This downturn distribution has a mean of 47% versus 52% for the entire-sample distribution (Exhibit 2). The sample standard deviation is 26% for both the downturn and entire-sample distributions. The red line in Exhibit 6 is the beta distribution with mean 45% which is used to define the 120 firm-wide LGD scenarios used in calculating the downturn LGD assessments.<sup>10</sup>

<sup>10</sup> This 45% mean recovery rate is five percentage points lower than the 50% mean employed for the entire-sample beta distribution used in calculating Moody's published LGD assessments. This 5-percentage point gap equals the difference between the actual means for the entire-sample and the downturn sample of firm-wide recovery rates rates from the URD (52% versus 47%).

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements



As a point of reference, Exhibit 7 shows the distribution of firm-wide recovery rates for non-downturn years using data from the URD. The mean of this distribution is 58% and the sample standard deviation is 25%.



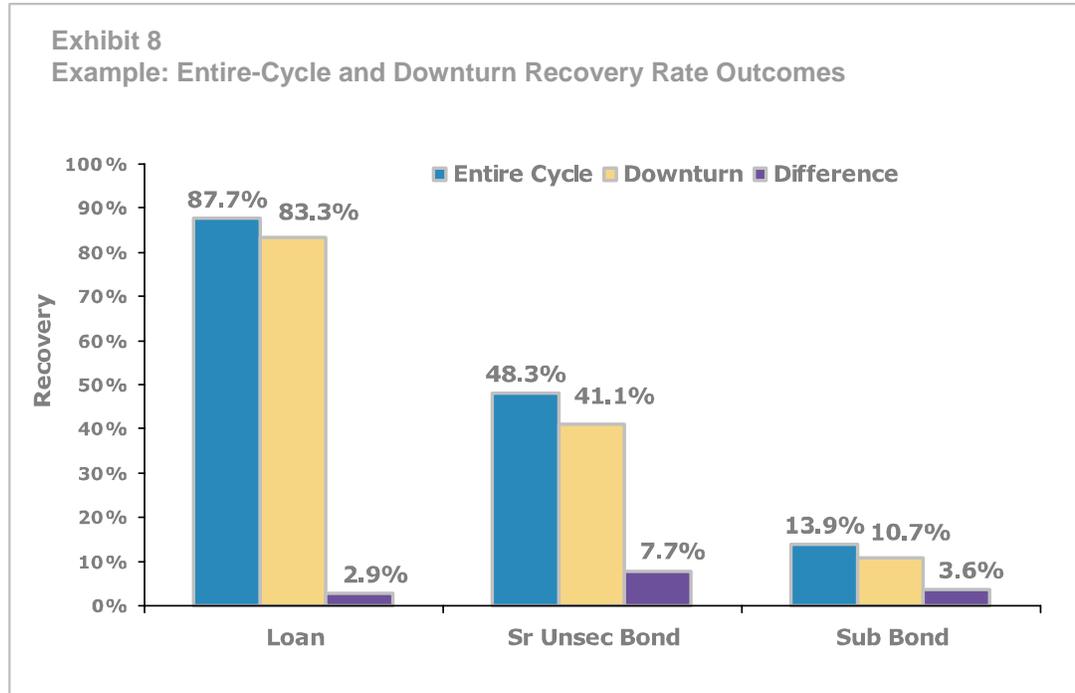
### Downturn Adjustments to Moody's LGD Point Estimates

The downturn probability distribution of firm-wide LGD rates derived above can now be used to calculate downturn LGD assessments in the same manner that Moody's published LGD assessments are calculated.

Returning to our simple example, we again consider 120 possible scenarios for firm-wide LGD rates but now use the downturn beta probability distribution shown in Exhibit 6, rather than the entire-sample distribution shown in Exhibit 2. The issue LGD rates under each of the 120 scenarios are equal to each other using either distribution, but the probabilities associated with the individual scenarios are now different. As a result, imposing downturn conditions on our example, the issue LGD rates for the 10 firm-wide LGD scenarios equal

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those shown in Exhibit 3 but the probabilities associated with those scenarios occurring are different and, as a result, the probability-weighted average LGD rates for the issues are now different. Specifically, the expected downturn LGD rates for the loan, senior unsecured bond and subordinated bond are now 16.7%, 58.9% and 89.3%, respectively. For this example, Exhibit 8 summarizes the outcomes in terms of expected recovery rates for both the entire-cycle and downturn scenarios.



