MOODY'S
INVESTORS SERVICE

RATING METHODOLOGY

Moody's Global Approach to Rating Collateralized Loan Obligations

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This rating methodology replaces *Moody's Global Approach to Rating Collateralized Loan Obligations* published in December 2020. In our approach to assessing the default distribution of collateralized loan obligation (CLO) portfolios, we adjusted our assumptions for CLO weighted average life and amortization profile in sections 2.3.2.2 and 8.2.1. We clarified our approach for assessing the impact of simple refinancing of CLOs in section 8.1 and improved the transparency of RiskCalc-based US rating factors in Appendix 11. We adjusted the industry classification layout in Appendix 6. We also added a section that mentions our approach to evaluating the risk from environmental, social and governance considerations, and we made limited editorial updates.

1. Executive Summary

This methodology describes our approach to rating collateralized loan obligations (CLOs), transactions backed by portfolios of loans to corporate entities. CLOs generally fall into one of two categories: those backed by broadly syndicated loans or those backed by small and medium enterprise loans. Most CLOs are managed transactions that permit the manager to purchase and sell assets during the life of the CLO, subject to a range of limits and covenants.

In applying this methodology, where appropriate, we consider factors that we deem relevant to our analysis. In our approach, we consider the risks associated with the CLO's portfolio and structure and, in addition to these quantitative assessments, our rating committees also consider other various qualitative and quantitative factors in their analysis. If actual performance or credit trends are not in line with the assumptions described in this methodology, we may consider or reflect that in our analysis. A rating committee ultimately assigns our ratings, taking into account the unique characteristics of each transaction.

1.1 Our Modeling Approach for CLOs

We base our rating of a CLO tranche on its expected loss (EL). We estimate EL using a cash flow model that consists of two primary components: (a) a mechanism for associating asset default scenarios with the likelihood of each scenario (a default distribution) and (b) a cash flow component that relates each asset default scenario to the cash flows that the rated tranche receives in that scenario. After we apply the default distribution to the cash flow model, we calculate the EL for each rated tranche.

More specifically, we derive the CLO's default distribution and asset cash flows from several portfolio measures. To determine the portfolio's default distribution, we typically rely on the binomial distribution and three key metrics of the CLO portfolio's assets – weighted average default probability, weighted average life and diversity score. To determine the interest proceeds that the portfolio generates in each default scenario, we rely on the portfolio's weighted average spread and weighted average coupon as well as a path for Libor,[1] based on the forward curve. To determine the principal proceeds that the portfolio generates in each default scenario, we rely on (a) an amortization profile that is evenly distributed around the portfolio's weighted average life and (b) a weighted average recovery rate assumption that we apply to the par amount of defaulted assets in a given default scenario. We generally derive our assumptions for the portfolio measures we describe above from the CLO's limitations on such measures.

We determine the amount of interest and principal proceeds each tranche receives in a given asset default scenario based on the priority of payments that the CLO's documentation specifies.

Finally, we calculate the EL for each tranche. The EL is the weighted average of the loss in each asset default scenario, where the weight is the likelihood of the scenario, as specified by the default distribution. We then compare the tranche's EL to the relevant EL benchmarks, based on the tranche's weighted average life, to determine the rating associated with such EL.[2]

1.2 Documentation and Legal Analysis

Our assessment of the legal structure of the CLO typically includes a review of key characteristics of the issuer, including bankruptcy remoteness. We review numerous documents including, as applicable, the indenture, collateral management agreement, trust deed, swap agreements and other agreements, as well as a number of legal opinions that law firms provide to the issuer and the arranger.

In our review of the CLO's documents, we seek to identify any features that we would need to incorporate into our rating analysis. Such features include, for example, the ability to acquire certain types of assets or rules for trading that, in either case, introduce additional risk to the noteholders.

1.3 Assessing the Roles of the Manager and Other Parties to the CLO

Given the manager's central role and potential impact on the CLO's performance, we assess in our rating analysis its ability to manage the transaction in keeping with the documentation. We base this assessment on the performance of its existing transactions and information we gather from our operations review.

We also consider the ability of the trustee/collateral administrator to carry out its responsibilities with respect to the CLO. Additionally, we rely on a third-party auditor's verification of the CLO's ongoing compliance with its various requirements and the process for resolving any inconsistencies with the trustee.

1.4 Monitoring

After a CLO closes, we track the credit performance of the underlying collateral, the characteristics of the transaction (e.g., reinvesting versus deleveraging), and relevant changes in the credit environment. If a performance measure varies materially from its initial limits or previous state, or if the transaction structure changes, we may review the CLO notes' outstanding ratings.

This publication does not announce a credit rating action. For any credit ratings referenced in this publication, please see the ratings tab on the issuer/entity page on www.moodys.com for the most updated credit rating action information and rating history.

[1] Note that any references to Libor or Euribor also apply to other applicable benchmark reference rates (e.g., SOFR or SONIA).

[2] For more information, see Section 9, "Loss Benchmarks."

2. Our Modeling Approach for CLOs

2.1 Overview

Most CLOs are managed transactions in which the collateral manager (the manager) can buy and sell assets subject to covenants in the CLO indenture.[3] Given the manager's ability to trade and to reinvest principal proceeds, we generally base our modeling of CLOs on assumptions we derive from the transaction covenants rather than the CLO's actual portfolio. However, we generally base our modeling of a static transaction, in which the manager has only limited or no ability to reinvest principal proceeds, on the characteristics of the actual portfolio.

2.2 Inputs to the Model

2.2.1 Default Probability

2.2.1.1 RATED INSTRUMENTS

We infer the default probabilities of the obligors included in a CLO from Moody's Default Probability Rating[4] of each obligor. Moody's Default Probability Rating is the obligor's Corporate Family Rating (CFR).[5] In the absence of a CFR, we derive, when possible, the Moody's Default Probability Rating from other debt of the obligor that we rate (see Appendix 12). Each Moody's Default Probability Rating is associated with a particular Moody's rating factor (rating factor),[6] as Exhibit 1 depicts.

EXHIBIT 1

Moody's Default Probability Ratings vs. Moody's Rating Factors

Moody's Default Probability Rating	Moody's Rating Factor	Moody's Default Probability Rating	Moody's Rating Factor
Aaa	1	Ba1	940
Aa1	10	Ba2	1350
Aa2	20	Ba3	1766
Aa3	40	B1	2220
A1	70	B2	2720
A2	120	B3	3490
A3	180	Caa1	4770
Baa1	260	Caa2	6500
Baa2	360	Caa3	8070
Baa3	610	Ca, C	10000

Source: Moody's Investors Service

As we have noted, our modeling of CLOs typically assumes certain portfolio-wide characteristics of the CLO's collateral. With respect to default probability, the key measure is the Weighted Average Rating Factor (WARF) of the portfolio. In general, the WARF is calculated as the par-weighted average of the rating factor of each of the assets in the portfolio.[7] Similarly, the weighted average life (WAL) of the portfolio is a par-

[3] For European transactions, the corresponding document is the offering circular.

[4] The Moody's Default Probability Rating, which we define here for the purpose of this methodology, should not be confused with the published corporate Probability of Default Rating.

[5] We assign a CFR to a corporate family as if it had a single class of debt and a single consolidated legal structure. If a loan of any given legal entity from a given corporate family is included in a CLO and we have assigned a CFR to any entity from that corporate family, we use that CFR to represent the Moody's Default Probability Rating for that debt. For a definition of the CFR, see *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

[6] The Rating Factor represents Moody's Idealized Default Rate for the relevant rating at a 10-year horizon, multiplied by 10,000. For more information, see *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

[7] We have recognized, nonetheless, that this weighted average approach could be inappropriate if the characteristics of the portfolio are heterogeneous or "barbelled" along some dimension, such as default probability or par amount. See Section 2.3.2.3 for further information about our approach to analyzing transactions with such features.

weighted average of the remaining lives of the individual assets.[8] We use the WARF, in conjunction with the WAL of the portfolio, to estimate the average default probability of the assets.

Moody's Idealized Cumulative Expected Default Rates table[9] shows how default probabilities relate to WARF and WAL. For example, using the table, we would ascribe a 22.65% default probability to a CLO portfolio with a WAL of six years and a WARF of 2720 (i.e., prior to applying the stress factors, discussed below).[10]

2.2.1.2 INSTRUMENTS WITHOUT RATINGS

In the absence of default probabilities inferred from our ratings,[11] we base our analysis on credit estimates,[12] default probabilities derived from Moody's Analytics RiskCalc™ (RiskCalc) or, in certain instances, from third-party internal ratings. If it is not possible to derive the default probability of an asset using any of these means, we will likely make an assumption about the asset's default probability, as we describe below.[13]

We express each credit estimate as a rating factor, which we use as an input to calculate the CLO's WARF.[14] As we discuss in Section 2.2.1.4, we adjust certain credit estimates and apply stress test analyses to others as part of the CLO credit analysis.

The RiskCalc US model is a model developed by Moody's Analytics to estimate the default probability of private US corporate firms. The inputs are data from a company's audited financial statements, and the output is an expected default frequency (.edf). We have established a mapping of each .edf to a rating factor. We use the rating factor to calculate the CLO's WARF. Appendix 11 provides more information about the use of the RiskCalc model, such as mapping the outputs from the model to rating factors, determination of a recovery rate assumption, single-obligor limits, and the maximum portion of a CLO's portfolio for which we rely on the model.

When the default probabilities of the debt instruments being securitized are based on a third-party entity's internal credit rating system rather than our ratings or credit estimates, we can derive such default probabilities from a mapping. For details on our approach to mapping ratings and scores, see Appendix 18.

When our rating, credit estimate, RiskCalc-based estimate, or third-party mapping is not available, we use other rules to determine an asset's default probability. This situation arises, for example, when a CLO indenture has a basket for assets rated only by other rating agencies and relies on those ratings to calculate the WARF. Although the basket for obligors whose ratings a typical CLO derives from other rating agencies' ratings is usually 10% of a given CLO's portfolio, we typically assume, based on historical utilization rates, that a manager will use, for example, only 30% of this basket. For such assets, we assume a Caa3 rating is appropriate in light of a typical CLO portfolio's credit quality.

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8 The lives of the individual assets are based on scheduled principal payments, without any assumptions regarding prepayments. If a CLO relies on the exercise date of a put option associated with a given asset to determine the asset's contribution to the CLO's WAL calculation or its compliance with the CLO's limits on long-dated assets, we would consider in our analysis the risks associated with the reliance on such date, rather than on the asset's scheduled maturity date.

9 For more information, see *Rating Symbols and Definitions*. A link can be found in the "Moody's Related Publications" section.

10 We compute the estimated default probability by interpolating in cases where the WARF lies between rating categories or the WAL lies between investment horizons.

11 Our ratings include loans assigned unpublished monitored loan ratings, or UMLRs, and loans assigned private monitored loan ratings, or PMLRs.

12 For an explanation of credit estimates please refer to *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section). In order to maintain up-to-date credit estimates, we require that the manager regularly provide us with relevant information. In the absence of such information, we will not be able to refresh the credit estimate.

13 If a CLO's exposure to assets whose default probabilities cannot be derived from our ratings, our credit estimates, RiskCalc or third-party internal ratings and is material from our perspective, we might not be able to rate the transaction, and, in the context of an outstanding CLO, we could withdraw the ratings.

14 Credit estimates are not publicly disseminated.

2.2.1.3 INSTRUMENTS ON REVIEW FOR UPGRADE OR DOWNGRADE

Our research has shown that ratings that we place on review for upgrade or downgrade do indeed have a higher likelihood of undergoing a rating change than those of similarly rated obligors whose ratings are not on review. To reflect this, we treat a corporate obligor whose ratings we have placed on review as follows:

» if on review for possible downgrade, adjust rating down one notch

» if on review for possible upgrade, adjust rating up one notch

For structured finance obligations, the rating adjustments are typically two notches for securities that are on review for downgrade or upgrade.[15]

We reflect these adjustments in each obligor's Moody's Default Probability Rating to calculate the WARF we use to rate the CLO.

2.2.1.4 STRESSING OF THE DEFAULT PROBABILITY

As Section 2.2.1.1 notes, we infer an average default probability from the WARF and the WAL. This average default probability is stressed for the purpose of the expected loss calculation we describe below. The degree of stress varies with the target rating of the CLO liability (see Appendix 1). The variable stress intends to capture the tail of the loss distribution. The more senior the liability, the more important it is to capture such tail effects.

The stress factors in Appendix 1 are the result of analyses we conducted using single-B issuer default data going back to the 1920s.

As Section 2.2.1.2 notes, we infer the default probabilities of some CLO assets from their credit estimates. We normally update such estimates at least once annually.[16] However, in some cases, annual updates do not occur, the most common reason being that the necessary financial information is not available. Moreover, unlike our ratings, credit estimates do not carry forward-looking indicators such as rating outlooks and are not placed on review for upgrade or downgrade.

To capture the uncertainty arising from estimates that have not been refreshed within a one-year period, we adjust the default probabilities associated with these estimates, as follows:

EXHIBIT 2

Credit Estimate Adjustments

Age of Credit Estimate*	Adjustment
≤12 months	0.0 notch
>12 months and ≤ 15 months	1.0 notch
>15 months	Use Rating Factor of 8070 (i.e., Caa3-equivalent)[17]

*Time elapsed since we assigned the credit estimate

Source: Moody's Investors Service

[15] For more information, see our methodology for rating SF CDOs. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[16] In addition, we will update a credit estimate when the credit undergoes a restructuring, recapitalization, or material amendment that might alter its overall risk profile.

[17] We might assume a higher rating factor if the obligor is expected to default with a high severity of loss.

For collateral pools with assets where the default probabilities are inferred from credit estimates, we apply various additional stresses.[18]

Because of the leveraged nature of a CLO, its ratings are sensitive to volatility in the credit performance of underlying structured finance obligations, such as notes issued by other CLOs, which CLO portfolios sometimes include. Hence, as we describe in our rating methodology for Structured Finance CDOs, we apply a stress, in our CLO models, to the default probability of structured finance obligations to address the impact of this leverage.[19]

2.2.2 Default Correlation

For most cash flow CLOs, we implicitly rather than explicitly model the default correlation of the CLO's assets. The implicit role of correlation is inherent in the use of our diversity score calculation as a component of the Binomial Expansion Technique (BET), which we describe below.

The CLO's assets are classified according to the corporate industry to which each obligor belongs. These industries are listed in Appendix 6. We use the number of assets and the par value of each asset to calculate the portfolio's diversity score. Appendix 4 provides more detail about the steps we take to compute a diversity score.

2.2.3 Recovery Rate

2.2.3.1 DETERMINATION OF RECOVERY RATE ASSUMPTIONS

To establish a recovery rate assumption for a given corporate debt instrument, we examine the difference between the instrument rating[20] and Moody's Default Probability Rating.[21] The higher the instrument rating relative to Moody's Default Probability Rating, the higher the expected recovery rate should the instrument default. Appendix 2 associates the instrument rating/Moody's Default Probability Rating differential with our assumed recovery rates. Note that the differential at the time of analysis, rather than the differential that was established at the issuance of the instrument, is the relevant basis for assigning a recovery rate assumption.

For structured finance obligations, we assign the recovery rate based on the rating of the structured tranche, as well as additional characteristics of the transaction issuing the obligation.[22]

We use the Weighted Average Recovery Rate (WARR) of the portfolio in modeling CLOs. The WARR is the par-weighted average of the base (i.e., unadjusted) recovery rate assumptions associated with each instrument the CLO holds.

In the BET framework, which we describe more fully later, we must adjust the WARR to produce a "certainty-equivalent" value. A certainty-equivalent recovery rate is the fixed recovery rate that implies the same EL for a given CLO tranche that would have been generated using a full distribution of recovery rates. The WARR covenant is the certainty-equivalent recovery rate for a tranche with a Aaa target rating. For a given WARR covenant, each tranche rating will have its own certainty-equivalent fixed recovery rate for us

[18] For more information, see our cross-sector methodology for using credit estimates. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[19] For more information, see our methodology for rating SF CDOs. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[20] See Appendix 12 for the algorithm we use to determine the instrument rating when we have not assigned a rating to the instrument.

[21] There are cases in which we explicitly assign a recovery rate assumption to a given asset without making the comparison described here.

[22] For more information, see our methodology for rating SF CDOs. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

to use in modeling the tranche's EL. The lower the target rating, the higher the certainty-equivalent recovery rate (see Appendix 2).[23]

2.2.3.2 MODELING RECOVERY TIMING

In our modeling analysis, we generally assume a 1.5-year recovery lag for defaulted securities. Under certain circumstances, we analyze a CLO assuming alternative or additional lag scenarios. If, for example, there is compelling evidence that the manager typically sells defaulted securities soon after the default date, we might assume that recoveries occur in the same period that the default occurred. Specific transaction features pertaining to defaulted securities could also give rise to the analysis of alternative or additional lag scenarios.

Our research indicates that recovery rates for defaulted securities generally have been higher, in current dollar terms, if they are retained through the workout period rather than sold shortly after default. When analyzing scenarios in which we assume a recovery lag of one year or more, we gross up the recovery rates in Appendix 2 by 7% per annum, based on an actual/360-day count convention. We cap any grossed-up recovery rate by the value determined from a 1.5-year recovery lag assumption.[24]

2.3 Calculating Expected Loss for Each Tranche

2.3.1 Components of the Model

The default and recovery properties of the CLO portfolio are typically incorporated into a model that calculates the EL for each rated CLO liability. Such a model consists of two primary components: (a) a mechanism for associating collateral default scenarios with the likelihood of each scenario (a default distribution) and (b) a cash flow component that relates each collateral default scenario to the cash flows that the rated liability receives in that scenario. Once we apply the default distribution to the cash flow model, we can calculate the EL for each rated tranche. We then compare the tranche's EL results to the EL benchmark.[25]

2.3.2 Defining the Collateral Default Distribution

2.3.2.1 THE BINOMIAL EXPANSION TECHNIQUE

The Binomial Expansion Technique (BET) is appropriate when analyzing transactions in which the portfolio is relatively homogeneous with respect to credit risk and diversified across industries. More specifically, we use the BET to calculate the default distribution of the collateral for most CLOs and apply it in conjunction with the diversity score. The diversity score is intended to represent the number of independent, identical assets that we can use to mimic the default distribution of the actual portfolio. Conceptually, and consistent with the calculations in Appendix 4, the diversity score will be higher when one or more of the following are true:

» The number of assets in the portfolio is larger.

» The assets in the portfolio are less correlated (e.g., are widely distributed across industries).

» The par amounts of the assets in the portfolio are more evenly distributed.

The higher the diversity score, the narrower the right tail of the default distribution, meaning a lower likelihood of extreme losses, which tends to reduce the calculated EL for most CLO liability classes.[26] Under

[23] The decrease in the certainty-equivalent recovery rate assumption as the target rating level becomes higher, in conjunction with the increase in the default probability stress as the target rating level becomes higher, in effect, incorporates the concept of correlation between recovery rates and default rates in the BET model.

[24] When modeling recovery lags of 1.5 years or longer, we cap the grossed up recovery rate by the following formula: (recovery rate from Appendix 2) x $(1+7\%/4)^6$.

[25] For more information, see Section 9, "Loss Benchmarks."

[26] In rare cases, a higher diversity score could imply a higher EL for very junior tranches. Although higher diversity reduces the likelihood of a very large number of defaults, it increases the probability that there will be at least a few defaults. Deeply subordinated tranches might suffer losses in such low-default scenarios.

the assumptions of the BET, the default distribution is described by (*D*+1) scenarios, where *D* is the diversity score. That is, the possible scenarios are {*0 defaults, 1 default, …. D defaults*}. The likelihood that the *j*-default scenario will occur is given by the binomial formula:

FORMULA 1

$$P_j = \frac{D!}{j!\,(D-j)!} p^j (1-p)^{(D-j)}$$

Where:

» D = diversity score,

» j = the number of defaults in the scenario, and

» p = the probability of default, based on the WARF and modeled WAL , and multiplication by a WARF stress factor to reflect the tranche's target rating.[27]

Source: Moody's Investors Service

Applying the formula to all *D+1* scenarios maps out the default distribution for the portfolio.

The default distribution represented in equation (1) must be coupled with an assumption about recovery rates to determine the collateral losses in each default scenario. As Section 2.2.3 describes, this is a matter of applying in the cash flow model the appropriate certainty equivalent recovery rates and recovery timing assumptions to the collateral.

Managed CLOs typically include a minimum diversity score covenant, enabling us to model them using the BET framework.[28]

2.3.2.2 WEIGHTED AVERAGE LIFE AND AMORTIZATION PROFILE

Our approach to a CLO transaction's WAL assumption depends on the WAL covenant, the portfolio WAL and the phase in the transaction's lifecycle (i.e., reinvestment period vs. amortization period) as described below and in section 8.2.1.

Rating Analysis at Inception

A reinvesting CLO typically has a maximum WAL covenant that steps down uniformly (e.g., quarterly) over time.[29] We model a WAL equal to the longer of:

» the WAL covenant minus one year, or

» the portfolio WAL[30] plus one year, subject to a cap by the WAL covenant

We model an amortization profile that is evenly distributed over a 2.5-year period.[31]

[27] We list the stress factors in Appendix 1.

[28] CLOs typically allow the Manager to select collateral quality test levels from a matrix containing possible combinations of WARF, diversity score, Weighted Average Spread and/or Weighted Average Coupon covenants and also include rules that govern such selections. We model numerous combinations to confirm that the associated EL for each tranche is consistent with the rating we assign. We may conduct additional modeling analysis for an atypical case, such as one in which the matrix rules introduce additional risks.

[29] If the WAL covenant does not decline by one year for each year in the life of the CLO, we may make adjustments to the modeled WAL to appropriately reflect the risk horizon.

[30] For initial analysis, the portfolio WAL would generally be based on the target portfolio identified by the manager.

[31] For instance, for a modeled WAL of 10 years, and a transaction that pays its liabilities semi-annually, the modeled amortization profile would be approximately 20% in each of periods 18 through 22 for the 2.5-year profile centered around the modeled WAL.

For a static CLO, we generally model a WAL and an amortization profile that are the same as those of the actual portfolio.

2.3.2.3 ALTERNATIVES TO THE BET

The BET may not be a suitable method for analyzing a CLO when the portfolio is heterogeneous along with one or more measures, such as WARF, WARR, par amount, or industry concentrations or when other risks such as foreign exchange (FX) risk are present. In such instances, we might use alternative or additional methods to calculate the default distribution, such as the double binomial or MOODY'S CDOROM™ (CDOROM).

The double binomial approach is an extension of the BET in which we segregate the portfolio into two independent sub-portfolios, each of which is relatively homogeneous. We might use the double binomial approach when the indenture covenants permit significant par contributions by a small number of obligors in a handful of industries or CDOROM when analyzing a static portfolio concentrated in a small number of obligors or industries. Other relevant cases might be when FX risk, which we discuss in Section 2.3.3.7, is present in the transaction.[32]

When we must take into account additional risks that require analysis by period, such as FX or interest rate risk, we might choose to overlay simulated paths for FX and/or interest rates with the cash flow scenarios derived from the BET.

2.3.3 The Cash Flow Model

Regardless of how we calculate the loss distribution for the collateral, each collateral loss scenario must be associated, via a cash flow model, with the interest and principal the rated liability classes receive. The cash flow model takes account of a number of factors:

- collateral cash flows
- the transaction covenants
- the priority of payments (waterfall) defined in the CLO indenture
- reinvestment assumptions
- the timing of defaults
- interest-rate scenarios
- FX risk (if present)

2.3.3.1 COLLATERAL CASH FLOWS

Our cash flow modeling begins with assumptions about the cash flows from the portfolio. As Section 2.3.3.2 describes, we use the Weighted Average Spread (WAS) and Weighted Average Coupon (WAC) covenants, in combination with the specified constraints on the proportion of floating-rate and fixed-rate assets, to model the interest flows from the CLO assets. Interest proceeds from the floating-rate collateral also reflect a given assumed path for Libor or Euribor, as Section 2.3.3.6 describes.[33]

Most CLOs that permit investment in fixed-rate securities include a WAC test.[34] When the CLO does not, its transaction documents typically incorporate any fixed-rate assets into the calculation of the WAS and limit

[32] We will typically allocate diversity to the double binomial baskets using the approach described in Appendix 9.

[33] Note that any references to Libor also apply to Euribor in the context of European CLOs.

[34] In certain cases, an issuer who might be reluctant to establish one WAC covenant level that is binding for the life of the transaction will instead incorporate a range of values for the WAC covenant into the collateral quality matrix.

the fixed-rate exposure to, say, 5% of the portfolio's aggregate par amount. We analyze case by case, a CLO that excludes an explicit WAC test by assuming a conservative WAC, i.e., with a significant haircut to then-current market rates.

We model principal proceeds from collateral maturities based on an amortization profile as discussed in Section 2.3.2.2. Defaults and corresponding recoveries are part of principal proceeds and are modeled as Section 2.3.3.5 describes.

Modeled interest proceeds and principal proceeds are each associated with a particular due period. At the end of each due period, any available interest proceeds and principal proceeds flow through the interest and principal waterfalls, which the CLO indenture specifies.

2.3.3.2 THE TRANSACTION COVENANTS

The cash flow model takes into account covenants in addition to those that determine the default probabilities and recovery rates used in the model (i.e., WARF, WAL, and WARR). These include the WAS and WAC covenants that apply to floating-rate and fixed-rate assets, respectively, which we must consider in conjunction with concentration limits that apply to the baskets for both floating-rate and fixed-rate assets.

2.3.3.3 THE PRIORITY OF PAYMENTS

We model cash flows received by each liability tranche to reflect the waterfall the CLO indenture specifies. Payments can be sequential or pro rata and can vary depending on compliance with or violation of certain tests. Flows to or from hedge counterparties are typically included in the model. An exception arises in the case of asset-specific hedges, for which the cash flow modeling already reflects the combination of the asset and the hedge. The modeled waterfall will incorporate any over-collateralization (OC) or interest-coverage (IC) tests that divert cash flows to more senior classes or to reinvestment upon a violation. The waterfall will reflect any relevant fees, expenses and accounts as well. The waterfall might change when the reinvestment period ends.

2.3.3.4 REINVESTMENT ASSUMPTIONS

When the portfolio generates cash, the proceeds may or may not be reinvested in new collateral. In general, we assume that reinvestment takes place whenever the indenture permits. We typically do not model amortization during the reinvestment period on the assumption that the manager will reinvest all amortization proceeds it receives during the reinvestment period in assets that mature after the reinvestment period.

Many CLOs incorporate a reinvestment OC test. Violation of this test is cured through the purchase of additional assets using interest proceeds rather than through the repayment of liabilities. We typically model the CLO to reflect such a test. However, when consistency between the model and actual operation of the test is compromised (e.g., when there are uncapped expenses just above the test in the payment waterfall), we might also model the transaction as if the test were not present.

Because assets purchased through reinvestment could default, we generally model defaults on reinvestment that occurs in connection with (a) a reinvestment OC test and (b) recoveries on defaulted securities. Specifically, we assume that the fraction of such reinvested assets that defaults in any period is identical to the fraction of initial assets that defaults in the period. Moreover, we apply default timing scenarios, which

we describe in Section 2.3.3.5, so that defaults of reinvested assets occur within the first six years of the CLO.[35] See Appendix 3 for examples of how we implement defaults on such reinvestments.

2.3.3.5 THE TIMING OF DEFAULTS

The default distribution models we discuss above do not determine the profile of defaults over time. Instead, we apply a number of scenarios for assumed default timing. In the BET, for example, we consider cases in which the defaults in a given BET scenario will occur during the first six years of the CLO, with 50% of scenario defaults occurring in one year and 10% in each of the other five years. The 50% default spike, which is intended to mimic the bunching of defaults in a recession, is moved through each of the first six years for a total of six default-timing scenarios.

For transactions with particularly long or short WALs, we might extend or truncate the default timing profile. Though rarely applicable for CLOs, we might use a flatter default profile (one with a spike of less than 50%) for investment-grade collateral. Also, we consider the possibility that structured finance collateral will default late in its life. Similarly, we typically consider a back-end default scenario for CLOs whose managers have demonstrated a tendency to delay the recognition of defaults.

Defaults can occur at any point during a CLO payment period. Depending on the type of default (bankruptcy filing vs. payment default), interest might or might not be paid prior to the default. For modeling purposes, we assume that defaults that occur during a CLO's payment period take place midway through the period. Thus, the CLO will have collected half the interest payable on defaulted securities.

2.3.3.6 INTEREST-RATE SCENARIOS

In the BET and related models, we assume a discrete number of interest-rate scenarios to reflect the potential for shifts in short-term rates over time. Specifically, we consider the prevailing forward interest rate curve (such as the Libor or Euribor curve) as a base case. We also consider one- and two-standard-deviation perturbations to the curve for a total of five interest-rate scenarios.[36] That is, we model the curve *t* years into the future as the following:

FORMULA 2

$$L_t = \tilde{L}_t \, exp\left\{\omega\sigma\sqrt{t}\right\}$$

Where:

» $\omega \in \{-2, -1, 0, 1, 2\}$

» L_t represents the forward interest rate curve (such as the Libor or Euribor curve) and

» σ = the annualized volatility of interest rates (such as Libor or Euribor).[37]

Source: Moody's Investors Service

For transactions with relatively long lives or in which interest rate risk is particularly important (as in the case of dynamic hedging or when modeling different baskets of currencies), we might instead choose to

[35] We do not model defaults of assets purchased through reinvestment of amortization proceeds because such reinvestment is already reflected in our WAL assumption. The impact on portfolio default of amortization is captured through the link between the WAL covenant and our default assumptions.

[36] Certain interest rate environments could lead us to analyze interest rate curves in addition to or other than those we describe here.

[37] We determine our assumption of the annualized volatility by reference to observed historical interest rate behavior. Our assumption typically falls in the range of 15% to 20%.

simulate the evolution of the yield curve. In doing so, we will assume a mean-reverting process for interest rates.[38]

Most CLOs permit a basket of, say, 5% of fixed-rate assets. When considering the impact of interest-rate risk, we consider fixed-rate and floating-rate collateral at their minimum and maximum limits, as the CLO indenture specifies. These sometimes, but not always, correspond to the proportions of bonds and loans in the portfolio.[39]

Some CLOs can enter into asset-specific hedges on or after the closing date. With suitable protections, the CLO treats these assets as having the characteristics of the hedged instrument in the calculation of the collateral quality tests. Thus, for example, it treats a fixed-rate bond coupled with an asset-specific interest-rate swap as a floating-rate asset whose par value is the same as that of the bond.[40] Absent an effective set of protections, we evaluate the provisions for asset-specific hedges to determine whether any additional modeling of the attendant risks is necessary.

The safeguards that CLOs typically incorporate to warrant the treatment we describe above include a near-perfect matching of the financial characteristics of the asset and the corresponding hedge. Hence, each hedge is associated with only one asset, with matching principal/notional amounts and maturity date, which is no later than the final stated maturity of the CLO. The amortization schedule of the hedge matches the expected amortization of the hedged asset and, when the asset is sold, defaults, prepays or is called, the associated hedge will be terminated. Finally, to minimize additional risks arising from the hedge, the CLO requires that the hedge conforms to a framework that de-links the risks associated with the counterparty from the CLO liabilities' ratings.[41]

Although arrangers typically structure CLOs such that the liabilities' ratings do not depend on swap counterparties' ratings, CLO structures could have such a dependency.[42]

2.3.3.7 FOREIGN EXCHANGE RISK

Foreign exchange risk can arise in multicurrency CLOs and can be mitigated by asset-specific or macro hedges. Such hedges may consist of some combination of FX swaps and FX options. In some cases, FX risk is unhedged. Regardless of the approach, we assess whether the additional EL borne by holders of the rated notes remains consistent with the target ratings.

We assume that CLOs are "single currency" (i.e., no currency risk needs to be modeled) when the liabilities are in a single currency and the assets are either denominated in such currency or are covered by "perfect" asset swaps. By perfect asset swaps, we refer to asset-specific currency swaps that amortize with the asset and for which there is no termination cost upon default, repayment, or prepayment (in part or in full) of the asset.[43]

[38] Specifically, we assume that rates evolve according to a Cox, Ingersoll, Ross process. The parameters are estimated using a Maximum Likelihood approach, listed in Appendix 7.

[39] For example, synthetic securities can be used to create floating-rate assets with bond-like recovery rates.

[40] Some indentures refer to such a bond as a "deemed floating" instrument and a loan that is hedged to mimic the characteristics of a fixed-rate instrument as "deemed fixed."

[41] For more information, see our cross-sector methodology for assessing swap counterparties in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[42] Ibid.

[43] Thus, a "perfect" asset swap also requires that recoveries be exchanged at the swap rate.

Although arrangers typically structure CLOs such that the liabilities' ratings do not depend on swap counterparties' ratings, CLO structures could have such a dependency.[44]

If the currency risk is small, we might apply haircuts to the par amount, interest proceeds, and principal proceeds or treat the assets that introduce currency risk as unhedged assets as Section 4.2.9 describes.[45] For CLOs in which foreign exchange risk is more integral, we simulate FX rates based on parameters we estimate from historical currency movements.[46] We layer the FX rates on a binomial analysis in the cash flow model. For each default and recovery rate scenario, we simulate several thousand FX rate curves to use as an input in the cash flow model. A double-binomial approach would be common in such cases to take account of differences in the base-currency and non-base-currency sub-portfolios.

2.3.4 The Expected Loss Calculation

The EL for each tranche is simply the weighted average of losses to each tranche across all the collateral loss scenarios, where the weight is the likelihood of the scenario occurring. We define the loss as the shortfall in the present value of cash flows to the tranche relative to the present value of the promised cash flows.[47] In the case of the BET,

FORMULA 3

$$EL = \sum_{j=0}^{D} P_j L_j$$

Where

» Pj = the probability that scenario j will occur, as defined in formula 1 above

» Lj = the percentage loss to the tranche in scenario j

Source: Moody's Investors Service

FORMULA 4

$$L_j = max\left(0, \frac{PV_{promised} - PV_j}{PV_{promised}}\right)$$

Source: Moody's Investors Service

We evaluate a tranche's EL relative to an EL benchmark. To do so, we first determine the tranche's WAL, which we calculate based on the timing of the tranche's principal payments assuming zero defaults on the underlying collateral. Next, using the tranche's WAL and target rating, we select the relevant EL benchmark from our Idealized Expected Loss Rates table. We then compare the tranche's EL results to the EL benchmark to determine if the EL results are consistent with the target rating.[48]

More specifically, we typically consider the 30 EL values resulting from the six default-timing scenarios and the five interest-rate scenarios described above. We calculate the weighted average of the 30 EL values

[44] For more information, see our cross-sector methodology for assessing swap counterparties in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[45] Small foreign currency baskets can be modeled in Moody's Analytics CDOEdge by stressing (dollar) cash flows using a conservative assumption about possible currency movements over time.

[46] Foreign exchange risk is far more common in EMEA CLOs than it is in US transactions. FX rates are assumed to be lognormally distributed with no trend. The parameters of the FX rate distributions are given in Appendix 8.

[47] The discount rate used to calculate both the PV of the promise and the PV of the cash flows received is the coupon rate or the floating rate plus the promised spread (as applicable) of the CLO liability tranche. For liability tranches with clearly "off-market" coupons or spreads, such as CLO repack, we will apply our quantitative approach for instruments with non-standard promises as described in Appendix 14.

[48] For more information, see Section 9, "Loss Benchmarks."

associated with a given tranche and compare it to the EL benchmark we describe above.[49] To achieve the target rating, the weighted average EL should not exceed the benchmark. However, we may consider exceptions depending upon the likelihood of the case being analyzed.[50] In addition, our rating determination considers the dispersion of the 30 EL results.

3. Liability Tranches with Special Characteristics

We have so far addressed the modeling of standard fixed-rate or floating-rate CLO tranches. The ratings of some special liability types require additional discussion.

3.1 Unfunded and Revolving Liabilities

Unfunded liabilities provide the manager flexibility with respect to asset purchases, particularly during the CLO's ramp-up period. We assign a rating to unfunded liabilities when the CLO closes. We analyze such tranches, which could affect the ratings of other CLO tranches, by considering cases in which the tranches are fully funded.[51]

Revolving notes are often issued to provide funding for revolving assets. If there are circumstances under which the CLO has to rely on such funding (rather than cash reserves) to avoid liquidity shortfalls, CLO documents require that purchasers of revolving notes have high ratings. In the absence of a P-1 rating requirement for such investors, it may be difficult for us to rate the notes. If the rating of the purchaser falls to P-1 under review for possible downgrade, the additional risk could be mitigated through replacement with a P-1-rated entity, a guarantee from a P-1-rated entity, or the complete drawing down of the facility by the CLO.

3.2 Liquidity Facilities

Some CLOs incorporate liquidity facilities that they can draw upon to inject cash in an amount equal to actual or expected par loss associated with defaulted securities or the sales of credit impaired securities. The manager can use the cash infusion, which creates a liability (possibly senior) for the CLO that it repays through the waterfall, to purchase collateral. Typically, the manager can also use liquidity facilities to cover trading losses.

The amount in the model that we assume the manager will draw reflects the provisions for draws under the CLO's governing documents. If the manager has discretion to draw an amount greater than the amount of expected par loss, we will likely run the model assuming the maximum draws permissible. We also model the default of collateral purchased with the proceeds of these draws. In calculating the EL for the facility, we use the amount assumed to be drawn in the particular scenario rather than the total capacity of the facility.[52]

We will consider the extent to which the CLO relies on the facility and the presence and strength of counterparty rating criteria to determine whether additional modeling is necessary.

[49] The weights we apply to each of the six default-timing scenarios and each of the five interest-rate scenarios are in Appendix 10.

[50] Such exceptions could arise, for example, for EL results related to certain points of a CLO's collateral quality matrix that we view as unrealistic.

[51] The fully funded case is normally the more stressful assumption since additional leverage tends to increase the calculated EL for each tranche. When there is reason to believe that this is not the more stressful assumption, we will analyze the transaction under the less-than-fully-funded case.

[52] Alternatively, such a liquidity facility can be viewed as having a path-dependent promise that is suitable for analysis with the non-standard promise approach. See Appendix 14. See also the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section) and in Section 9, "Loss Benchmarks."

The CLO might also have access to a liquidity facility that an external party provides and that the CLO can use to pay interest in the waterfall. Typically, these can be drawn up to the amount of unpaid accrued interest on the assets and are reimbursed at a super-senior level. One particular concern is that the amounts drawn under the facility can be flushed through the waterfall to the equity investors. To address this possibility, we model such draws (which flow through the interest waterfall to the equity) and repayments (on a senior basis) assuming that the amount drawn under the liquidity facility in each period equals a percentage of the interest received on the collateral in that period.

3.3 CLO Liabilities that Mature Prior to Other Tranches

In some cases, CLOs issue liabilities that mature prior to some of the assets in the portfolio, while other liabilities are scheduled to mature after all of the assets do. We then test for the potential for an EOD that would occur if the principal on the shorter-term liabilities cannot be paid in full by maturity. To mitigate such risk, some CLOs include OC tests that assess whether there is sufficient par coverage for shorter-lived tranches based only on the par value of assets that mature prior to these shorter-lived liabilities.

3.4 Securities that Are Backed by CLO Debt Tranches and Equity

We are sometimes asked to rate instruments that are backed by one or more of the CLO's debt tranches and sometimes also the equity tranche. Detailed discussions on the quantitative approach to rate these types of securities appear in Appendix 14.

3.5 CLO Pass-through Instruments

Some CLOs issue instruments that simply pass through all the cash flows of two or more CLO debt tranches to the holders of the instruments. We analyze such instruments using a weighted average expected loss approach. The analytical approach involves the calculation of the expected loss (EL) for the instrument as the par-weighted average of the components' ELs and its WAL as the par-weighted average of the components' zero-default WALs. We then compare the resulting EL value with the EL benchmark from our Idealized Expected Loss Rates table, based on the instrument's WAL, to determine if the EL results are consistent with the target rating.[53]

3.6 Instruments Issued out of Senior/Sub structures

In some cases, CLOs issue instruments that repackage CLO debt tranches and sometimes CLO equity ("CLO repack") out of senior/sub structures. The analytical approach used to analyze these instruments involves modeling the relevant structural waterfall with the cash flows of the underlying CLO components, as described in Section 2. If CLO equity is included as one of the components, we haircut the cash flows received by the equity, as described in Appendix 14.

4. Assets with Special Characteristics

In the modeling approach that we have described so far, we have not distinguished between different types of corporate collateral. In addition to standard syndicated term loans, a CLO can purchase a variety of loan types, as well as non-loan instruments. We discuss the treatment of some of these assets in this section.

The treatment of the various asset types we describe below reflects typical CLO market practice. We consider whether deviations from these practices require adjustments to our modeling assumptions. In the

[53] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section) and in Section 9, "Loss Benchmarks."

extreme, such deviations could make it impossible for us to rate a CLO because adequate analysis of the resulting risks becomes impossible.