The LGD outcomes in this example highlight that the adjustments to Moody's LGD assessments used to satisfy the Basel II downturn requirement are larger for mezzanine debts than for senior or junior debts. This result contrasts with the Federal Reserve's proposed supervisory mapping rule whereby senior debts experience the largest adjustments and junior debts the smallest adjustments.

Under Moody's LGD methodology, the downturn adjustment is larger for mezzanine debts because the mean of the firm-wide LGD rate distribution is shifting from 50% to 45% under downturn conditions, precisely the range where mezzanine debts are positioned in the liability structure in terms of absolute priority. To see this more clearly, in our simple example, consider the impact of moving the firm-wide LGD rate from 50% to 45% when there is no uncertainty. In this case, there is no impact on the LGD rates of the loan and the subordinated bond. The loan LGD rate remains at 0% and the subordinated bond LGD rate remains at 100%. However, the LGD rate on the senior unsecured bond increases from 50% to 64%. In fact, with no uncertainty, any movement of the firm-wide LGD rate in the range of 33% to 66% has no impact on the senior and junior debts in our example, as they remain at 0% and 100% respectively.

Qualitatively, with uncertainty present, moving from the entire-cycle distribution (Exhibit 2) to the downturn distribution (Exhibit 6), the same result applies that the LGD impact is larger for those debts positioned in the middle of the liability structure.<sup>11</sup>

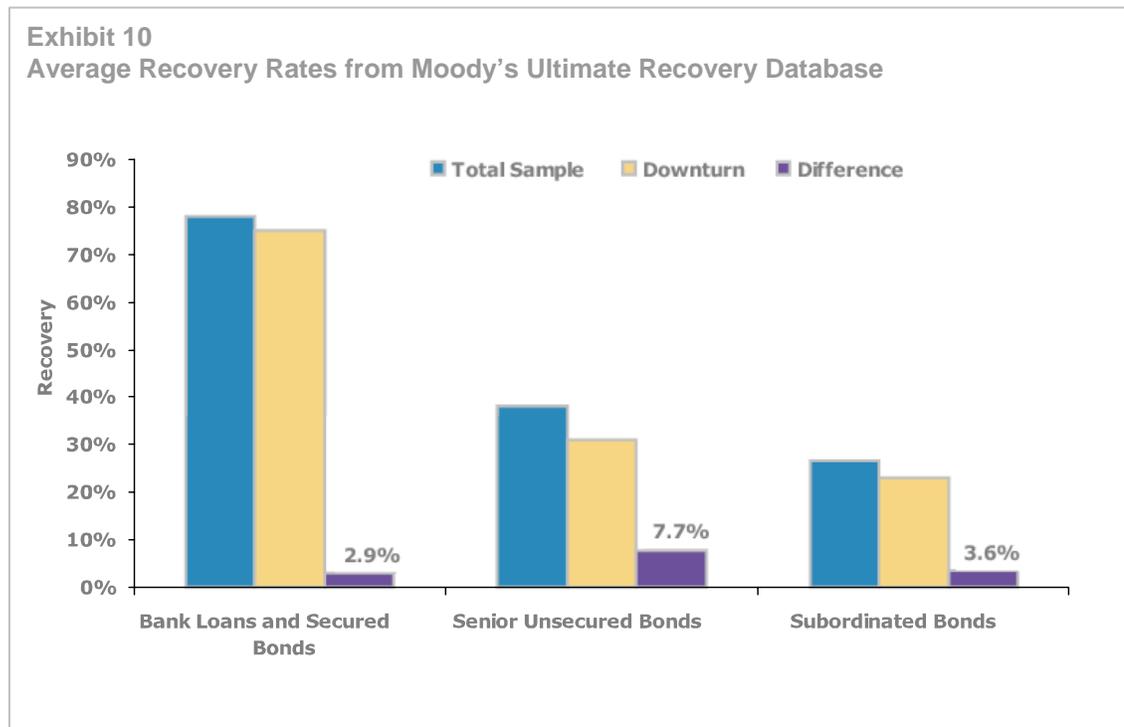
<sup>11</sup> An analogy is the responsiveness of in-the-money versus out-of-the-money option prices to a change in the price of the underlying. In this context, LGD rates on senior and junior debts can be thought of as out-of-the-money since the specific change in the underlying, the firm-wide LGD rate, will have little impact on their expected LGD rate, while mezzanine debts can be thought of as in-the-money where the expected LGD impact is likely to be relatively large.