4.1 Other Loan Types

4.1.1 Revolving Loans

CLOs often allow for the purchase of loans that are revolving commitments to corporate borrowers (revolving loans). Under such arrangements, the CLO issuer commits to lending a certain maximum amount to a borrower (the commitment amount). The borrower can draw down the line of credit fully or partially pursuant to the terms of the revolving loan. The outstanding drawn amount is the funded amount, and any unused portion of the commitment amount is the unfunded amount.

To calculate the WARF, WARR, diversity score, WAL, and concentration limits, we assume that revolving loans are fully drawn. Thus, the relevant measure of par for these calculations is the commitment amount rather than the funded amount.

To calculate the WAS, we assume that the loan's stated spread is weighted by the funded amount and that the loan's commitment fee is weighted by the unfunded amount.

The OC calculations typically reflect both the funded amount and the balance of any cash in the reserve account established to meet draws on the unfunded amount. When a portion of the unfunded amount is drawn, the reserve account balance will be reduced to fund the draw and the funded amount will increase by a like amount. Thus, a draw will have no effect on the OC ratios.

The IC calculations typically reflect both the funded amount and the unfunded amount. The numerators of the IC ratios include the interest paid in respect of the funded amount, as well as the commitment fees received in respect of the unfunded amount. In addition, the numerators of the IC ratios include any income generated from a reserve account established to meet draws on the unfunded amount.

To help ensure that revolving loans do not impose a liquidity burden on the CLO, they are generally mirrored by a highly liquid source of funding, such as cash in a segregated account or the issuance of a revolving note by the CLO, which we discuss in Section 3.1.

4.1.2 Loan Participations

Normally, the special-purpose vehicle (SPV) in a cash flow CLO will acquire assets in the form of debt obligations such as bonds or loans through a transfer, assignment, or novation of a current lender's rights under a pre-existing bond or loan. In doing so, the SPV will obtain the direct right to the payments of principal and interest from the obligor pursuant to the terms of the asset. If the obligor defaults on payments of interest or principal on the asset, the SPV will have direct rights against the obligor with respect to that asset. Usually, the SPV will also have the benefit of any collateral the obligor provides to secure payment under the bond or loan.

However, in some cases, it is not possible or expedient for an SPV to acquire a direct interest in an asset as described above. In this case, an SPV might instead acquire an indirect exposure to the asset by way of participation, credit-linked note, guarantee, or another similar method, by agreement with a third party that has an interest in the relevant asset. The most common form is participation.

The purchase of a loan participation exposes a CLO to the risk that the seller of the participation will default on its obligations under the participation agreement, particularly in the event of the seller's bankruptcy or insolvency. Such an event would likely impair the seller's ability to pass on to the CLO, in a timely manner,

the cash flows related to the participated loan, with the commensurate risk that the CLO might not ultimately recover the full amount of cash flows that the seller owes it under the participation agreement. To mitigate these concerns, which arise from credit exposure to the seller, as well as operational and legal risks associated with the participation arrangement, CLOs typically limit the amount of loan participations, as well as their exposures to individual sellers, in a manner consistent with the counterparty exposure limits listed in Appendix 5. We consider the limits specified in a CLO's documentation when evaluating the risks posed by exposure to participations.[54]

In some cases, the participating bank itself has only an indirect exposure to the asset through yet another counterparty, which, in turn, might also derive its participation through still other banks. CLO documentation typically limits such chain participations to a very low percentage. Here again, we consider such limits in our analysis.

4.1.3 DIP Loans

Debtor-in-Possession (DIP) loans are court-approved loans made to bankrupt entities. If a DIP entity is subsequently liquidated by a bankruptcy court, a DIP loan lender typically has a super-priority claim against the DIP entity, which entitles the lender to be paid in full before any other creditors are paid. Consequently, if the loans satisfy certain criteria, including having a rating or credit estimate that we have assigned, we model them using a 50% base recovery rate assumption and a Moody's Default Probability Rating one notch below our rating of the facility. CLOs also generally incorporate a concentration limit on DIP loans, typically of no more than 10% of the portfolio.

4.2 Other Assets

4.2.1 Deep Discount Obligations

CLOs typically apply OC haircuts to instruments purchased at a discount to par to address the risks that the manager will purchase such instruments to avoid tripping the OC tests. Without these haircuts, we may model the transaction without giving benefit to the diversion of interest and principal proceeds upon an OC test failure.

CLO indentures generally consider a loan purchased at a price below 85% of par to be a deep discount obligation that should be carried at purchase price for OC test purposes. However, the deep discount obligation threshold might extend down to 80% of par if the loan is rated B3 or higher. For bonds, the corresponding thresholds are 80% and 75% of par.

A small number of CLOs have incorporated the value of a relevant index into their determination of whether an asset qualifies, at the time of purchase, as a deep discount obligation. In such instances, with respect to loans, if the purchase price is less than the lower of a specified price threshold or a relevant index's value on the date of purchase, the loan is defined as a deep discount obligation. With respect to bonds, if the purchase price is less than a specified price threshold and the bond's yield at the time of purchase is more than a certain amount greater than a relevant nationally recognized index, the bond is defined as a deep discount obligation.

Most indentures further provide that a deep discount obligation is carried in the OC tests at 100% of its par value if it trades above a price of 90% of par for loans (85% of par for bonds) for at least 30 consecutive calendar (or 22 consecutive business) days, the price reflecting an independent pricing source, rather than the manager's own opinion. In some cases, CLOs that rely on price and yield thresholds for bonds adopt 100% par treatment once the bond's price rises above a certain trigger level or the yield spread above an

[54] Such counterparty risk can be modeled using the double-binomial approach or through simulation.

index falls below a predetermined trigger amount; others apply 100% par treatment only when the bond price trigger is exceeded.

Some CLOs have also adopted the concept of a deep discount obligation substitution. A substitution entails the sale of an asset at a significant discount, coupled with the purchase of a similarly discounted asset. If the asset sold was not classified as a deep discount obligation (e.g., if it was initially purchased at par), the asset purchased can avoid designation as a deep discount obligation under certain circumstances. The relevant conditions typically include a 10% cumulative limit on such activity, as well as a floor on the price of the purchased asset and a requirement that the price and Moody's Default Probability rating of the purchased asset be at least as high as those of the asset sold. Some transactions also require compliance with key tests, such as satisfaction of the WARF or OC criteria. If a CLO's indenture does not adequately address the risks associated with deep discount obligation substitution, we may model the CLO as if the OC tests were not present.

4.2.2 Caa-Rated Instruments

Because Caa-rated assets have a heightened risk of default, they may not warrant full par credit. CLO indentures generally treat Caa-rated loans and bonds that exceed a threshold of, say, 5% to 7.5% of total par as having par values equal to their market values.[55] These par haircuts typically apply to all of the OC tests and treat the assets with the lowest market values as constituting the excess exposure. When assets are both deep discount obligations and constitute an excess concentration in obligors rated Caa, CLOs typically apply the more conservative of the two par haircuts.

If a CLO's indenture does not adequately address the risks associated with Caa-rated instruments, we may adjust our modeling assumptions, such as by assuming that the OC tests are not present during the reinvestment period.

4.2.3 Defaulted, Current Pay and Credit Impaired Securities

4.2.3.1 DEFINITION AND TREATMENT OF DEFAULTED SECURITIES

CLOs typically base their definition of a defaulted security on a missed interest or principal payment or a bankruptcy filing (or another similar event) and, to capture differences in payment timing, also include in their definition the missed or delayed payment of interest or principal due on an obligation that is senior to or *pari passu* with the instrument the CLO holds. If a CLO's indenture does not reflect these events, we may conduct additional modeling analysis. Additionally, we treat assets with a Moody's Default Probability Rating of "Ca" or "C" as defaulted obligations when reviewing a transaction for surveillance purposes.

Given the potential for defaults in the CLO portfolio, the CLO could at times hold defaulted securities. Market practice is to exclude such assets from the CLO's collateral quality tests and concentration tests.

For the purpose of the CLO's OC tests, the carrying value of a defaulted security is normally the lower of its relevant Moody's recovery rate and its market value. CLO indentures typically require that the manager determine market value from an objective source, if available. Thus, typically, the manager will first seek a bid price from an independent, nationally recognized loan or bond pricing service. If no such price is available, the manager will then seek quotes from independent, nationally recognized dealers who actively trade the instrument. The CLO will use the average of three such quotes or, if three are not available, the lower of two. If only one quote is available, CLOs can rely on it, subject in some cases to additional

[55] In certain cases, the assumed value is min (Market Value, ½*(Moody's Recovery Rate + 100%)).

constraints.[56] It is worth noting that some CLOs permit using values determined by independent valuation services when pricing service or dealer valuations are not available.

If no objective pricing source can be found, CLOs usually permit self-pricing, subject to certain conditions. The CLO permits the manager to self-price a security for the first 30 days after objective sources for its market value are no longer available. After this period, the CLO treats the security as having a market value of zero until a value is available from objective sources. However, the manager can continue to self-price after the first 30 days if the manager (a) is subject to the Investment Advisor's Act of 1940 (or other comparable regulation), (b) self-prices a security for the CLO in the same manner in which it self-prices that security for all other purposes, and (c) will always assign the same value to that security in the CLO that it assigns for all other purposes.

4.2.3.2 TREATMENT OF CURRENT PAY SECURITIES

In addition, the market convention has been that current pay securities need not be treated as defaulted securities. CLO indentures typically define a current pay security as an obligation of an entity that is undergoing insolvency proceedings, that is current on its interest and principal payments, and that the manager believes will remain current. Full par treatment for these instruments is typical so long as they are rated B3 or higher. Instruments with lower ratings usually are also eligible for such treatment so long as their market values exceed certain levels. More specifically, an instrument with (a) a facility rating of at least Caa1 and a market value of at least 80% of par or (b) a facility rating of at least Caa2 and a market value of at least 85% of par, is typically eligible for current pay status. If the instrument's rating or market value falls below the relevant threshold, the instrument is treated as a defaulted security. Finally, CLO indentures usually prohibit a manager from buying current pay securities if the purchase raises the percentage of such instruments relative to total portfolio par beyond a certain threshold, such as 7.5%.

If a CLO excludes current pay securities from calculations such as the portfolio's WARF or the haircuts for Caa-rated assets in excess of the permitted threshold, we may conduct additional modeling analysis to address the associated risks.

4.2.3.3 PURCHASES OF DEFAULTED SECURITIES

Although the typical CLO prohibits the purchase of defaulted securities, some permit their purchase with the sale proceeds from defaulted securities. To mitigate the additional risks that such purchases could introduce, CLOs have incorporated a number of constraints that limit the scope of such purchases and the conditions under which they are permitted. Such constraints typically include the following:

- Except for the fact that a purchased defaulted security (PDS[57]) is a defaulted security, it is otherwise eligible for purchase.
- Sale proceeds of a PDS cannot be used to purchase a PDS.
- The PDS has a lien priority at least equal to that of the sold defaulted security (SDS[58]) and is no less senior in right of payment than the SDS.
- The Moody's Default Probability Rating, if any, of the PDS is equal to or better than the Moody's Default Probability Rating of the SDS if any.

[56] Such constraints might include a limit on the percentage of assets that rely solely on one bid, a more restricted set of bid providers, or a requirement that the manager is subject to the Investment Advisor's Act of 1940.

[57] A defaulted security that is purchased with the sale proceeds of a defaulted security.

[58] A defaulted security that is sold and whose proceeds are used to purchase a defaulted security.

- The period during which the SDS was held is included when determining the length of the period during which the PDS has been held.[59]
- The over-collateralization and interest coverage tests and Moody's WARF test are in compliance after the sale and purchase.
- No restricted trading condition[60] exists.
- The total par amount of all PDS held at any time does not exceed a small fraction (typically, 2.5% to 5%) of the total par amount of the portfolio.
- The total par amount of all PDS purchased after the closing date does not exceed 10% of the portfolio's effective date par amount.

Absent such constraints, we may conduct additional analysis to address the risks associated with the purchase of defaulted securities.

4.2.3.4 PURCHASES OF CREDIT IMPAIRED SECURITIES

A typical CLO prohibits the purchase of credit impaired securities. However, others permit their purchase with the sale proceeds from credit impaired securities but do not require that such purchases comply with the CLO's collateral quality tests and other key limitations, including the rules that govern trading. To mitigate the additional risks that such purchases could introduce, these CLOs typically incorporate many of the constraints that we describe in Section 4.2.3.3 and others that address the risk of a lower ultimate recovery rate and par loss. Absent such constraints, we may conduct additional analysis to address risks such as an increase in the portfolio's WARF or WAL, a reduction in the portfolio's WARR or principal balance or exposure to long-dated assets.

4.2.4 Long-Dated Assets

Long-dated assets, assets that mature after the maturity dates of the CLO liabilities, present market value risk to a CLO. In our modeling of long-dated corporate assets, we generally use the lower of the current market value and the liquidation values we show in Exhibit 3. These liquidation values are based on the extent to which such assets are scheduled to mature after the rated liabilities. In our modeling of long-dated structured finance assets, we rely on the mean recovery rate assumptions that we specify in our methodology for rating structured finance transactions.[61]

[59] This is relevant primarily with respect to any transaction features relating to the treatment of defaulted securities held past a certain holding period.

[60] CLO documents typically define a restricted trading condition as having occurred when we have downgraded any Aaa-rated notes or Aa-rated notes or when we have downgraded any A-rated notes or Baa-rated notes by more than one rating subcategory.

[61] For more information, see our methodology for rating SF CDOs. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

EXHIBIT 3

Corporate Assets' Remaining Time to Maturity After CLO Notes' Maturity	Liquidation Values for Corporate Assets	
	Bonds	Loans
≤6 months	80%	90%
> 6 months and ≤1 year	75%	80%
> 1 year and ≤2 years	50%	70%
> 2 years or no covenant*	25%	50%

* Where the identities of long-dated assets are known, we may use Moody's Aaa certainty-equivalent recovery rates for such assets.

Source: Moody's Investors Service.

Long-dated assets might also be subject to par haircuts in the CLO's OC tests. If so, we might model a few cases, varying the extent to which the basket is utilized and the timing of investment in such assets.

4.2.5 Assets Whose Maturities are Extended

Amend and extend (A&E) arrangements, through which lenders agree to extend the maturities of loans under existing credit agreements, can pose risks to a CLO that does not subject A&Es to the same rules that govern the acquisition of assets. Risks arise if the resulting amended asset can be long-dated or if the manager can consent to such amendments without regard to compliance with the CLO's WAL test, outcomes that would not arise if the rules governing asset acquisitions were to apply.

CLOs address these risks in one of several ways. Many eliminate them by precluding the manager from consenting to amendments that would result in long-dated assets or violation of the WAL test. Some include such preclusions but reduce their effectiveness with various exceptions, some of which are not explicitly credit-related. Others do not address the risks at all.

If long-dated asset risk is present, we may conduct additional analysis assuming a significant portion of long-dated assets is sold at the deal's maturity date at a substantial haircut to par. If the WAL of the deal can be extended through A&Es, we may conduct additional analysis that captures the risks of a WAL that is longer than the CLO's WAL covenant. When both risks are present, we combine these assumptions into a single additional analysis.

4.2.6 Accreting Assets

Market practice is to treat the proceeds from the disposition of accreting assets in a manner consistent with their treatment in the CLO's OC tests. Typically, if the par values of the accreting assets include accretion for OC test purposes, the CLO treats proceeds following the sale, maturity, or redemption of such assets as principal proceeds, up to the assets' accreted values. If instead, the accretion is excluded from the calculated par value in the OC tests, the CLO treats proceeds associated with accretion as interest proceeds. In either case, if the issuer of an accreting asset misses an interest payment on any *pari passu* security, the CLO treats the accreting asset as a defaulted security for OC test and modeling purposes.

4.2.7 Assets with Irregular Interest Cash Flows and WAS Test Adjustments

4.2.7.1 PIKABLE ASSETS

Assets that pay or are payable in kind are those that can defer payment of interest in full (PIKable securities) or in part (partial PIK securities) without being in default under their terms. This excludes obligations that contractually pay a portion of their interest in the form of capitalized principal, as is the case for some mezzanine loans. PIKable securities give rise to liquidity concerns. CLOs are generally unable to purchase assets that are paying in kind at the time of purchase, but there is usually no prohibition against acquiring assets that can subsequently PIK. Interest paid in kind, including the deferring portion of the spread on

partial PIK securities, receives no credit toward the WAC or WAS tests, the result being that a shortfall in the interest on these assets must be offset by additional interest on the CLO's other assets. To limit the risk of a shortfall in interest to non-PIKable CLO liabilities, the basket for assets whose terms do not require that they pay current interest – for example, PIKable and zero-coupon assets – is normally limited to no more than a small percentage of the portfolio balance.

Once an instrument begins to pay in kind – an indication of credit deterioration – the CLO usually treats the instrument as defaulted in the OC tests if it is rated Baa3 or higher and has paid in kind for the lesser of a year or two payment periods, or if it is rated Ba1 or lower and has paid in kind for the lesser of six months or one payment period. It is important to note that the inclusion in the OC test numerators of capitalized interest that arises from PIKing would distort the par credit of the CLO.

4.2.7.2 STEP-UP AND STEP-DOWN ASSETS

Step-Up and Step-Down instruments have coupons or spreads that are scheduled to increase or decrease over time, respectively. Indentures typically treat coupons from Step-Up instruments at their current rates or spreads in the WAC and WAS tests, and we generally model the assets this way. By contrast, indentures generally treat Step-Down instruments as if their coupons or spreads are always equal to their minimum scheduled values.

4.2.7.3 LESS FREQUENTLY PAYING ASSETS

Less frequently paying assets are those that are scheduled to pay interest less frequently than the CLO's liabilities. The inclusion of such assets in a CLO portfolio gives rise to concerns about the CLO's ability to pay interest on its tranches whose interest payments are not deferrable. When the limit for such assets exceeds 10%, CLOs typically incorporate one of the following mitigants.

(a) Cash reserve account: The account traps a portion of interest proceeds from less frequently paying assets in periods when those assets have scheduled payment dates. The trapped cash is then released back into the interest proceeds waterfall in periods in which the less frequently paying assets do not have scheduled payment dates.

(b) Timing swap between the CLO and a highly rated counterparty: The CLO pays the counterparty interest that it receives on less frequently paying assets and, in return, the counterparty pays the CLO a smoothed cash flow stream that is dollar-equivalent, annually, to the CLO's payments to the counterparty. The counterparty is normally subject to the same ratings-based exposure limits as other third parties such as participation sellers.

(c) A limit on the concentration of less frequently paying assets with interest payment dates in any single CLO pay period: The limit depends on the transaction's features, but for a typical CLO, a basket of up to 10% can be sufficient to mitigate the risk posed by less frequently paying assets.

4.2.7.4 LOANS WITH LIBOR AND EURIBOR FLOORS

It is common for CLOs to include the benefit of Libor or Euribor floors when measuring compliance with their WAS tests. The benefit that floors provide could erode as Libor or Euribor increases or if loans with floors mature, prepay, or are sold and are not replaced by loans with comparable yields. Therefore, we may conduct additional cash flow analysis, assuming a WAS that is below the covenant when the benefit of floors is expected to contribute to the WAS calculation.

4.2.7.5 NON-LIBOR- AND NON-EURIBOR-INDEXED FLOATING-RATE ASSETS

Non-Libor- and non-Euribor-indexed floating-rate assets give rise to potential basis risk in a CLO whose liabilities pay a spread over Libor or Euribor. If indices other than Libor or Euribor are eligible bases for assets' interest payments, the CLO sometimes limits the amount of such floaters. For the purpose of the WAS test,

the spread for non-Libor or non-Euribor floaters is normally defined as the difference between the current coupon and current Libor or Euribor.

4.2.7.6 WAS TEST ADJUSTMENTS

Some CLOs permit adjustments to the calculation of WAS when testing for compliance with the WAS covenant. Such adjustments may occur based on the purchase of a given asset at a price below par.

CLOs that permit the manager to determine the contribution of an asset's spread to the WAS calculation by dividing the nominal spread by the purchase price[62] can substantially overstate the portfolio's WAS. However, such CLOs typically incorporate several features to mitigate the risk of such treatment, including carrying the asset at its purchase price in the OC tests. If the manager has the ability to apply such treatment to assets that are deep discount obligations or if the typical restrictions noted above are absent, we may adjust our modeling analysis to use a portfolio WAS assumption that is lower than the WAS covenant.

4.2.8 Instruments that are Convertible, Exchangeable or Have Warrants Attached

CLOs often preclude the purchase of instruments with equity components. Transactions that permit them typically have restrictions that limit the amount of the portfolio's par used to acquire these components. Such restrictions include (i) limiting the value of the equity component to a very small percentage of the value of the instrument and (ii) limiting the amount of assets with equity components to a small percentage of the portfolio's par amount or permitting the purchase of such component only with excess interest proceeds. In addition, CLOs usually permit conversion only at the holder's option and specify that upon conversion, the CLO should dispose of the equity instrument quickly. Absent these types of restrictions, we may adjust our modeling analysis to reflect the risk of par loss associated with such instruments.

4.2.9 Unhedged Assets

In some transactions, a manager will receive a higher allocation than it expects for a desired primary market asset. In this case, the manager would typically sell the excess amount in the market. If the asset is not denominated in the same currency as the liabilities of the CLO, the CLO's hedging requirements might provide for the entry into a precisely matching FX asset swap upon purchase of the asset. However, because the manager's expectation is to quickly sell the excess amount, the manager can try to avoid the cost of entering into a matching asset swap for the excess amount (as well as the cost of swap termination upon the sale of the excess amount). Such assets are unhedged assets.

As there is no perfect asset swap, these assets expose the CLO to FX risk. To minimize this risk, CLO documentation typically imposes certain conditions:

- Unhedged Assets are only primary market obligations (i.e., are purchased within three months from issuance).
- The basket of unhedged assets is limited to 5% of the portfolio.
- Haircuts are applied on the spread or coupon of such unhedged assets in the WAS or WAC test, in the numerator of the IC test, in the calculation of accrued interest, in the OC and the reinvestment tests, and to calculate satisfaction of the target par amount at the effective date.
- The haircuts also apply to the par amount of such assets for the purpose of checking satisfaction of the par maintenance test in the reinvestment criteria (only upon purchase of unhedged assets and not upon their sale).

[62] CLO indentures, however, typically prohibit this treatment for deep discount obligations.

» Unhedged Assets are either sold or are matched by perfect asset swaps within six months of purchase by the CLO.

If these or similar conditions are imposed, and the haircuts are determined to sufficiently assess the FX risk, we may not explicitly model the FX risk arising from the holding of unhedged assets. For standard currencies (USD, GBP, DKK, CHF, NOK, SEK), if the liabilities are denominated in euros, haircuts would typically equal 15%.[63]

4.2.10 Obligors in Countries with Non-Aaa Ceilings

CLOs sometimes permit the inclusion of obligors organized or incorporated in countries that introduce additional credit risk. This risk becomes material as a function of the size of the exposure to such credits as well as the country ceiling itself.

This country risk has multiple sources such as political instability, the risk of systemic economic disruption, or currency redenomination. Scenarios that introduce such risk to CLOs include (a) material exposure to one such country or (b) material exposure to two or more such countries whose risks are fully or partially correlated. In Appendix 13, we provide a framework that we use to analyze scenarios of full correlation. The framework applies haircuts to a CLO portfolio's par amount based on three factors: (a) the CLO tranche's target rating, (b) the amount of exposure to obligors organized or incorporated in such countries, and (c) the magnitude of the country risk, determined by the countries' local currency country ceilings (please see our cross-sector methodology that discusses these ceilings[64]). As we note in Appendix 13, we conduct a case-by-case analysis rather than apply the framework to other circumstances that pose country risk.

Furthermore, significant exposure to obligors from multiple countries that individually pose country risk could affect default correlation and, therefore, the diversity score. We also determine the appropriate recovery rate assumptions for obligors from any one or more such countries case by case considering the domicile of the obligor, whether the obligor is a corporate or sovereign entity, and the instrument type, among other factors.

4.2.11 Structured Finance Securities, Synthetic Securities and Securities Lending

See Appendices 15 through 17 for a discussion of structured finance securities, synthetic securities and securities lending, respectively.

5. Other Structure and Documentation Issues

As in the case of assets and liabilities with special characteristics, the treatment of the structural features we describe below reflects typical CLO market practice. As we have noted, we consider whether deviations from these practices require adjustments to our modeling assumptions. In some instances, such deviations could make rating such a CLO impossible because adequate analysis of the resulting risks is impossible.

5.1 Closing Date, Effective Date, and Ramp-Up Provisions

5.1.1 Interim Tests and Effective Date

Although some transactions declare their effective date on the closing date, most have a ramp-up period during which the manager completes the acquisition of assets. Depending on the length of the ramp-up period and the proportion of assets purchased by the closing date, interim ramp-up tests are sometimes

[63] For CAD, AUD and NZD, the current typical haircuts are 22%, 23% and 30%, respectively. We may update the haircuts for all relevant currencies periodically.

[64] A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

incorporated into the transaction documents.[65] We assess the risk that the effective date covenants will not be met, giving consideration to any interim tests that can mitigate this risk. We also consider whether there are any significant differences between the attributes of the closing date portfolio and the effective date collateral quality criteria, as well as the manager's experience and success in ramping up CLOs.

Soon after the CLO's effective date, a nationally recognized accounting firm (the Auditor) will provide the CLO issuer, the trustee, or the manager an accountant's certificate that includes a list of assets the manager has acquired as well as information regarding compliance with the transaction's effective date criteria: the transaction's target par amount, collateral quality tests, coverage tests, and concentration limitations. The CLO's Collateral Administrator also prepares a report, which it provides to us, that includes information regarding compliance with the effective date criteria. The CLO's waterfall typically includes one or more steps that divert interest and principal proceeds to the extent necessary to preclude our downgrade of any class of rated notes that could arise from the failure of any of the effective date criteria.

5.1.2 Reclassification of Excess Issuance Proceeds as Interest Proceeds

Some CLOs permit the manager to classify a small percentage of issuance proceeds as interest, rather than principal, proceeds following the effective date. In such cases, the CLO indenture limits the classification to issuance proceeds that remain after the ramp-up period has ended. Also, the indenture typically requires that the portfolio has met the CLO's effective date conditions, i.e., the effective date target par amount, collateral quality tests, coverage tests and concentration limitations both before and, on a pro forma basis, after giving effect to the distribution.

5.2 Defining Interest and Principal Proceeds

Because interest proceeds and principal proceeds are usually treated differently in CLO waterfalls, their definitions can have an important impact on the distribution of cash flows. In general, interest proceeds are derived from interest and CDS premia paid on the CLO assets, while principal proceeds are derived from amortization, including amortization of a CDS and other principal payments.[66] Below, we note general market practice to address some of the issues that can arise in the context of these definitions.

5.2.1 Interest Proceeds

CLOs sometimes classify recovery proceeds in excess of par as interest proceeds. However, any interest received with respect to defaulted securities is normally classified as principal proceeds unless and until 100% of par has been recovered.

Interest received on securities that have been paid in kind are only regarded as interest proceeds if there is no remaining PIK balance and the most recent interest payment has been paid in full.

Some transactions treat trading gains as interest proceeds instead of principal proceeds. In such cases, indentures typically impose certain conditions that must be met before such gains are distributed. To mitigate the risks associated with the purchase of deep discount obligations, trading gains are usually measured as the asset's sale price minus the greater of its par amount and purchase price. If instead, the measurement of the gain is based on the difference between the sale and purchase prices, we may adjust our modeling analysis to reflect the resulting risk to the rated notes.

[65] Interim tests typically address asset par acquired, diversity score, WARF, WARR, WAS, and WAC.

[66] Interest proceeds might also include payments such as certain accrued interest payments, late interest payments, various amendment and late fees, guaranteed investment contract earnings, swap payments, and interest on Eligible Investments. Principal Proceeds might also include certain uninvested amounts, reimbursement payments covering synthetic write-downs, principal on Eligible Investments, various late payment or amendment fees, call premia, and certain sale proceeds.

Further, indentures also typically require that (a) trading gains are not classified as interest proceeds until one year after the effective date to prohibit their distribution during that first year; (b) collateral quality tests (at a minimum, the WARF test) are met after the release of the gains through the interest waterfall; (c) the Caa basket is in compliance after release; (d) the junior-most OC test equals or exceeds its effective date level after release; and (e) release of proceeds cannot occur if the senior-most notes have been downgraded or the junior notes have been downgraded by more than one notch.[67] Absent certain of these conditions, we may conduct additional modeling analysis to assess the resulting risk to the rated notes.

5.2.2 Principal Proceeds

If the manager uses principal proceeds to purchase accrued interest, CLO documentation will generally indicate that the amounts are not to be classified as interest proceeds. When interest is actually received on such assets, the amounts will continue to be classified as principal proceeds.[68] If the asset defaults prior to making its interest payment or if the next payment is due after the CLO's next payment date, the CLO will typically reclassify excess interest as principal proceeds to the extent of principal proceeds used to purchase accrued interest on the instrument.

5.3 Eligible Investments and Banks Holding Accounts

A CLO will, from time to time, temporarily invest cash such as interest and principal collections in eligible investments. To minimize the CLO's exposure to credit, duration, and counterparty risk through its holdings of eligible investments, the transaction documents generally incorporate stipulations such as limitations on the types of investments permitted and minimum ratings on such investments. In addition, transaction documents typically include requirements for the minimum ratings on banks that hold the CLO's various accounts and procedures for replacing such entities should they fail to maintain such minimum requirements. We have published a framework applicable to all structured finance transactions that specifies (a) rating standards for a transaction's eligible investments, (b) the types of instruments that qualify as eligible investments, and (c) rating standards for banks holding accounts.[69]

5.4 Fee and Expense Issues

5.4.1 Fees Paid Senior and Junior in the Waterfall

Fees to third parties (e.g., managers, trustees, hedge counterparties, and insurers) that are uncapped pose a risk to the CLO. Open-ended expenses, especially related to indemnification, could threaten the interests of holders of the rated notes if the fees are senior in the waterfall to payments on the rated notes. CLOs usually address this risk by stipulating a cap on any fees that are senior to rated note payments. We include these caps in its cash flow model. Nonetheless, a typical CLO waterfall provides for payment of expenses that exceed the cap. These payments are generally junior to payments that directly affect the rated notes but are senior to payments to the equity.

5.4.2 Management Fees

Fees paid to managers are typically divided into senior and subordinated components. Should the CLO perform poorly, the subordinated fees will most likely be cut off. In this case, the ability of the CLO to attract a replacement manager will depend on the adequacy of the senior fees. To help ensure that a

[67] For the purpose of this and similar downgrade tests, "senior" applies to notes initially rated Aa2 or higher. "Mezzanine" refers to notes initially rated below Aa2 but higher than Ba1.

[68] In other words, the manager cannot convert principal proceeds to interest proceeds through the purchase of accrued interest.

[69] For more information, see our cross-sector methodology for assessing counterparty-related risks in structured finance transactions, including the temporary use of cash in structured finance transaction accounts. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section. We view the degree of linkage between a typical CLO and its Eligible Investments and accounts as "medium."

replacement manager can be found, CLOs typically specify senior fees at a level sufficient to fairly compensate a replacement manager. We will consider the adequacy of these fees in our rating analysis.

Some CLOs mitigate the risk that the initial senior fee will be inadequate by incorporating a senior fee that would be paid only if a replacement manager is needed, and generally with the consent of noteholders. The voting requirements to effect such a fee are normally the same as those for replacing the manager. To be effective, this type of arrangement is typically stipulated in the CLO's closing date documentation.

5.5 Sales and Reinvestment

5.5.1 Sales

Most CLO indentures permit the manager to identify and sell assets as credit-improved or credit-impaired based on various criteria. Indentures also permit the manager to engage in discretionary sales, subject to an annual limit. In addition, indentures typically specify that, upon the erosion of par coverage below the effective date level and the downgrade of certain classes of notes below specified thresholds (such events, together, a "restricted trading condition"), the credit-improved and credit-impaired criteria become more objective and, therefore, more restrictive, and the manager may no longer engage in discretionary sales. Some transactions further specify that following such downgrade, the vote of a requisite percentage of noteholders is sufficient to waive the restricted trading condition.

5.5.2 Reinvestment

We want to ensure that our modeling of CLO risks is consistent with the rules that govern trading and reinvestment. Reinvestment criteria generally provide for the maintenance of the par amount of the portfolio upon reinvestment of credit-improved security sales proceeds, discretionary sales proceeds, and unscheduled or scheduled principal proceeds. Additionally, the reinvestment criteria typically specify that principal proceeds from recoveries from defaulted securities and proceeds from sales of credit-impaired securities be reinvested such that the par amount of the reinvestment collateral is no less than the amount of the sale proceeds. If such par maintenance provisions are absent, we might adjust our modeling assumptions to reflect the potential for the loss of par related to trading. Furthermore, the reinvestment criteria also subject the collateral quality tests to maintain-or-improve criteria.

Some CLOs permit reinvestment after the reinvestment period ends. Proceeds eligible for such reinvestment are normally limited to unscheduled principal receipts and proceeds from the sales of credit-impaired or credit-improved assets. In addition to requiring compliance with all of the rules applicable to trading during the reinvestment period, CLO market practice is to restrict reinvestment after the reinvestment period to cases in which the WARF test, Caa concentration limit, and junior-most OC test are in compliance after the proposed reinvestment.[70] Also, such reinvestment would typically not be permitted if it were to result in a lengthening of the CLO portfolio's remaining WAL. Finally, CLO documentation normally prohibits such reinvestment if the CLO's notes have been downgraded below certain thresholds. Absent such constraints, we may conduct additional analysis to address the risks that reinvestment after the reinvestment period poses.

Some CLOs permit the manager to make basket trades, in which the criteria that apply to individual trades instead apply to groups of assets. If such a provision is incorporated in a CLO indenture, a maintain-or-improve condition is normally attached. The indenture typically further requires that either (a) the time period for a given basket trade is limited to one day or (b) the percentage of the portfolio that can be sold and reinvested in a single basket trade is limited to a small percentage of the portfolio's par amount and the

[70] Rules applicable to trading during the reinvestment period refer to the collateral quality tests, coverage tests, concentration limitations, and rules that pertain to par maintenance.

time limit for the completion of a given basket trade is no more than a few days. In addition, the indenture typically stipulates a suspension of further basket trading if a prior basket trade failed the maintain-or-improve objective.

5.6 Treatment of Events of Default Under the CLO Documentation

Upon an EOD, one or more classes of noteholders generally have the right to accelerate payment to the notes or to liquidate the assets. Typically, upon an acceleration, all cash generated by the assets, after payment of certain fixed expenses, will flow to each class of noteholders based on the class's payment priority until the obligations of each class are met in full or until the cash flows are exhausted. If noteholders choose to liquidate, the assets will be sold over what could be an extended period of time, and proceeds will be paid first to senior noteholders.

Most CLOs include among the causes of an EOD the failure to satisfy an over-collateralization test established solely for determining the occurrence of an EOD. The inclusion of such an OC-based EOD test introduces additional risks to the non-senior notes because acceleration or liquidation resulting from a breach of the test could result in less than their full repayment.

However, CLOs typically include one or more provisions that mitigate such risks. For example, some CLOs require that a super-majority of each class of rated notes, voting separately, must approve the acceleration or liquidation. Such voting rights, in contrast to voting rights for only the controlling class of notes, mitigate the risk that the EOD will result in an outcome that is adverse to the interests of each class of notes. Furthermore, most CLOs define the OC-based EOD test's numerator, denominator and trigger level such that the likelihood of breaching the test is low.[71] Because such a breach and its associated acceleration or liquidation would arise only when asset coverage is negligible for the non-senior-most classes, the incremental risk to these classes is minimal.

If there is neither a voting rights framework nor an OC-based EOD definition that protects all of the rated notes, we might analyze the implications of this feature by modeling a scenario in which the non-voting noteholders receive no interest or principal payments beginning in the period in which the OC-based EOD occurs.

5.7 Domicile of Obligor

CLOs may include covenants on the domiciles of corporate obligors and base the domicile of each corporate obligor on the country in which the obligor is organized or incorporated. They often include an exception for obligors that are operating companies and are organized in certain well-established tax-haven jurisdictions. Some CLOs treat these obligors as domiciled in countries other than tax haven jurisdictions if the manager certifies that the principal portion of the obligor's revenue is generated and income-producing assets are located in such country. In addition, some CLOs permit reliance on the country in which the guarantor of an obligor's debt is organized or incorporated to determine the obligor's domicile. To the extent that a CLO permits significant flexibility on the determination of an obligor's domicile, we may adjust our modeling assumptions accordingly.

[71] For example, a calculation whose denominator includes only the senior-most class of notes and whose trigger is set significantly below the test's closing date level and no higher than between, say, 100% and 102.5% helps to mitigate the risk. The exclusion of par haircuts related to deep discount obligations and Caa-rated assets from the numerator of the calculation further reduces the likelihood of triggering an OC-based EOD. Some transactions further reduce the likelihood of triggering an EOD by carrying defaulted securities at par, rather than at the lower of par and market value.

5.8 Additional Issuance of Notes and Note Redemptions

5.8.1 Additional Issuance of Notes

CLOs permit the issuance of additional notes and typically include provisions to mitigate the risks that such issuance could pose. These provisions often require that (a) issuance of new debt and equity be proportional across all asset classes or that the issuance entails only additional equity; (b) the spreads or, in the case of fixed rate notes, the coupons on the new notes be no higher than, and maturities be at least as long as, those of the corresponding original notes; (c) the coverage tests be maintained or improved after giving effect to the additional issuance; and (d) the proceeds of issuance be classified as principal proceeds and subject to the transaction's reinvestment criteria. In addition, CLOs typically require that holders of the controlling class and the equity consent to any such additional issuance.

Absent this consent requirement or the set of structural provisions above, we may conduct additional modeling analysis to capture the risks of potential additional note issuance.

5.8.2 Selective Note Redemption

Some CLOs permit the issuer to redeem notes that it has issued by buying back and retiring such notes. Such permission could pose credit risk to the notes that remain outstanding if the issuer uses principal proceeds to effect such redemption. The use of such proceeds could result in a reduction in the remaining notes' effective subordination.

CLOs typically include protections to reduce this additional credit risk. These include a requirement (a) that any such redemptions occur in the order of the notes' payment priority and (b) to maintain or improve OC test ratios after the purchase.

Absent the first provision, we might be unable to rate the CLO because the various note classes would have no clear payment priority. Absent the second provision, we may conduct additional modeling analysis to capture the risks of a reduction in the notes' overcollateralization.

5.8.3 Optional Redemption and Partial Refinancing

CLOs generally include an optional redemption ("call") feature by which the CLO can redeem all of its liabilities before the CLO's final stated maturity, using proceeds from a refinancing, the sale of the CLO's assets, or other sources. The CLO's indenture permits a call upon the vote of a sufficient proportion of the equity holders and the satisfaction of various conditions. We review the CLO's call features, including those related to the manager's ability to withdraw a notice of redemption. Most CLOs permit a withdrawal up to a few days before the redemption date if the manager believes that proceeds will, ultimately, be insufficient to redeem the liabilities in full. We view the presence of such an allowance as beneficial to a CLO as it helps mitigate the risk that an optional redemption may fail to fully redeem the notes.

CLOs generally permit the refinancing of one or more classes of notes, subject to the satisfaction of numerous conditions. These conditions typically include that, relative to the notes being redeemed, the newly issued notes have: (a) the same principal amount, rights and payment priority, (b) spreads or fixed rate coupons that are no greater and (c) stated maturities that are no shorter. Absent these conditions, we may conduct additional modeling analysis to assess the resulting risk to the rated notes.

5.8.4 Cancellation of Outstanding Notes

CLOs typically include provisions that (a) prevent noteholders from surrendering their notes to the trustee for cancellation without receiving payment in return or (b) require that any such canceled notes be included in the CLO's OC test calculations until the related class of notes would otherwise have been paid in full. These provisions are helpful to noteholders – their absence could result in note cancellations that reduce the

efficacy of the CLO's OC and IC tests. If a CLO does not include such provisions, we may conduct consider additional modeling analysis to assess the resulting risk to the rated notes.

6. Documentation and Legal Analysis

6.1 Documentation and Legal Opinion Review

Our overall assessment of the legal structure of the CLO typically includes a review of key elements of the issuer, including bankruptcy remoteness, and numerous documents including, as applicable, the indenture, collateral management agreement, trust deed, swap documentation, other transactional agreements, and a number of legal opinions provided by various law firms to the issuer and the arranger.[72] The standard legal opinions delivered in almost every CLO include a general corporate opinion for each party to the transaction, a security interest opinion, an enforceability opinion covering the agreements made by each party to the transaction, and relevant tax opinions. In certain cases, we review additional opinions related to the specifics of a transaction's structure, such as a true sale opinion where there is a close relationship between the seller of the assets and the CLO.