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements



### Empirical Evidence

Historical ultimate LGD data from the URD lend some support to the idea that a debt's position in the firm's liability structure matters for how downturn conditions affect LGD rates. Specifically, as discussed above, under Moody's LGD methodology, mezzanine debts' LGD rates are expected to increase more severely under downturn conditions than are senior or junior debts' LGD rates. Exhibit 10 shows average recovery rates for the entire sample of defaulters in the URD, as well as the average recovery rates for the downturn years 1990-1992 and 2000-2002. The data show that average senior unsecured bond recovery rates are approximately 7.7 percentage points lower during downturn conditions as compared to the average for the entire sample, while secured debt and subordinated bond average recovery rates are only 2.9 and 3.6 percentage points lower, respectively.



## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

Similarly, Exhibit 11 shows annual average loan and bond recovery rates over time, indicating more cyclicity for bonds than for loans. For example, from 2001 at the trough of the last credit cycle to 2006, the average loan recovery increased from \$73 to \$90, a 23% increase, while the bond recovery rate increased from \$22 to \$70, a 218% increase.

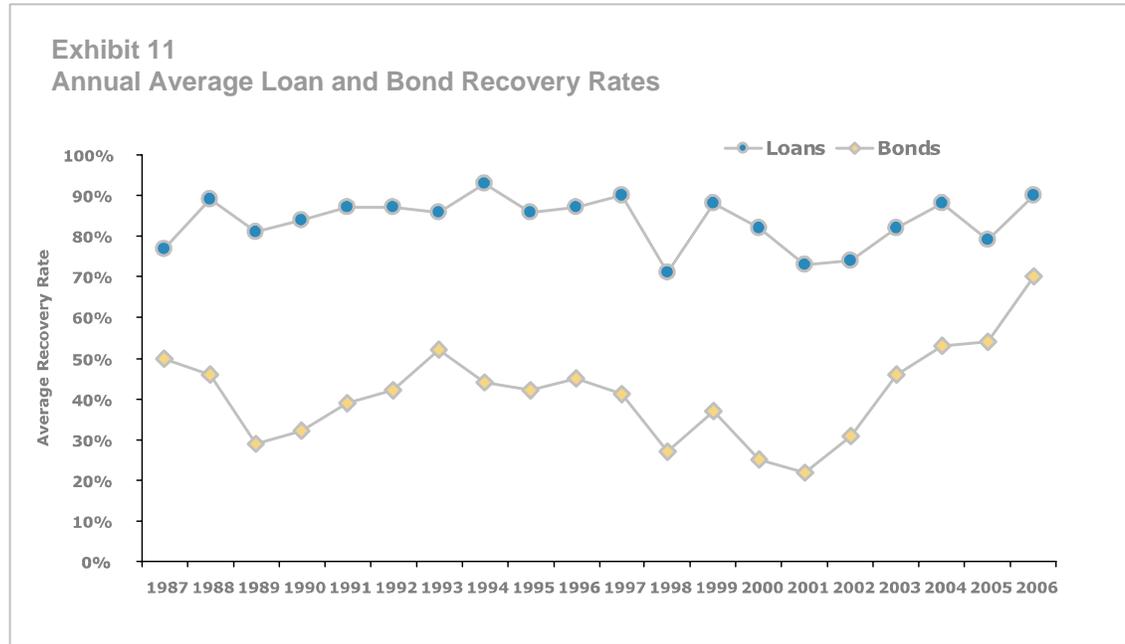
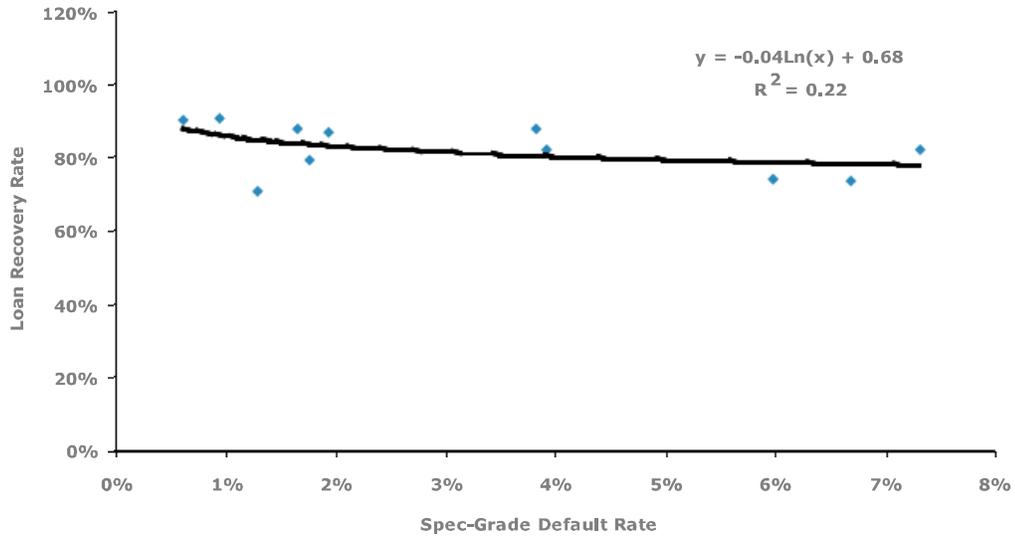