The legal opinions apply the law of the jurisdiction the parties to the transaction have chosen as the governing law of the transaction documents. Therefore, the opinions do not ask the reader to assume that the law of one jurisdiction is the same as that of any other jurisdiction.

In our review of the CLO's documents and opinions, we seek to identify any features, ambiguities, or incentives that could result in the CLO performing in a manner that is not consistent with our rating analysis. Our rating analysis depends on the adequate understanding of the actual functioning of a CLO, as the legal documentation describes. If the documentation is vague or allows wide latitude for amendments that could change key attributes of the transaction, we may adopt a more conservative reading of the document to ensure that alternative interpretations do not render our analysis inadequate.

6.2 Tax Subsidiaries

Some CLOs have established tax blocker subsidiaries (tax subsidiaries) to hold securities that could give rise to tax risks to the CLOs if they held such assets directly. Many tax subsidiaries have been established to passively receive equity securities that the CLOs obtain through the workout of assets. However, some CLOs have sought to expand the types of assets their associated tax subsidiaries hold and the activities in which the tax subsidiaries engage. Broadening the role of the tax subsidiaries can create both tax and bankruptcy risk for the CLO. The expanded holdings and permitted activities of tax subsidiaries are pertinent to our ratings because of the potential credit impact that a loss of income, heightened bankruptcy risk and other related risks can introduce to a CLO. We consider the effects of such additional risks in our CLO rating analysis.

7. Assessing the Roles of the Manager and Other Parties to the CLO

7.1 The Manager

7.1.1 Reviewing the Manager

Given the manager's important role and potential impact on CLO performance, we assess in our rating analysis the manager's ability to manage the CLO. We base our assessment on a number of factors in light

[72] For information on bankruptcy remoteness, a link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

of the specific terms and features of the CLO, as set forth in its governing documents.[73] These factors include the performance of the manager's existing transactions and information we gather from our operations review of the manager. This assessment is part of our qualitative analysis and sometimes leads us to adjust our quantitative analysis to appropriately capture our expectations for the manager's performance.

Regarding the performance of existing CLOs, we consider whether the various coverage and collateral quality tests are in compliance, any positive or negative aspects to the manager's trading behavior, the manager's overall handling of conflicting interests between the debt and equity investors and its adherence to the spirit of the transactions' documents.

Our operations review of the manager includes a discussion about a range of topics, including the amount of corporate assets under management, its overall credit strategy, its credit decision process, and its performance relative to objective benchmarks, as well as unusual transaction features and the performance of the manager's existing CLO transactions. In addition, we discuss the manager's history, organization, staffing, policies and internal controls, systems, software, and business continuity plans. We also seek information related to any audits or regulatory investigations of the manager, such as whether any irregularities were discovered.

7.1.2 The Collateral Management Agreement

The manner in which the manager carries out its duties with respect to the CLO depends, in part, on the provisions of the collateral management agreement (CMA). We believe that the CMA should address, among other issues, three key elements:

» the standards of care and liability of the manager

» the conditions governing termination of the manager

» the provisions for dealing on an arm's-length basis

A strong CMA would generally include the following provisions.

The manager agrees to exercise a degree of care that is no less than that which an institutional manager of international standing would exercise when managing comparable assets. Furthermore, the degree of care is no less than that which the manager itself exercises when managing comparable assets for itself, affiliates, and third parties.

The standard of liability provides that the manager incurs financial liability for losses suffered due to any of its actions that are typically "grossly negligent."

The manager can be removed by investors for cause, including any willful violation or breach of the CMA (without a cure period or material effect carve-out), as well as misrepresentations and breaches of warranties (allowing for a cure period or material effect carve-out). The removal for cause can be prompted by the resolution of a single class of noteholders, rather than effected through the votes of several classes of noteholders, to avoid a delay in or blocking of such removal. In addition, under certain circumstances, the noteholders can remove the manager without showing cause, subject to a majority or super-majority vote. The manager (or any of its affiliates and any accounts for which the manager holds a discretionary mandate) cannot vote on its termination for cause or, following such termination, on naming a replacement manager.

[73] Among these documents is the collateral management agreement, which includes a description of the manager's duties with respect to the CLO. See Section 7.1.2 for a more detailed discussion of this document.

In any case, the process for replacing the manager is resolved with the prevailing decision of the controlling class or the trustee or, ultimately, a court.

The CMA typically provides that the manager deals with related parties on an arms-length basis.

7.2 The Trustee/Collateral Administrator

A fundamental question we ask is whether the trustee/collateral administrator is capable of carrying out its responsibilities with respect to the CLO. The answer will depend, in part, on the experience of the trustee in handling assets of the type the CLO will hold as well as its experience playing the same role in other CLOs.

One of the most important responsibilities of the trustee is to report on the CLO's compliance with the many requirements of the CLO indenture. At a minimum, we expect to receive the following from the trustee every reporting period, all for the purpose of monitoring the assigned ratings:

- measured levels vs. covenanted levels for all coverage tests, collateral quality tests and concentration limitations, along with a pass/fail indication and calculation details
- each defaulted security (not just those that defaulted during the latest period) and the date of default
- details of the portfolio, including trading history[74]
- notional amounts of any hedges
- account balances
- note balances
- the rated balance for any combination securities
- the status of unhedged assets
- the ratings of any noteholders that have contingent funding obligations
- the ratings of any hedge counterparties

For each payment date, we ask to receive the following:

- all items in the report list above
- details of payments applied in accordance with the waterfall

We ask to receive copies of any written notices provided to any party pursuant to the underlying documentation. We also request prompt written notice of any note redemptions so that we can withdraw our ratings on a timely basis. We review pro forma reports to assess if we believe that they are sufficient for our monitoring purposes.

7.3 The Auditor

As Section 5.1.1 notes, the auditor is generally required to certify compliance with CLO indenture covenants on the effective date. The auditor audits the accounts of the CLO issuer at least annually and provides the results to the trustee.

The auditor also performs certain agreed-upon-procedures (such as effective date confirmations).

[74] Our credit estimates and UMLRs should not be provided in these reports.

8. Monitoring

8.1 Overview

We generally apply the components of the approach described in this report when monitoring CLO note ratings.

After a CLO closes, we incorporate in our monitoring analysis information that becomes available to us over time. In addition to periodic notices and reports that we receive from the transaction parties (e.g., Trustee), we may require other information on a case-by-case basis.

Generally, we track the credit performance of the underlying collateral (e.g., potential defaults or significant credit migration), the characteristics of the transaction (e.g., reinvesting versus deleveraging), and relevant changes in the credit environment. If a performance measure varies materially from its initial limits or previous state or the transaction structure changes, we may review the CLO notes' outstanding ratings.[75]

When assessing the impact of simple CLO refinancings where the CLO's liabilities are repriced at lower rates, we generally follow the components of our approach for monitoring analysis. A simple CLO refinancing reduces a transaction's financing costs with limited amendments to the transaction terms and no significant change in the structure or covenants.

8.2 Reinvesting vs. Static or Amortizing Transactions

When rating a reinvesting transaction, we derive our portfolio assumptions from the limits defined in the indenture. In contrast, when rating a CLO that is static (or substantially static) or amortizing, we typically use the portfolio's actual collateral quality measures as inputs to our modeling.

In our analysis of reinvesting CLOs whose collateral quality measures or par coverage have improved significantly or have large buffers relative to their covenants, we may use collateral quality measures or par amounts that consider such improvements or buffers. Conversely, if a CLO is out of compliance with one or more of its collateral quality covenants or has lost par coverage relative to its effective date level, we typically use the portfolio's actual metrics.

8.2.1 Weighted Average Life and Amortization Profile

In our monitoring analysis, we model WAL and an amortization profile based on the transaction's then-current WAL covenant, the portfolio WAL and the phase in the transaction's lifecycle (reinvestment period vs. amortization period).

Reinvestment phase: We generally model a WAL and an amortization profile consistent with our approach to analyzing transactions at inception. However, we use the WAL and the amortization profile of the current portfolio when there are fewer than four months remaining in the reinvestment period.[76]

For transactions where performance metrics have deteriorated to the extent that we expect to downgrade one or more rated obligations, we would use a WAL with a period that is the shorter of the current portfolio

[75] For example, in methodologies where models are used, modeling is not relevant when it is determined that (1) a transaction is still revolving and performance has not changed from expectations, or (2) all tranches are at the highest achievable ratings and performance is at or better than expected performance, or (3) key model inputs are viewed as not having materially changed to the extent it would change outputs since the previous time a model was run, or (4) no new relevant information is available such that a model cannot be run in order to inform the rating, or (5) our analysis is limited to asset coverage ratios for transactions with undercollateralized tranches, or (6) a transaction has few remaining performing assets.

[76] Assets that mature during the remaining four months are modeled as maturing during the amortization period. The resulting WAL is likely to be moderately longer than that of the current portfolio.

WAL plus one year or the WAL covenant. If less than one year remains in the reinvestment period, we generally model the WAL and amortization profile of the current portfolio.[77]

Amortization phase: We generally assume a WAL and an amortization profile that are the same as those of the current portfolio.

When necessary, we modify these assumptions to account for transactions with unique provisions, such as those that make reinvestment contingent on transaction performance or permit significant reinvestment flexibility during the amortization period.[78]

8.2.2 Analyzing End-of-Life Portfolios

As a portfolio's homogeneity decreases significantly late in the life of a transaction, the BET may become less suitable for modeling the portfolio's default distribution. As a result, we may shift to or complement the BET analysis with a simulated default distribution approach, using CDOROM and/or individual scenario analysis.

8.2.3 Weighted Average Spread and Floors

In our monitoring analysis of reinvesting transactions, we typically conduct additional cash flow analysis, assuming a WAS that is below the covenant when the WAS calculation includes the benefit of floors, as we describe in section 4.2.7.4. However, we allow greater credit to the cash-flow benefit that Libor or Euribor floors provide when rating a transaction during its amortization period or when there are fewer than four months remaining in the reinvestment period. In such cases, WAS is modeled as a period-by-period vector of weighted average spreads that might vary in each period. The vector is based on the current portfolio's projected schedule of weighted average spreads (without the benefit of floors and based on current information on scheduled maturities), but adjusted upward in each model period, as applicable, by an amount equal to the excess of the weighted average floor rate over the assumed Libor or Euribor base rate for the period. For this purpose, the weighted average floor rate is a constant value calculated based on the floors of the loans in the then-current portfolio.

8.3 Other Monitoring Assumptions

8.3.1 Long-Dated Obligations

When monitoring CLOs, we generally apply the same approach that we outline in Section 4.2.4 to address the market value risk associated with the liquidation of long-dated assets. But, we typically make some adjustments to that approach, basing our analysis on the amount of any material accumulation of long-dated assets. In addition, we may make adjustments depending on (a) the likelihood that long-dated assets will remain outstanding as the deal approaches maturity and becomes subject to liquidation risk and (b) the potential liquidation values of the identified long-dated assets. For example, we may consider the expected prepayment rates of such long-dated assets and the manager's track record and strategy with respect to such assets. We may also consider the flexibility that the CLO structure affords the manager to participate in loan amendments that extend maturities. Last, we might adjust our estimated liquidation values of long-dated assets outlined in Section 4.2.4 based on the price volatility of assets similar to the long-dated assets and the time remaining until the CLO's maturity.

[77] Assets that mature during remaining reinvestment period are modeled as maturing during the amortization period. The resulting WAL is likely to be moderately longer than that of the current portfolio.

[78] See Section 5.5.2 for a discussion of reinvestment following the reinvestment period.

When monitoring CLO liabilities (a) that are maturing within one year and (b) whose outstanding balances exceed the total par amount of the portfolio's non-long-dated assets, we may apply the following rating caps:

EXHIBIT 4

Time to CLO Liability Maturity	Rating Cap
> 6 months and ≤ 1 year	Baa3 (sf)
≤ 6 months	Ba3 (sf)

Source: Moody's Investors Service

We begin to apply these caps one year prior to maturity. However, when exposures to long-dated assets are material, we may apply these caps before the deal reaches the one-year mark.

Additionally, in the case of investments in CLO tranches that are also long-dated assets, our analysis reflects an assessment of their expected lives to determine if they expose the rated liabilities to liquidation price risk. Our determination is based on the CLO tranche investment's legal maturity and seniority (with the current rating as a proxy for seniority). For investments in CLO tranches with (a) current ratings of A3 or above and (b) legal maturities within the two years following the maturity date of the rated liabilities, we expect that such securities are highly likely to be repaid before their scheduled legal maturities. Therefore, we treat them as if they were not long-dated assets and include them in our calculation of portfolio WARF and WARR.

In the case of all other CLO tranches that are long-dated assets (i.e., CLO tranches that have legal maturities more than two years after the maturity of the rated liabilities or have current ratings of Baa1 or below), we model the liquidation of such CLO tranches at the maturity of the rated liabilities. However, we exclude such securities from our calculation of portfolio WARF and WARR.

8.3.2 Haircuts for Excess Caa Assets and Deep Discount Obligations

A CLO's indenture typically provides that deep discount obligations, as well as Caa assets exceeding a certain threshold, are subject to par haircuts in some or all of the CLO's OC tests, as Sections 4.2.1 and 4.2.2 describe. When monitoring CLO ratings in relation to portfolios that are or might soon become subject to such haircuts, we take into consideration the potential volatility in such haircuts over the life of the CLO. In this regard, we might analyze a number of scenarios, including electing not to model de minimis[79] haircut amounts or modeling an aggregate par haircut in an amount up to that reflected in the CLO's most recent trustee report (expressed as a percentage of portfolio par).

8.3.3 Recovery Rates and Recovery Timing for Defaulted Securities

If a CLO holds defaulted securities, we make assumptions in our monitoring analysis regarding recovery rates and timing of recovery. We assume recoveries to be equal to the current market values of these securities when analyzing transactions whose rated obligations we expect to downgrade. Conversely, when analyzing transactions that we expect to upgrade, we assign recovery values equal to the lower of the defaulted securities' current market values and our recovery rate assumptions for such securities. In modeling the timing of recoveries on such holdings, we assume that such recoveries are realized in cash on the first payment date occurring 1.5 years from the date of our analysis.

In modeling defaults and recoveries on material concentrations of structured finance obligations, we assume that recoveries occur immediately after default. As a result, we model recoveries on such defaulted

[79] We generally consider trustee-reported haircuts of less than or equal to 2% of outstanding par to be sufficiently trivial.

structured finance obligations without any applicable gross-up arising from higher post-workout recoveries described in Section 2.2.3.2.

8.3.4 Portfolio Information

As Section 7.2 describes, we receive periodic trustee reports outlining all of the current characteristics of the portfolio, as well as the computation of all of the CLO's tests. In those cases in which we consider the actual characteristics of the portfolio, the monitoring of the rated CLO liabilities is based in part on these reports. However, because of the impact of any modifications of assumptions that we might make during the life of a transaction, our analysis uses certain model inputs (e.g., par, WARF, diversity score, and WARR) whose values are not necessarily the same as those reported by trustees, but which reflect our best assessment of the actual characteristics of the portfolio.

9. Loss Benchmarks

In evaluating the model output for CLOs, we select loss benchmarks referencing the Idealized Expected Loss table[80] using the Wide Asymmetric Range, in which the lower-bound of loss consistent with the rating category is given by the Idealized Expected Loss rate associated with the next higher rating category. For initial ratings and upgrade rating actions, the upper-bound of loss consistent with a given rating category is equal to the Idealized Expected Loss rate associated with the given rating category. When monitoring a rating for downgrade, the upper-bound of loss is computed as a 50/50 weighted average on a logarithmic scale. That is, the benchmark boundaries of loss appropriate for evaluating rating category R are given by:

FORMULA 5

$$[1]\ Rating\ Lower\ Bound_R = Idealized\ Expected\ Loss_{R-1}$$

$$[2]\ Initial\ Rating\ Upper\ Bound_R = Idealized\ Expected\ Loss_R$$

$$[3]\ Current\ Rating\ Upper\ Bound_R = exp\{0.5 \cdot log(Idealized\ Expected\ Loss_R) + 0.5 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

Where:

- $Rating\ Lower\ Bound_R$ means the lowest Idealized Expected Loss associated with rating R and the expected loss range of rating R is inclusive of the $Rating\ Lower\ Bound_R$.
- $Initial\ Rating\ Upper\ Bound_R$ means the highest Idealized Expected Loss associated with rating R that is either initially assigned or upgraded and the expected loss range of rating R is exclusive of the $Rating\ Upper\ Bound_R$.
- $Current\ Rating\ Upper\ Bound_R$ means the highest Idealized Expected Loss associated with rating R that is currently outstanding and the expected loss range of rating R is exclusive of the $Rating\ Upper\ Bound_R$.
- $R\text{-}1$ means the rating just above R.
- $R+1$ means the rating just below R.
- The Rating Lower Bound for Aaa is 0% and the Rating Upper Bound for C is 100%. These are not derived using the formula.

Source: Moody's Investors Service.

[80] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in Rating Symbols and Definitions. A link can be found in the "Moody's Related Publications" section.

10. Environmental, Social and Governance Considerations

Environmental, social and governance (ESG) considerations may affect the ratings of CLOs which are backed by a portfolio of loans to corporate entities. We evaluate the risk following our cross-sector methodology that describes our general principles for assessing these ESG issues[81] and may incorporate it in our analysis.

[81] A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Appendix 1: Default Probability Stresses

EXHIBIT 1-1

Default Probability Stresses

Rating	Rating Factor	Stress Factors
Aaa	1	1.95
Aa1	10	1.80
Aa2	20	1.78
Aa3	40	1.76
A1	70	1.73
A2	120	1.71
A3	180	1.69
Baa1	260	1.67
Baa2	360	1.65
Baa3	610	1.63
Ba1	940	1.50
Ba2	1350	1.35
Ba3	1766	1.20
B1	2220	1.00
B2	2720	1.00
B3	3490	1.00
Caa1	4770	1.00
Caa2	6500	1.00
Caa3	8070	1.00
Ca	10000	1.00
C	10000	1.00

Source: Moody's Investors Service

Appendix 2: Recovery Rate Assumptions

Recovery Rate Assumptions

The assumptions below are appropriate when immediate recoveries or recovery lags of up to but excluding one year are modeled:[82]

TABLE 1

Target Rating	First-Lien Senior Secured Loan Instrument Rating Relative to Moody's Default Probability Rating[83]					
	-3 Notches or Less	-2 Notches	-1 Notch	0 Notches	1 Notch	2 Notches or More
Aaa	20.0%	30.0%	40.0%	45.0%	50.0%	60.0%
Aa1	20.0%	30.0%	40.0%	45.0%	50.0%	60.0%
Aa2	20.0%	30.0%	40.0%	45.0%	50.0%	60.0%
Aa3	20.7%	31.0%	41.7%	46.7%	51.7%	61.7%
A1	21.3%	32.0%	43.3%	48.3%	53.3%	63.3%
A2	22.0%	33.0%	45.0%	50.0%	55.0%	65.0%
A3	22.8%	34.1%	46.7%	51.7%	56.7%	66.7%
Baa1	23.5%	35.2%	48.3%	53.3%	58.3%	68.3%
Baa2	24.2%	36.3%	50.0%	55.0%	60.0%	70.0%
Baa3	25.0%	37.5%	51.7%	56.7%	61.7%	71.7%
Ba1	25.9%	38.8%	53.3%	58.3%	63.3%	73.3%
Ba2	26.7%	40.0%	55.0%	60.0%	65.0%	75.0%
Ba3 to C	26.7%	40.0%	55.0%	60.0%	65.0%	75.0%

Source: Moody's Investors Service

TABLE 2

Target Rating	Second-Lien Loan, Senior Secured Bond, Senior Secured Floating Rate Note Instrument Rating Relative to Moody's Default Probability Rating[84]					
	-3 Notches or less	-2 Notches	-1 Notch	0 Notches	1 Notch	2 Notches or more
Aaa	5.0%	15.0%	25.0%	35.0%	45.0%	55.0%
Aa1	5.0%	15.0%	25.0%	35.0%	45.0%	55.0%
Aa2	5.0%	15.0%	25.0%	35.0%	45.0%	55.0%
Aa3	5.2%	15.5%	25.8%	36.5%	46.7%	56.6%
A1	5.4%	16.1%	26.7%	37.9%	48.3%	58.0%
A2	5.5%	16.5%	27.5%	39.4%	50.0%	59.6%
A3	5.7%	17.1%	28.4%	40.9%	51.7%	61.1%
Baa1	5.9%	17.6%	29.3%	42.3%	53.3%	62.6%
Baa2	6.1%	18.2%	30.3%	43.8%	55.0%	64.2%
Baa3	6.3%	18.8%	31.3%	45.2%	56.7%	65.7%
Ba1	6.5%	19.4%	32.3%	46.6%	58.3%	67.2%
Ba2	6.7%	20.0%	33.3%	48.1%	60.0%	68.8%
Ba3 to C	7.0%	20.0%	33.3%	48.1%	60.0%	68.8%

Source: Moody's Investors Service

[82] We will provide recovery rate assumption for credit estimates to the CLO's manager.

[83] We apply the recovery rate assumptions in Table 1 to first-lien senior secured loans and apply the recovery rate assumptions in Table 2 to first-lien last-out loans and other secured loans without senior-most priority.

[84] For obligations that are second lien loans, senior secured bonds, or senior secured floating rate notes, if the corresponding obligor has a CFR and the obligation has an instrument rating assigned by us, we will determine its recovery rate assumption from Table 2. Otherwise, if such obligor does not have a CFR or the obligation does not have an instrument rating assigned by us, we will determine the recovery rate assumption from Table 3.

TABLE 3

Target Rating	Senior Unsecured Loan, Senior Unsecured Bond, Subordinated Bond Instrument Rating Relative to Moody's Default Probability Rating					
	-3 Notches or less	-2 Notches	-1 Notch	0 Notches	1 Notch	2 Notches or more
Aaa	5.0%	15.0%	25.0%	30.0%	35.0%	45.0%
Aa1	5.0%	15.0%	25.0%	30.0%	35.0%	45.0%
Aa2	5.0%	15.0%	25.0%	30.0%	35.0%	45.0%
Aa3	5.2%	15.5%	25.8%	31.0%	36.5%	46.7%
A1	5.4%	16.1%	26.7%	32.0%	37.9%	48.3%
A2	5.5%	16.5%	27.5%	33.0%	39.4%	50.0%
A3	5.7%	17.1%	28.4%	34.1%	40.9%	51.7%
Baa1	5.9%	17.6%	29.3%	35.2%	42.3%	53.3%
Baa2	6.1%	18.2%	30.3%	36.3%	43.8%	55.0%
Baa3	6.3%	18.8%	31.3%	37.5%	45.2%	56.7%
Ba1	6.5%	19.4%	32.3%	38.8%	46.6%	58.3%
Ba2	6.7%	20.0%	33.3%	40.0%	48.1%	60.0%
Ba3 to C	7.0%	20.0%	33.3%	40.0%	48.1%	60.0%

Source: Moody's Investors Service

To determine the certainty-equivalent recovery rate assumption to use in the modeling of a typical CLO, we will select three categories of recovery rate assumptions from the tables above and assign weights to each category, based on the following:

1. Assign a 25% recovery rate assumption ("Aaa" row of Table 2, "-1 Notch" column) to the maximum percentage of instruments other than first-lien senior secured loans that the CLO permits.
2. Calculate the recovery rate assumption for the remainder of the portfolio needed to achieve the Aaa certainty-equivalent weighted average recovery rate assumption for the overall portfolio.
3. Select the two adjacent rates from the "Aaa" row of Table 1 whose weighted average will achieve the desired result in the previous step and calculate the necessary weights for those two recovery rate assumptions.
4. Determine the certainty-equivalent recovery rate assumption for a given CLO tranche using both the appropriate recovery rate assumption from each of the three recovery rate categories, based on the tranche's target rating and the weights corresponding to those categories as determined from the previous three steps.

Recovery Rates for Structured Finance Obligations

For Moody's recovery rate assumptions for structured finance obligations, see our methodology for rating SF CDOs.[85]

[85] For more information, see our methodology for rating SF CDOs. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Appendix 3: Examples Illustrating Moody's Modeling Approach to Defaulting Reinvestment

	Period (Year)		1	2	3	4	5	6	Total Reinvestment Defaulted	Proportion of Defaults as Fraction of the Reinvested Amount
	Default Timing Vector Applied to Original Collateral		50%	10%	10%	10%	10%	10%		
	Default Scenario *	20%								
	Reinvested Amount	$10,000,000								
Example 1:	Amount of Reinvestment**		$10,000,000							
	Amount of Reinvestment Defaulted		$1,000,000	$200,000	$200,000	$200,000	$200,000	$200,000	**$2,000,000**	**20%**
Example 2:	Amount of Reinvestment**			$10,000,000						
	Amount of Reinvestment Defaulted			$200,000	$200,000	$200,000	$200,000	$200,000	**$1,000,000**	**10%**
Example 3:	Amount of Reinvestment**				$10,000,000					
	Amount of Reinvestment Defaulted				$200,000	$200,000	$200,000	$200,000	**$800,000**	**8%**
Example 4:	Amount of Reinvestment**					$10,000,000				
	Amount of Reinvestment Defaulted					$200,000	$200,000	$200,000	**$600,000**	**6%**
Example 5:	Amount of Reinvestment**						$10,000,000			
	Amount of Reinvestment Defaulted						$200,000	$200,000	**$400,000**	**4%**
Example 6:	Amount of Reinvestment**							$10,000,000		
	Amount of Reinvestment Defaulted							$200,000	**$200,000**	**2%**

* We show these six examples for a scenario in which 20% of the assets in the original portfolio default.

** The amount assumed to be reinvested arises from the recovery proceeds of previous defaults and interest proceeds diverted by the reinvestment OC test.

Source: Moody's Investors Service

Appendix 4: Diversity Score

We calculate a CLO's diversity score according to the following steps:

» An **obligor par amount** is calculated for each obligor represented in the portfolio by summing the par amounts of all the assets in the portfolio issued by that obligor and its affiliates.

» An **average par amount** is calculated by summing all of the obligor par amounts and dividing the resulting sum by the number of obligors represented in the portfolio.

» An **equivalent unit score** is calculated for each obligor by taking the lesser of (a) one or (b) the quotient of (i) its obligor par amount and (ii) the average par amount.

» An **aggregate industry equivalent unit score** is calculated for each industry group by adding the equivalent unit scores for all obligors in the same industry group. "Industry group" means those obligors that have the same Moody's industry classification (see Appendix 6).

» Each aggregate industry equivalent unit score is mapped to its corresponding industry diversity score (see the table below). If any aggregate industry equivalent unit score falls between two aggregate industry equivalent unit score values in the table, the applicable industry diversity score will be that corresponding to the lower of the two aggregate industry equivalent unit score values.

» The CLO's diversity score is the sum of all the industry diversity scores. If the CLO's diversity score is not an integer, it is rounded down to an integer.

Aggregate Industry Equivalent Unit Score	Industry Diversity Score	Aggregate Industry Equivalent Unit Score	Industry Diversity Score	Aggregate Industry Equivalent Unit Score	Industry Diversity Score	Aggregate Industry Equivalent Unit Score	Industry Diversity Score
0.0000	0.0000	5.0500	2.7000	10.1500	4.0200	15.2500	4.5300
0.0500	0.1000	5.1500	2.7333	10.2500	4.0300	15.3500	4.5400
0.1500	0.2000	5.2500	2.7667	10.3500	4.0400	15.4500	4.5500
0.2500	0.3000	5.3500	2.8000	10.4500	4.0500	15.5500	4.5600
0.3500	0.4000	5.4500	2.8333	10.5500	4.0600	15.6500	4.5700
0.4500	0.5000	5.5500	2.8667	10.6500	4.0700	15.7500	4.5800
0.5500	0.6000	5.6500	2.9000	10.7500	4.0800	15.8500	4.5900
0.6500	0.7000	5.7500	2.9333	10.8500	4.0900	15.9500	4.6000
0.7500	0.8000	5.8500	2.9667	10.9500	4.1000	16.0500	4.6100
0.8500	0.9000	5.9500	3.0000	11.0500	4.1100	16.1500	4.6200
0.9500	1.0000	6.0500	3.0250	11.1500	4.1200	16.2500	4.6300
1.0500	1.0500	6.1500	3.0500	11.2500	4.1300	16.3500	4.6400
1.1500	1.1000	6.2500	3.0750	11.3500	4.1400	16.4500	4.6500
1.2500	1.1500	6.3500	3.1000	11.4500	4.1500	16.5500	4.6600
1.3500	1.2000	6.4500	3.1250	11.5500	4.1600	16.6500	4.6700
1.4500	1.2500	6.5500	3.1500	11.6500	4.1700	16.7500	4.6800
1.5500	1.3000	6.6500	3.1750	11.7500	4.1800	16.8500	4.6900
1.6500	1.3500	6.7500	3.2000	11.8500	4.1900	16.9500	4.7000
1.7500	1.4000	6.8500	3.2250	11.9500	4.2000	17.0500	4.7100
1.8500	1.4500	6.9500	3.2500	12.0500	4.2100	17.1500	4.7200
1.9500	1.5000	7.0500	3.2750	12.1500	4.2200	17.2500	4.7300
2.0500	1.5500	7.1500	3.3000	12.2500	4.2300	17.3500	4.7400

Aggregate Industry Equivalent Unit Score	Industry Diversity Score	Aggregate Industry Equivalent Unit Score	Industry Diversity Score	Aggregate Industry Equivalent Unit Score	Industry Diversity Score	Aggregate Industry Equivalent Unit Score	Industry Diversity Score
2.1500	1.6000	7.2500	3.3250	12.3500	4.2400	17.4500	4.7500
2.2500	1.6500	7.3500	3.3500	12.4500	4.2500	17.5500	4.7600
2.3500	1.7000	7.4500	3.3750	12.5500	4.2600	17.6500	4.7700
2.4500	1.7500	7.5500	3.4000	12.6500	4.2700	17.7500	4.7800
2.5500	1.8000	7.6500	3.4250	12.7500	4.2800	17.8500	4.7900
2.6500	1.8500	7.7500	3.4500	12.8500	4.2900	17.9500	4.8000
2.7500	1.9000	7.8500	3.4750	12.9500	4.3000	18.0500	4.8100
2.8500	1.9500	7.9500	3.5000	13.0500	4.3100	18.1500	4.8200
2.9500	2.0000	8.0500	3.5250	13.1500	4.3200	18.2500	4.8300
3.0500	2.0333	8.1500	3.5500	13.2500	4.3300	18.3500	4.8400
3.1500	2.0667	8.2500	3.5750	13.3500	4.3400	18.4500	4.8500
3.2500	2.1000	8.3500	3.6000	13.4500	4.3500	18.5500	4.8600
3.3500	2.1333	8.4500	3.6250	13.5500	4.3600	18.6500	4.8700
3.4500	2.1667	8.5500	3.6500	13.6500	4.3700	18.7500	4.8800
3.5500	2.2000	8.6500	3.6750	13.7500	4.3800	18.8500	4.8900
3.6500	2.2333	8.7500	3.7000	13.8500	4.3900	18.9500	4.9000
3.7500	2.2667	8.8500	3.7250	13.9500	4.4000	19.0500	4.9100
3.8500	2.3000	8.9500	3.7500	14.0500	4.4100	19.1500	4.9200
3.9500	2.3333	9.0500	3.7750	14.1500	4.4200	19.2500	4.9300
4.0500	2.3667	9.1500	3.8000	14.2500	4.4300	19.3500	4.9400
4.1500	2.4000	9.2500	3.8250	14.3500	4.4400	19.4500	4.9500
4.2500	2.4333	9.3500	3.8500	14.4500	4.4500	19.5500	4.9600
4.3500	2.4667	9.4500	3.8750	14.5500	4.4600	19.6500	4.9700
4.4500	2.5000	9.5500	3.9000	14.6500	4.4700	19.7500	4.9800
4.5500	2.5333	9.6500	3.9250	14.7500	4.4800	19.8500	4.9900
4.6500	2.5667	9.7500	3.9500	14.8500	4.4900	19.9500	5.0000
4.7500	2.6000	9.8500	3.9750	14.9500	4.5000		
4.8500	2.6333	9.9500	4.0000	15.0500	4.5100		
4.9500	2.6667	10.0500	4.0100	15.1500	4.5200		

Source: Moody's Investors Service

Appendix 5: Typical Concentration Limits for Counterparty Exposure

The limits below are typical for exposures to participation, letter of credit, securities lending and synthetic security counterparties.

Rating of Institution	Individual Counterparty Limits	Aggregate Cumulative Counterparty Limits
Aaa	20.0%	20.0%
Aa1	10.0%	20.0%
Aa2	10.0%	20.0%
Aa3	10.0%	15.0%
A1	5.0%	10.0%
A2*	5.0%	5.0%
A3 or below	0%	0%

* Only if the entity also has our short-term rating of P-1

Source: Moody's Investors Service

Appendix 6: Moody's Industry Classifications

For the calculation, we treat obligors in a given local industry but from different regions as if they were in different industries. We group obligors in global industries based on their corresponding industries, regardless of their regions.[86] The Industry Classifications are as follows (local industries are underlined).

1) Aerospace & Defense
2) Automotive
3) Banking, Finance, Insurance & Real Estate
4) Beverage, Food & Tobacco
5) Capital Equipment
6) Chemicals, Plastics & Rubber
7) Construction & Building
8) Consumer Goods – Durable
9) Consumer Goods – Non-durable
10) Containers, Packaging & Glass
11) Energy – Electricity
12) Energy – Oil & Gas
13) Environmental Industries
14) Forest Products & Paper
15) Healthcare & Pharmaceuticals
16) High Tech Industries
17) Hotel, Gaming & Leisure
18) Media – Advertising, Printing & Publishing
19) Media – Broadcasting & Subscription
20) Media – Diversified & Production
21) Metals & Mining
22) Retail
23) Services – Business
24) Services – Consumer
25) Sovereign & Public Finance
26) Telecommunications
27) Transportation – Cargo
28) Transportation – Consumer

[86] A link to the corresponding industries can be found in the "Moody's Related Publications" section.

29) Utilities – Electric

30) Utilities – Oil & Gas

31) Utilities – Water

32) Wholesale

Regions (applicable to the diversity score calculation when local industries are included in the portfolio)

We consider any country not listed in the table below to be in the "Other" category.

This region classification is not based on geography but rather on our view of contagion risk.

Country	Region for Diversity Score
AFGHANISTAN	Region 1
ALAND ISLANDS	Region 1
ALBANIA	Region 1
AMERICAN SAMOA	Region 2
ANDORRA	Region 1
ANGUILLA	Region 1
ANTARCTICA	Region 2
ARMENIA	Region 1
ARUBA	Region 1
AUSTRALIA	Region 3
AUSTRIA	Region 1
AZERBAIJAN	Region 1
BAHAMAS	Region 2
BARBADOS	Region 2
BELARUS	Region 1
BELGIUM	Region 1
BERMUDA	Region 2
BOSNIA	Region 1
BOSNIA AND HERZEGOVINA	Region 1
BOUVET ISLAND	Region 1
BRUNEI	Region 3
BULGARIA	Region 1
CAMBODIA	Region 3
CANADA	Region 2
CAYMAN ISLANDS	Region 2
CHINA	Region 3
CHRISTMAS ISLAND	Region 3
COCOS (KEELING) ISLANDS	Region 3
COOK ISLANDS	Region 3
CROATIA	Region 1
CUBA	Region 2
CYPRUS	Region 1
CZECH REPUBLIC	Region 1

Country	Region for Diversity Score
DENMARK	Region 1
DOMINICAN REPUBLIC	Region 2
ESTONIA	Region 1
FAROE ISLANDS	Region 1
FIJI	Region 3
FINLAND	Region 1
FRANCE	Region 1
FRENCH GUIANA	Region 1
FRENCH POLYNESIA	Region 1
FRENCH SOUTHERN TERRITORIES	Region 1
GEORGIA	Region 1
GERMANY	Region 1
GIBRALTAR	Region 1
GREECE	Region 1
GREENLAND	Region 2
GUADELOUPE	Region 1
GUAM	Region 3
HAITI	Region 2
HEARD ISLAND AND MCDONALD ISLANDS	Region 3
HONG KONG	Region 3
HUNGARY	Region 1
ICELAND	Region 1
INDONESIA	Region 3
IRELAND	Region 1
ISRAEL	Region 1
ITALY	Region 1
JAMAICA	Region 2
JAPAN	Region 3
KAZAKHSTAN	Region 1
KIRIBATI	Region 3
KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF	Region 3
KOREA, REPUBLIC OF	Region 3
SOUTH KOREA	Region 3
KYRGYZSTAN	Region 1
LAOS	Region 3
LATVIA	Region 1
LIECHTENSTEIN	Region 1
LITHUANIA	Region 1
LUXEMBOURG	Region 1
MACAO	Region 3
MACEDONIA	Region 1
MALAYSIA	Region 3
MALTA	Region 1
MARSHALL ISLANDS	Region 3

Country	Region for Diversity Score
MARTINIQUE	Region 1
MAYOTTE	Region 1
MICRONESIA	Region 3
MOLDOVA	Region 1
MONACO	Region 1
MONGOLIA	Region 3
MYANMAR	Region 3
NAURU	Region 3
NETHERLANDS	Region 1
NETHERLANDS ANTILLES	Region 2
NEW CALEDONIA	Region 3
NEW ZEALAND	Region 3
NIUE	Region 3
NORFOLK ISLAND	Region 3
NORTHERN MARIANA ISLANDS	Region 3
NORWAY	Region 1
PALAU	Region 3
PAPUA NEW GUINEA	Region 3
PHILIPPINES	Region 3
PITCAIRN	Region 1
POLAND	Region 1
PORTUGAL	Region 1
ROMANIA	Region 1
RUSSIA	Region 1
RUSSIAN FEDERATION	Region 1
SAINT HELENA	Region 1
SAINT KITTS AND NEVIS	Region 1
SAINT PIERRE AND MIQUELON	Region 2
SAMOA	Region 3
SAN MARINO	Region 1
SERBIA AND MONTENEGRO	Region 1
SINGAPORE	Region 3
SLOVAKIA	Region 1
SLOVENIA	Region 1
SOLOMON ISLANDS	Region 3
SPAIN	Region 1
SVALBARD AND JAN MAYEN	Region 1
SWEDEN	Region 1
SWITZERLAND	Region 1
TAIWAN	Region 3
TAJIKISTAN	Region 1
THAILAND	Region 3
TIMOR-LESTE	Region 3
TOKELAU	Region 3

Country	Region for Diversity Score
TONGA	Region 3
TRINIDAD AND TOBAGO	Region 2
TURKEY	Region 1
TURKMENISTAN	Region 1
TUVALU	Region 3
UKRAINE	Region 1
UNITED KINGDOM	Region 1
UK	Region 1
UNITED STATES	Region 2
UNITED STATES MINOR OUTLYING ISLANDS	Region 2
UZBEKISTAN	Region 1
VANUATU	Region 3
VATICAN CITY STATE	Region 1
VIETNAM	Region 3
WALLIS AND FUTUNA	Region 3
SUPRANATIONAL	Region 4
EUROMARKET	Region 1
ASIA	Region 3
EUROZONE	Region 1
GLOBAL	Region 4
ASIA-NOT EMERGING MARKET	Region 3

Source: Moody's Investors Service

Appendix 7: Simulation of Interest Rate Curves

The Cox-Ingersoll - Ross process models the changes in interest rates according to the following differential equation:

FORMULA 7-1

$$dr = \alpha(\beta - r)dt + \sigma\sqrt{r}dW_t$$

Where:

» α, β, and σ are constants.

» *r* is the current level of interest rates.

» *dWt* is a normally distributed random variable equal to the product of a white noise *dz (dz~N(0,1))* and $\sqrt{dt}$.

Source: Moody's Investors Service

The values for α, β, and σ have been determined analytically with the Maximum Likelihood method:

	$3M	£3M	€3M
α	21.68%	14.39%	13.74%
β	3.82%	5.80%	3.27%
σ	6.18%	5.96%	5.28%

Source: Moody's Investors Service

Correlations between white noises of each interest rate curve:

	US$	£	€
US $	1	62%	31%
£		1	51%
€			1

Source: Moody's Investors Service

Appendix 8: Simulation of Foreign Exchange Rates

We list the stressed standard deviations of FX rates to be used below:

Currency Couple	Historical Annualized Standard Deviation of Monthly Variations	Stress Factor	Stressed Annualized Standard Deviation
EUR/USD	11.30%	1.5	17.00%
GBP/USD	10.90%	1.5	16.40%
EUR/GBP	8.40%	1.8	15.20%

Source: Moody's Investors Service

Appendix 9: Alternative Diversity Allocation in a Double Binomial

Scaling of Diversities to Sum to the Portfolio Diversity

Typically, unadjusted diversity scores (i.e., diversity scores before any scaling is applied) are calculated separately for each sub-portfolio as if they were unrelated portfolios. These unadjusted diversity scores are then multiplied by a scaling factor to ensure that the adjusted sub-portfolio diversity scores add up to the portfolio diversity score.