Exhibit 12 and 13 show, using regression analysis, that bond recovery rates are more correlated with the annual speculative-grade default rate than are loan recovery rates, again indicating more cyclicity for bond recovery rates. In Exhibit 12, a bi-variate regression shows that the default rate explains approximately 22 percent of the variation in loan recovery rates, while Exhibit 13 shows that the level of the default rate explains approximately 48 percent of the variation in bond recovery rates.

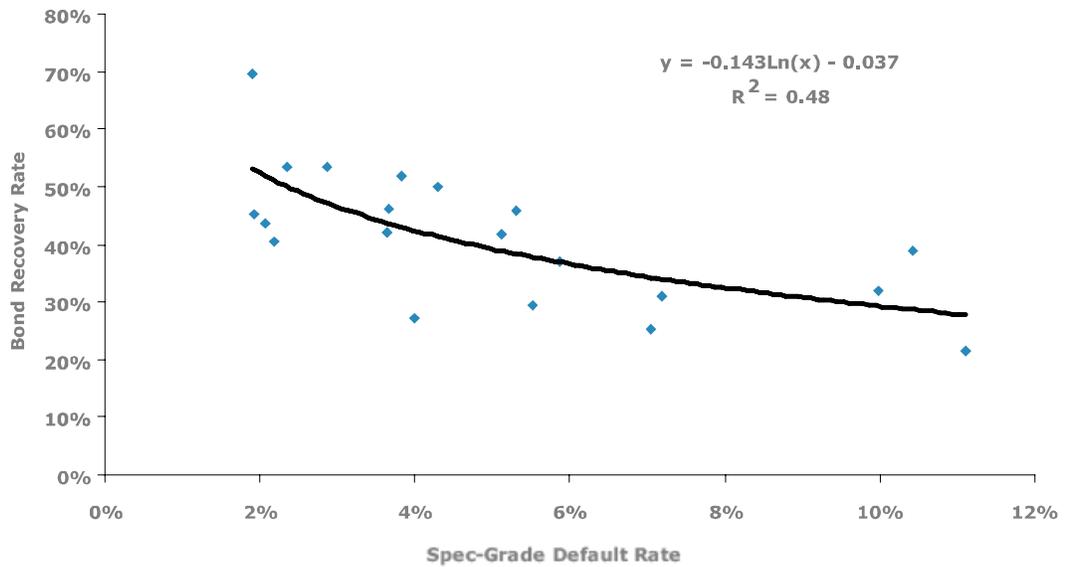
As a whole, the historical data from the URD support the idea that senior and junior debt LGD rates are likely to be less effected by the presence of downturn conditions than are mezzanine debts, consistent with Moody's LGD methodology and the recommended adjustments to Moody's LGD assessments to meet Basel II downturn conditions.

## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

**Exhibit 12**  
Average Annual Loan Recovery Rates and Speculative-Grade Default Rates



**Exhibit 13**  
Average Annual Bond Recovery Rates and Speculative-Grade Default Rates



## Adjusting Moody's LGD Assessments to Meet Basel II Downturn Requirements

### Moody's Related Research

#### Special Comments

- Users' Guide to Prioritizing Claims and Applying the LGD Model, September 2006 (99071)
- Back-Testing Moody's LGD Methodology, June 2007 (103426)
- Moody's Ultimate Recovery Database, April 2007 (102664)
- Corporate Default and Recovery Rates, February 2007 (102071)

#### Rating Methodology

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

#### Basel Committee on Banking Supervision

- Guidance on Paragraph 468 of the Framework Document, July 2005

#### Board of Governors of the Federal Reserve System

- The Bank as Grim Reaper: Debt Composition and Recoveries on Defaulted Debt, Federal Reserve Board Working Paper, Mark Carey and Michael Gordy, March 2007
- Basel II Capital Accord—Notice of Proposed Rulemaking, September 2006.

*To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.*

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