Let us illustrate with the following example:

» The overall portfolio diversity score is 50.

» The unadjusted diversity scores of the two sub-portfolios are 48 and 6.

The scaling factor is 0.926 = 50 / (48+6), the ratio of the overall portfolio diversity to the sum of unadjusted sub-portfolio diversities.

This scaling factor is used to adjust the unadjusted sub-portfolio diversities so that the sum of the adjusted diversity scores would be the overall portfolio diversity score of 50. In this example, the adjusted diversity scores of each sub-portfolio would be (after rounding to the closest integer): 44 and 6.

Scaling down the unadjusted diversity scores is necessary because these unadjusted diversity scores do not account for the correlation across sub-portfolios. This is necessary because the double binomial explicitly assumes statistical independence across sub-portfolios. This simple linear scaling method will prevent diversification from being overstated (and default variation from being understated) in many CLOs, but it is important to pay attention to the effect that this assumption has on the variation of the default distribution of the idealized multi-pool portfolio around its mean.

Appendix 10: Probability Weights for Moody's Default Timing and Interest Rate Scenarios

Base-case probability weights used to compute the weighted average expected loss are in the table below. As circumstances warrant, we may examine weighted average EL results given by alternative weightings.[87]

		Libor Scenarios					
		-2 Std. Dev.	-1 Std. Dev.	Forward	+1 Std. Dev.	+2 Std. Dev.	Total
Year of Default Spike	1	1%	4%	10%	4%	1%	20%
	2	1%	4%	10%	4%	1%	20%
	3	1%	4%	10%	4%	1%	20%
	4	1%	4%	10%	4%	1%	20%
	5	0.5%	2%	5%	2%	0.5%	10%
	6	0.5%	2%	5%	2%	0.5%	10%
	Total	5%	20%	50%	20%	5%	100%

Source: Moody's Investors Service

[87] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section) and in Section 9, "Loss Benchmarks."

Appendix 11: RiskCalc-Based Rating Factors

Pre-qualifying Conditions for RiskCalc Users to Derive Rating Factors

When using RiskCalc to derive initial or updated rating factors for a given obligor, the manager documents that the following conditions are met:

1) The obligor is a US for-profit operating company whose industry classification is not any of the following:
   - Banking, Finance, Insurance & Real Estate
   - Sovereign and Public Finance
2) An unqualified, signed, US GAAP audit opinion for the most recent annual statement is the source for model inputs. See below for limited use of Quality of Earnings (Q of E) reports.
3) Q of E reports may be used as the source of model inputs if the following conditions are met:
   - Q of E reports are from a nationally recognized audit firm
   - GAAP audits are not available
   - Q of E reports may be used for no more than 18 months for any single obligor
4) Debt/EBITDA is less than 9X

Model Runs and Mapping .edf Outputs to Rating Factors

RiskCalc-based rating factors mapped from five-year .edfs are provided by the manager using the most recent version of the US Corporate RiskCalc model. To produce these .edfs, the RiskCalc model is run in both financial statement only (FSO) mode and credit cycle adjusted (CCA) mode. In the CCA mode, the model inputs are based on current financial data and are run for the current year, as well as for each of the previous four years (12, 24, 36, 48 months prior). The weakest .edf from these six runs is then mapped to determine the obligor's rating factor.

Exhibit 11-1 should be used for mapping the weakest .edf to a rating factor, which will then be used to calculate the CLO's Weighted Average Rating Factor (WARF).

EXHIBIT 11-1

Mapping .edf Outputs to Moody's Rating Factors

RiskCalc-Derived .edf		Moody's Rating Factor
Ba2.edf and higher	0X < Debt/EBITDA < 3X and total assets > $200mm	2720
	Debt/EBITDA ≥ 3X or Total Assets ≤ $200mm	3490
Ba3.edf		3490
B1.edf		
B2.edf		
B3.edf		
Caa-C.edf		4770

Source: Moody's Investors Service

Limits, Recovery Rates, and Monitoring

Limits

Up to 20% of the collateral portfolio can be assigned rating factors using GAAP-audit-based RiskCalc model runs. An additional 10% of the collateral portfolio, for up to 18 months for a given obligor, can be assigned rating factors using Q of E-based RiskCalc model runs.

For any single obligor that represents more than 3% of the portfolio, the RiskCalc-based rating factor would typically be subject to the same adjustments that apply to credit estimates.[88]

Recovery Rate Assumptions

The assumed recovery rate for RiskCalc-based rating factors for a tranche with a Aaa rating target are:

» first-lien senior secured loan: 50%[89]

» all other: 25%

Monitoring

RiskCalc-based rating factors should be updated by the manager at least annually and following any material loan modification or amendment. To use RiskCalc-based rating factors in our analysis, the manager submits the following information:

» Documentation that pre-qualifying conditions have been met.

» Names of obligor, manager, and transaction current RiskCalc run date, loan maturity, Moody's Industry, weakest .edf, mapped rating factor, assumed recovery rate, and for Q of E-based rating factors documentation that the initial run date was not more than 18 months prior to the current model run

» RiskCalc batch model output file including all six model runs.

Reporting

CLO trustee reports should include relevant data and information as described in this appendix.

[88] For more information, see our cross-sector methodology for using credit estimates in rating analysis. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[89] We use the recovery rate assumptions for first-lien senior secured loans whose instrument rating is one notch higher than Moody's Default Probability Rating.

Appendix 12: Moody's Default Probability Rating and Instrument Rating

Algorithm for Determining Moody's Default Probability Rating

For all corporate assets, use the following:

a) the CFR[90]

b) if a) is not available, the rating we have assigned to senior unsecured debt of the obligor (Senior Unsecured Rating)

c) if neither a) nor b) is available, the rating we have assigned to senior secured debt of the obligor notched down by one notch

d) if neither a) nor b) nor c) is available, a credit estimate, provided by us within the last 15 months (subject to any applicable credit estimate adjustment, as specified in Exhibit 2)

a) or Caa3 if none of our ratings referenced above is available

Algorithm for Determining the Instrument Rating

For first-lien senior secured loans, use the following:

a) the rating we have assigned to the instrument

b) if a) is not available, the CFR notched up by one notch

c) if neither a) nor b) is available, the Senior Unsecured Rating notched up by two notches

d) otherwise, Caa3 if none of our ratings referenced above is available

For corporate assets other than first-lien senior secured loans, use the following:

a) the rating we have assigned to the instrument

b) if a) is not available, the Senior Unsecured Rating

c) if neither a) nor b) is available, the CFR notched down by one notch

d) if neither a) nor b) nor c) is available, the rating we have assigned to subordinated debt of the obligor notched up by one notch

e) otherwise, Caa3 if none of our ratings referenced above is available

[90] If the obligor itself does not have a CFR, we will use the CFR of any entity in the obligor's corporate family.

Appendix 13: Par Value Haircut Tables Reflect Highly Correlated Exposures to Countries with non-Aaa Ceilings

Assessing the impact of country risk (i.e., the risk affecting a given country that arises from political, institutional, financial and economic factors either within that country or externally) in cash flow CLOs entails the application of par value haircuts, as specified in Exhibit 13-1 below, when rating a CLO transaction. For a given bucket size of assets in countries with local currency country ceilings (LCCs) of A1 and lower, the par value haircut tables indicate for a specific CLO note target rating the par value haircut to be deducted from the portfolio par amount.

An LCC determines the maximum credit rating achievable in local currency for a debt issuer domiciled in that country or for a structured instrument whose cash flows are entirely or largely generated from domestic assets or residents. The LCC captures non-diversifiable country risks, which affect all issuers/assets in a country. These risks cannot be mitigated by a local diversification of the portfolio or by credit enhancement. Country risk materializes if one or more of the political, institutional, financial and economic factors addressed by a LCC occur.

We provide three par value haircut tables. The first applies to LCCs in the A1 to A3 range, the second applies to LCCs in the Baa1 to Baa3 range, and the third applies to LCCs of Ba1 and Ba2. There are no haircuts for LCC ratings of Aa3 or higher. All of the par value haircuts are expressed as a percentage of the total portfolio par amount (excluding defaulted assets).

EXHIBIT 13-1

Par Value Haircuts: LCC Range A1 to A3

CLO Tranche Target Rating	LCC Bucket Size		
	10%	15%	20%
Aaa (sf)	0.00%	2.00%	4.00%
Aa (sf)	0.00%	1.25%	2.50%
A (sf)	0.00%	0.50%	1.00%

Par Value Haircuts: LCC Range Baa1 to Baa3

CLO Tranche Target Rating	LCC Bucket Size		
	10%	15%	20%
Aaa (sf)	1.50%	4.00%	6.00%
Aa (sf)	1.00%	3.00%	4.50%
A (sf)	0.75%	1.50%	2.50%
Baa (sf)	0.00%	0.50%	1.00%

Par Value Haircuts: LCC Range Ba1 to Ba2

CLO Tranche Target Rating	LCC Bucket Size		
	10%	15%	20%
Aaa (sf)	3.00%	6.00%	9.00%
Aa (sf)	2.50%	4.50%	7.00%
A (sf)	1.50%	3.00%	5.00%
Baa (sf)	1.25%	2.00%	3.00%
Ba (sf)	0.50%	1.00%	1.50%

Source: Moody's Investors Service

We do not apply the tables above to non-Aaa LCC exposures that exceed 20% of the portfolio par amount, to LCC exposures below Ba2, or to exposures to non-highly correlated countries with an LCC below Aa3. In those instances we conduct a case-by-case analysis. Furthermore, in order to assess potential adverse selection issues, we consider how the loans forming part of the portfolio were sourced or retained. Also, we perform sensitivity runs that assume defaults would occur for a substantial portion of the assets.

Average of Par Value Haircuts Used for Multiple LCC Jurisdictions

When a portfolio consists of countries with different LCCs, we compute an exposure weighted average of the par value haircuts based on the applicable bucket size. For example, assume a CLO portfolio consisting of a 15% A3 LCC exposure and a 5% Baa3 LCC exposure. The respective haircut values in the 20% bucket size column for a Aaa (sf) target rating are 4% for the A3 LCC exposure and 6% for the Baa3 LCC exposure. Ultimately, the exposure weighted average par value haircut will be:

FORMULA 13-1

$$WA\ Haircut = 75\% \cdot 4.0\% + 25\% \cdot 6.0\% = 3.0\% + 1.5\% = 4.5\%$$

Source: Moody's Investors Service.

Linear Interpolation Used for More Granular Country Risk Bucket Sizes

For country risk bucket sizes deviating from the percentages 10%, 15% and 20% (as shown in Exhibit 13-1), we can derive the applicable par value haircuts using linear interpolation. Specifically, in relation to country risk bucket sizes between 0% and 10%, the applicable par value haircut will be obtained from linear interpolation between the par value haircut in the relevant 10% country risk bucket size column and 0%.

Par Value Haircut Reflects CLO Losses When Modeled Using BET Loss Distribution

Country risk can be characterized as a binary event with the country event either occurring or not occurring. There is nothing in between that can be described as a "close-to-a-country-collapse" event.

In order to reflect the binary nature of country risk, we focus on two different states of the world to derive the par value haircut numbers. The first state assumes that no country ceiling event occurs and thus a CLO transaction can be modeled as "normal" by applying the relevant Binomial Expansion Technique (BET) loss distribution based on the general CLO methodology.

However, the second state reflects the occurrence of a country ceiling event and assumes that the entire sub-portfolio affected by country risk has defaulted such that all borrowers forming part of this bucket exhibit a 100% pairwise default correlation. In this context, we also simulated different sets of recovery rate assumptions with regard to the exposures defaulted due to the occurrence of a country ceiling event.

Ultimately, these two states of the world were blended into one single state by taking into account the probability of the relevant country event occurring as reflected by the country ceiling. In essence, modeling the relevant BET loss distribution after applying the par value haircut replicates the expected loss on a CLO tranche under that blended scenario.

Appendix 14: Approach to Rating Instruments that Are Backed by CLO Secured Debt Tranches and Equity, and CLO Instruments with non-Standard Promises

In this appendix, we describe our quantitative approach to evaluating instruments that are backed by one or more CLO tranches, including possibly equity, and our approach to evaluating CLO-related instruments in which the promise to investors is non-standard either because it promises a return of principal only, or because coupons on these instruments correspond to sub-market rates.

Instruments that are Backed by CLO Debt Tranches and Equity

Securities that are backed by a combination of one or more CLO tranches and equity are exposed to the risks associated with CLO equity cash flows and potential refinancing[91] of the CLO secured debt tranches if such refinancing is permitted under deal documentation.

Haircuts to Equity Cash Flows

In modeling these instruments, we apply haircuts to the equity cash flows if one of the components is the CLO equity tranche to address the specific risks associated with CLO equity.[92] As Exhibit 14-1 shows, our equity-tranche cash flow haircuts vary with the target rating of the CLO repack.

EXHIBIT 14-1

Equity Cash Flow Haircuts by CLO Repack Rating

CLO Repack Target Rating	Equity Cash Flow Haircut
Aaa (sf) to Aa3 (sf)	100%
A1 (sf) to A3 (sf)	75%
Baa1 (sf) to Baa3 (sf)	50%
Ba1 (sf) to Ba3 (sf)	25%
B1 (sf) and below	0%

Source: Moody's Investors Service

Refinancing Scenarios

If the deal documentation allows the refinancing of some of the underlying secured debt tranches of the rated instruments, such refinancing can change the instrument's credit risk through the loss of future coupon payments from the refinanced CLO debt tranches. As such, we include a CLO refinancing scenario in our analysis to account for the risks associated with the potential refinancing of the CLO secured debt tranches. Adding the refinancing scenario analysis will capture the combined effects of missing coupon payments of the refinanced debt tranches as well as the impact on the instrument's weighted average life/duration.

For CLOs evaluated at any time between closing and one year after the end of their non-call period, we assume that refinancing occurs one year after the expiration of the non-call period, and we typically assign a 20% probability to the CLO refinancing scenario. For CLOs evaluated at any time after the end of this period and up to the end of the reinvestment period, we assume that refinancing occurs at the end of the reinvestment period and we typically assign a 10% probability to the CLO refinancing scenario. For CLOs evaluated at any time after the end of the reinvestment period, we assume that refinancing is unlikely to

[91] The term refinancing refers to any repayment in full of the CLO secured debt tranches that takes place much earlier than expected.

[92] We apply these haircuts to address the risks affecting equity cash flows which include expenses exceeding the cap that CLOs place on the payment of expenses at the top of the payment waterfall, trading losses, and other negative factors. The haircuts described here would also apply when we are asked to rate instruments that represent claims only on the equity tranche.

occur, and thus we typically assign a 0% probability to the occurrence of a CLO refinancing scenario after the end of the reinvestment period.

We first perform the modeling analysis for a base case assuming no refinancing by deriving the corresponding weighted average EL and zero-default WAL/Duration and obtaining a model output. We then run the refinancing scenario analysis assuming that the securities receive cash flows before refinancing occurs, their outstanding balance is reduced accordingly, and they receive only equity cash flows (after haircuts) post refinancing. We derive the weighted average EL and zero-default WAL/Duration for this refinancing scenario and obtain a model output. We then combine the results of both cases in accordance with the probabilities discussed above. When the CLO refinancing scenario is assumed to occur one year after the end of the non-call period, the probabilities assigned to the base case and the refinancing scenario will typically be 80% and 20% respectively. When the CLO refinancing scenario is assumed to occur at the end of the CLO reinvestment period, the probabilities assigned to the base case and the refinancing scenario will typically be 90% and 10% respectively. If the CLO has reached the end of the reinvestment period, we typically assume that the probability of refinancing has been reduced to zero.

Under certain circumstances, we may adjust up or down our assumptions on the probability of a refinancing, in consideration of factors such as market conditions and deal-specific features.

Instruments With Non-standard Promises

As with CLO notes with standard promises, our quantitative analysis for instruments with non-standard promises focuses on the expected loss (EL) borne by investors. We generally calculate EL by determining the losses to the noteholders in a series of default scenarios for the underlying collateral and weighting the losses by the likelihood of the scenario occurring.[93] In any scenario, the absolute loss to the noteholders is the difference between the net present value (NPV) of the expected cash flows of the note and the NPV of the promised payments on the note, expressed as a percentage of the promise.

The non-standard promise approach differs from the standard CLO method in its calculation of loss, discount factor, exposure period and benchmark rate, as we summarize in Exhibit 14-2. We also use this approach to analyze CLO repacks with non-standard promises.

EXHIBIT 14-2

Comparison of Non-Standard Promise and CLO Approaches

	Non-Standard Promise	CLO
Promise	Path-dependent promise	Par
Loss (%)	(Promise – NPV CF[94]) / Promise	(Par – NPV CF) / Par
Discount Factor	Risk-free rate (or a nearly risk-free rate, such as Libor)	Coupon
Exposure Period	Probability weighted duration	Weighted average life (zero default scenario)
Benchmark	Dynamic benchmark rate	Moody's Idealized Expected Loss rates[95]

Source: Moody's Investors Service

[93] For a full discussion of the modeling approach for CLOs, see Section 2.

[94] NPV CF refers to the net present value of all cash flows.

[95] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

Our approach to modeling non-standard promise instruments entails the following steps:

1) Generate cash flows to the CLO repack note, for each default scenario
2) Calculate the NPV of cash flows using a (usually Libor-based) risk-free rate as the discount factor for each default scenario
3) Determine the promised cash flows by summing up the NPV of cash flows and unpaid interest and principal, for each default scenario
4) Calculate loss and duration, for each default scenario
5) Calculate the EL and expected duration by weighting the various default scenarios by their probabilities of occurrence
6) Compare the EL of the CLO repack note to that of the benchmark bond with a similar duration, to derive an appropriate rating

STEP 1: GENERATE CASH FLOWS

We generate cash flows as described in Section 2.3.3. In each default scenario, we allocate the cash flow to the CLO repack note according to the note structure.

STEP 2: CALCULATE THE NET PRESENT VALUE (NPV) FOR EACH DEFAULT SCENARIO

For each default scenario, we calculate the NPV of all of the cash flows, discounting each cash flow using Libor/the risk-free rate:

FORMULA 14-1

$$NPV\ CF = \sum_{t=1}^{m} CF_t * DF_t$$

Where:

» CF_t refers to the cash flows during the period t; DF_t refers to discount factor at time t; and m refers to maturity.

Source: Moody's Investors Service

STEP 3: DETERMINE THE PROMISE FOR EACH DEFAULT SCENARIO

In analyzing a CLO repack, we calculate the promise which is path-dependent and varies in each default scenario, as described in the following equation

FORMULA 14-2

$$Promise = NPV\ CF + NPV\ Unpaid\ Interest\ and\ Principal\ when\ Due$$

Where:

*NPV Unpaid Interest and Principal when Due = (PIK Balance[96] + Principal Loss) * Discount Factor at Maturity[97]*

Source: Moody's Investors Service

[96] Some of these debt instruments can defer interest payments if there is a cash flow shortfall. The unpaid interest, which accrues interest, is called PIK Balance.

[97] We allow for the possibility that the CLO repack note is PIK-able and principal is not due until maturity. Therefore, the *Promise = NPV CF + PV Unpaid Interest and Principal at Maturity* and only the discount factor at maturity is necessary for the second half of the calculation. If the note were not PIK-able, we would use the present value of the unpaid interest for each period using the appropriate discount factors for the relevant periods.

STEP 4: CALCULATE LOSS AND DURATION FOR EACH DEFAULT SCENARIO

Under each default scenario, the total loss is simply the shortfall in the NPV of cash flows relative to the promise and equal to the NPV of unpaid interest and principal when due. The loss rate is the ratio of the total loss to the promise.

FORMULA 14-3

$$Loss\ \% = \frac{(Promise - NPV\ CF)}{Promise}$$

The duration (Dur) is that of promised, not actual, cash payments:

$$Dur = \frac{(\sum_{t=1}^{m} DF_t * \ CF_t * t) + DF_m * (PIK\ Balance + Principal\ Loss) * m}{(\sum_{t=1}^{m} DF_t \ * CF_t) + DF_m * (PIK\ Balance + Principal\ Loss)}$$

The PIK Balance in this equation applies only to CLO repacks that can defer interest payments.

Source: Moody's Investors Service

STEP 5: CALCULATE EXPECTED LOSS AND EXPECTED DURATION

We calculate the expected loss (EL) and expected duration (ED) as the probability-weighted loss and duration across all of the default scenarios using the following formulas.

FORMULA 14-4

$$EL = \sum_{i=0}^{D} Loss_i\% * P_i$$

$$ED = \sum_{i=0}^{D} Duration_i * P_i$$

where D refers to the number of default scenarios and P_i refers to the probability associated with each default scenario.

Source: Moody's Investors Service

STEP 6: COMPARE THE EL OF THE CLO REPACK TO THAT OF A SAME-DURATION BENCHMARK BOND

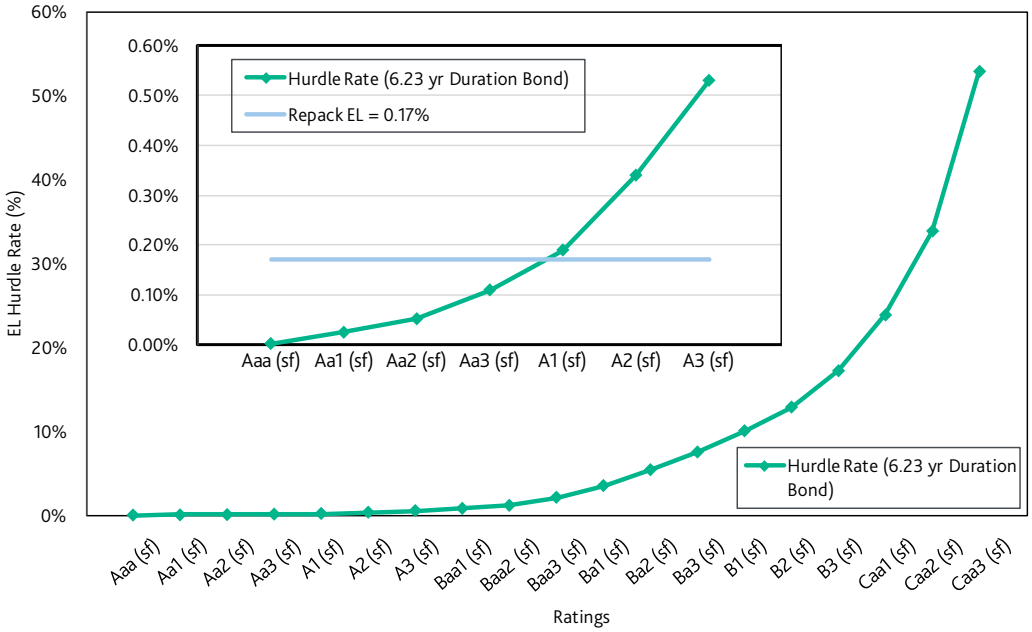
We derive the rating on the note by matching its EL to that of an appropriate benchmark bond with the same duration (as we describe in the text box following Exhibit 14-3). We calculate the EL hurdle rate of the benchmark bond based on a number of inputs: rating, duration, the risk-free rate curve, recovery rate and payment frequency. We adjust our benchmarks to reflect the discounting used to compute the EL of a note with a non-standard promise. Whereas ELs for standard promise notes are calculated using the coupon of the note (which generally includes a credit spread on top of the risk free rate), ELs for non-standard promise notes use the risk free rate. The use of the risk free discount factor necessitates an adjustment to our usual EL benchmarks.[98]

Exhibit 14-3 shows the procedure for a note with an EL of 0.17% and an expected duration of 6.23 years.

[98] While we use the loss boundaries as described in Section 9 of this report, we select loss benchmarks as set forward in Exhibit 14-4.

EXHIBIT 14-3

Comparison of the EL of the CLO Repack to the EL Hurdle of the Benchmark Bond



Source: Moody's Investors Service

FORMULA 14-5

Deriving the Hurdle Rate of the Benchmark Bond

By definition, the benchmark par bond's non-arbitrage price equals its par value. For simplicity, we assume that the bond's par value is equal to 1. In general, we calculate the price of the benchmark par bond as

$$Par = \sum_{t=1}^{N} PV(CFs(t) \mid default\ in\ time\ period\ t) * Prob(default\ in\ time\ period\ t) + PV(All\ Promised\ CFs(N) \mid no\ default) * Prob(survival\ in\ time\ [0,N])$$

where

- ***PV*** = the present value
- *CFs(t)* = all cash flows received in time periods *1* to *t*
- *PV(CFs(t) | default in time t)* = the present value of all cash flows received from time period *1* to *t* given that the bond has experienced a default in time *t*
- *Prob(*$\mathcal{E}$*)* = the probability that event $\mathcal{E}$ has occurred.

For a general case considering default risk in the expected cash flow payments, the price of the bond can be expressed as

$$Price = \sum_{t=1}^{N} [S_t(f_t + s) + d_t r]F_t + S_N F_N$$

where

- D_t = cumulative probability of default for time *t*
- d_t = probability of default in period *t* (survival through period *t - 1* and default in period *t*) = $D_t - D_{t-1}$
- r = recovery rate (constant)
- f_t = risk free rate in period *t*
- s = credit spread (constant)
- F_t = discount factor for period *t* (calculated using the risk free rate)
- S_t = probability of survival (no default) through period *t* = *1* - D_t
- N = total number of time periods

Assuming the bond is priced at par, we can solve for the default-implied credit spread, *s*:

$$s = \frac{1 - \sum_{t=1}^{N}[S_t f_t + d_t r]F_t - S_N F_N}{\sum_{t=1}^{N} S_t F_t}$$

We use the default-implied credit spread to calculate the present value of the benchmark bond promise, ***PV(Promise)***:*

$$PV(Promise) = \sum_{t=1}^{N} (f_t + s)F_t + F_N$$

Thus, we derive the benchmark par bond expected loss and expected duration using the following formulas:

$$EL(\%) = \frac{PV(Promise) - 1}{PV(Promise)}$$

$$Expected\ Duration = \frac{\sum_{t=1}^{N}(f_t + s)tF_t + NF_N}{PV(Promise)}$$

* The promise for the benchmark bonds is not path-dependent, because they are conventional (non-PIKable) bullet bonds: It is exactly the discounted value of the promised coupons plus the discounted par amount at maturity.

Source: Moody's Investors Service

Appendix 15: Structured Finance Obligations

CLOs purchase corporate obligations but sometimes include the flexibility to add other types of assets, such as structured finance obligations. Such purchases are typically limited to no more than 5% to 10% of the portfolio.

CLO documentation at closing normally provides tables of recovery rates for such securities. Given the recovery rate for a particular security, we derive the rating factor for use in the WARF calculation using the following formula:

FORMULA 15-1

$$RF = \frac{Unadjusted\ Rating\ Factor\ of\ such\ SF\ Obligation}{(1-R)} x55\%$$

Where:

» R = the recovery rate of the structured finance obligation as determined from the relevant table in our SF CDO rating methodology, using the instrument's initial rating

» $Unadjusted\ Rating\ Factor$ = the rating factor that would be associated with our current rating of the structured finance obligation if the rating were treated as a Moody's Default Probability Rating.[99]

Source: Moody's Investors Service

In our analysis, we typically treat as defaulted any structured finance obligation with a rating of Ca (sf) or C (sf).

One particular type of structured finance obligation in which CLOs have invested is tranches of other CLOs. As noted above, this is generally limited to no more than 5% to 10% of the portfolio. We have conducted analyses that indicate that a CLO's exposure to tranches of other CLOs can lower the diversity score because of industry and name overlaps between the obligors in the CLO and those associated with the re-securitized tranches. Correlations between pairs of CLO tranches can also have a negative effect on the diversity score. Our research shows that if the basket for CLO investments is limited, typically to no more than 5% of the portfolio's par amount, its potential negative impact on the CLO diversity score is small enough not to require modeling. When rating such transactions, we assign no diversity score credit to any of the CLO tranches acquired. However, if the overall CLO basket exceeds 5%, we apply a haircut to the diversity score to capture the potential negative impact on diversification.

Of greater concern is the purchase of tranches from CDOs that the manager or an affiliate of the Manager manages. Because of the potential for conflicts of interest, such purchases would typically be subject to a concentration limit of 1% to 2% and explicit reporting. If the CLO does purchase CLO tranches managed by a common manager or its affiliates (including, especially, the manager of the CLO issuer or affiliates of the manager of the CLO issuer), we may again assess a diversity score penalty to reflect the impact on diversification.

Other structured finance obligations requiring special treatment are interest-only (IO) and principal-only (PO) instruments. IOs are typically purchased only with excess interest. They are typically excluded from collateral quality tests but included in the numerator of any IC test. IO securities enter into interest coverage/coupon/spread calculations with a haircut. POs are normally included at their purchase prices in collateral quality, concentration, and OC tests. They are considered part of the basket for Less Frequently Paying assets.

[99] See Exhibit 1.

Appendix 16: Synthetic Securities

Some CLOs contain a basket for synthetic securities ("Synthetics"). In general, Synthetics are a mechanism for gaining credit exposure to collateral that is generally appropriate but that might not be entirely eligible for the CLO because of one or more specific attributes. Hence, CLO indentures normally require that the reference obligation and any deliverable obligation satisfy the definition of a Collateral Debt Security, though perhaps with some modification of payment frequency, basis, or maturity, and also apart from the fact that the instrument delivered may be defaulted. If "soft" credit events such as restructurings are permitted, CLO market practice is that the contract provides for physical delivery.

For collateral quality tests other than the Diversity Score, we will look to the synthetic security contract. However, concentration test calculations are normally based on the characteristics of the reference obligation/entity. Exceptions are concentration limits related to the payment characteristics of the instrument, such as fixed/floating, payment frequency, and maturity limits.

We view a Synthetic as defaulted if either a Credit Event has occurred or the counterparty to the synthetic transaction has defaulted.

If a default by the Synthetic's counterparty triggers a termination payment due by the CLO issuer, the payment is typically junior in the waterfall to any payment due to the rated notes. CLO swap documents normally require that any collateral posted under a Credit Default Swap ("CDS") contract satisfy the definition of Eligible Investments and be redeemable on demand at par, without any penalty.[100]

A limited number of CLOs allow synthetic short positions, through which the CLO buys credit protection. CLO documentation normally specifies that for the CLO to receive hedging "credit"[101] vis-à-vis matching long positions, such short contracts should precisely mirror the terms of the corresponding long positions; in particular, the maturity of the short should equal that of the underlying asset. The premia the CLO pays under the short are reflected in the WAS or WAC test. In case of the sale, payment or prepayment of the underlying collateral obligation, the offsetting swap can be terminated or, if the WAS test is satisfied, become a naked short obligation. Also, CLO documentation typically provides that an offsetting CDS can be terminated without the sale of the corresponding obligation only if the reinvestment criteria are satisfied after giving effect to such a termination.

A concentration limit of, say, 10% is typical for such offsetting CDS positions. Additionally, offsetting CDS termination payments are usually not paid senior to the rated notes unless there is a mechanism ensuring that enough proceeds remain after such a payment to pay interest and principal on the rated notes on the payment date. In some cases, CLOs can enter into "naked" short positions (i.e., synthetic short positions for which the CLO does not hold any corresponding long position). The CLO documentation typically allows the SPV to enter into such "naked" short positions if the CLO is passing all of its collateral quality tests and there is enough of a buffer in the WAS test that the WAS test criterion will be satisfied even after paying the premia for the short CDS positions. We take into account in our analysis naked short positions by assuming that the CLO will make the contractual premium payments but will not receive any payments related to credit events. Indentures also usually incorporate a concentration limit of, say, 5% on naked short positions. It is also the market norm that naked short termination payments are not paid senior to the rated notes

[100] It is important that the collateral be redeemable on demand because a cash settlement payment can be payable on any day, and not necessarily on a CLO Payment Date. This possibility would otherwise expose the CLO to unmodeled market risk.

[101] Such "credit" is given in the sense that a reference obligation with an offsetting short position is not considered "defaulted" even following the occurrence of a default. Thus, such credits are considered at par value for the purpose of the OC and other tests.

unless there is a mechanism ensuring that enough proceeds remain after such a payment to pay interest and principal on the rated notes on the payment date.

To mitigate the counterparty, operational and legal risks associated with Synthetics, CLOs typically limit the amount of such securities in a manner consistent with the counterparty exposure limits in Appendix 5. We consider the limits specified in a CLO's documentation when evaluating the risks posed by Synthetics.

Appendix 17: Securities Lending

Some CLOs incorporate provisions that permit them to earn additional income through securities lending. To mitigate the counterparty, operational and legal risks associated with such lending agreements, such CLOs incorporate numerous protections. These protections normally require that the borrower pledge to the CLO collateral that has a market value greater than that of the loaned securities require that the borrower have a short-term rating of P-1 and a long-term rating of at least A1, and incorporate concentration limits. CLOs that permit securities lending typically limit the amount of securities lending as well as their exposures to individual borrowers in a manner consistent with the counterparty exposure limits in Appendix 5. We consider the limits specified in a CLO's documentation when evaluating the risks posed by securities lending.

Appendix 18: Approach to Mapping Ratings and Scores Provided by Third-party Entities

Overview

In this appendix, we describe our approach for mapping ratings and scores from third-party entities, such as banks and specialized rating or score providers, to Moody's rating factors. We map third-party ratings for unrated assets included in e.g. certain collateralized loan obligations (CLOs) such as balance sheet CLOs or transactions backed by loans to small- and medium-sized enterprises (SME). Our mapping approach incorporates both qualitative and quantitative elements and is determined and periodically reviewed by rating committees.

A mapping is a correspondence between a third-party rating category (or class) and our rating factor as per our Idealized Cumulative Default Rates. The rating factor that results from the mapping allows us to associate a default probability with an asset that does not have our rating or a credit estimate. Rating factors are not equivalent to and do not represent our traditional credit ratings. If we conducted an analysis commensurate with a full credit rating, the result may be significantly different.

Furthermore, we may seek a credit estimate for any unrated individual asset that accounts for more than approximately 3% of the portfolio rather than using a mapping for the asset.

Qualitative Analysis

Our qualitative mapping analysis determines whether we can achieve a mapping that is sufficiently reliable for use in a transaction. We cover the key qualitative elements of the rating system during an operational review. More specifically, our operational review of the third party[102] includes an assessment of the entity's rating system methodology and associated processes, including the credit approval process, credit and loan personnel and systems. We also review the independence of its rating assignments from its processes for both loan origination and the selection of assets for inclusion in the structured finance transaction.

Operational Review

During the operational review, we seek to understand the expertise and experience of the individuals who are responsible for assigning the ratings, the adequacy of staffing levels at the rating provider, and detailed information on the third-party rating process. If the rating provider is a bank, we also obtain an overview of its loan underwriting standards. The operational review also includes a discussion of the roles of the rating provider's relevant staff, any models, methodologies and systems involved and the set of procedures applicable to the assignment of an internal rating.

We will also seek information related to the rating provider's monitoring process, including the standard frequency of review of ratings, the circumstances which may prompt an unscheduled review and the placement of credits 'on watch' for further attention. Another factor we consider is the stability of the rating process itself.

Finally, we will review whether the rating provider is regulated and the applicable regulations governing the provider. If regulated, we will assess the frequency and extent to which the provider's rating process is audited by an internal audit function and evaluated by an external regulator(s). Both the frequency of such reviews and the findings are relevant. For a bank's rating system, an important aspect is whether it has been approved for the advanced approach under the Basel II framework (or any subsequent revision thereof). We

[102] When the rating is provided by a specialized provider, the operational review will cover the specialized provider with respect e.g. to the rating system methodology and rating assignment process and the originator with respect e.g. to the use of the ratings.

consider mappings of these types of rating systems to be generally more reliable because of: (1) the close scrutiny bank regulators apply to assess a bank's internal credit processes, and (2) their acknowledged experience and expertise in assessing the credit risk of their customers and counterparties. Strong bank supervision and implementation of robust risk management processes greatly increase the likelihood that a bank will maintain consistent credit policies across time, as well as across borrowers in different regions and sectors.

If we believe the entity's rating system is not sufficiently complete or robust, we may apply more conservative assumptions or adjustments when determining a mapping or we may conclude that a mapping process is not feasible.

Quantitative Analysis

In general, to determine the correspondence between a third-party's rating and Moody's rating factor, two approaches are possible:

1) If the rating provider's overall portfolio contains a sufficiently large sample of borrowers with monitored Moody's ratings and the sample is representative of the securitized portfolio, we perform a statistical analysis, comparing the third-party ratings to Moody's monitored ratings.[103] We call this the *rating matching approach*.
2) If the rating provider's overall portfolio contains an insufficient sample of borrowers with monitored Moody's ratings, we establish a mapping by comparing
    a. The long-run average probabilities of default ("target PDs") assigned to each rating grade within the provider's rating system to our Idealized Default Rates of the same time horizon; or
    b. If the third party's rating system does not include target PDs, the performance (e.g. historical default rates) of the provider's rating system with the performance of Moody's monitored ratings over a similar time horizon.

Mapping approach 2.a. may be complemented by an analysis of performance data commensurate with the approach described under 2.b. We call this the *default rate matching approach*.

Regardless of the type of mapping approach, for each third-party rating category the best possible rating factor equivalent will be the one corresponding to the third party's expected default rates (i.e. based on its master scale if they have a master scale). This ensures that the resulting rating factors are no better than the third party's expected ones.

We may adjust the results of this quantitative analysis based on the qualitative analysis we describe above. These adjustments may affect the entire portfolio or only a fraction of it (e.g. an 'x'-notch adjustment is applied to the mapping only for assets originated in a particular country).

Rating Matching Approach

To establish a mapping between the third party's ratings (TPR) and our rating factors, we use a sample of borrowers with both a TPR and a Moody's rating and we establish a mapping function between the two by performing a regression of the TPR on Moody's rating, i.e., the dependent variable, adjusted to take into account the number of observations available for each TPR (for more details, see Box 1).

[103] We may also rely on RiskCalc to generate one-year expected default frequencies (EDFs) that may be compared to the provider's internal ratings and can be directly translated by using our idealized default probability table. For more information, see www.moodys.com.

Box 1. The Rating Matching Approach

We start with a frequency distributions table of Moody's ratings for the obligors in the sample that have been assigned the TPR (see Exhibit 18-1).

EXHIBIT 18-1

Sample Frequency Distributions of Third-Party Ratings (TPRs) and Moody's Ratings

	Moody's																				
TPR	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca	Grand Total
1	16.7%	22.2%	16.7%	16.7%	5.6%	11.1%	5.6%	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
2	0.0%	6.5%	9.7%	9.7%	16.1%	16.1%	29.0%	12.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
3	0.0%	0.0%	4.0%	8.0%	18.0%	28.0%	20.0%	18.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
4	3.0%	1.0%	3.0%	4.0%	12.1%	24.2%	16.2%	24.2%	7.1%	5.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
5	0.0%	1.5%	0.0%	1.5%	4.6%	13.8%	20.0%	20.0%	23.1%	13.8%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
6	0.0%	2.2%	0.0%	0.0%	2.2%	6.5%	8.7%	26.1%	39.1%	13.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
7	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	7.1%	32.1%	39.3%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
8	2.9%	0.0%	0.0%	0.0%	2.9%	5.7%	17.1%	22.9%	17.1%	14.3%	8.6%	8.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
9	0.0%	0.0%	0.0%	0.0%	4.2%	12.5%	0.0%	4.2%	37.5%	25.0%	4.2%	4.2%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	3.4%	13.8%	13.8%	37.9%	10.3%	6.9%	6.9%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
11	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	7.1%	14.3%	14.3%	28.6%	7.1%	14.3%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
12	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	2.7%	5.4%	13.5%	18.9%	10.8%	10.8%	13.5%	10.8%	2.7%	2.7%	2.7%	0.0%	0.0%	0.0%	100.0%
13	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.1%	18.2%	0.0%	9.1%	0.0%	9.1%	27.3%	9.1%	18.2%	0.0%	0.0%	0.0%	0.0%	100.0%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	11.8%	23.5%	5.9%	23.5%	11.8%	11.8%	0.0%	5.9%	0.0%	0.0%	0.0%	100.0%
15	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	0.0%	16.7%	16.7%	0.0%	16.7%	16.7%	16.7%	0.0%	0.0%	0.0%	100.0%
16	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%	5.0%	10.0%	5.0%	15.0%	0.0%	30.0%	20.0%	5.0%	0.0%	0.0%	100.0%
17	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	25.0%	12.5%	0.0%	12.5%	0.0%	12.5%	0.0%	12.5%	0.0%	100.0%
18	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	33.3%	0.0%	0.0%	33.3%	0.0%	0.0%	100.0%
19	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
20	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%	20.0%	20.0%	20.0%	0.0%	0.0%	0.0%	100.0%

Source: Moody's Investors Service

Our objective is to derive a mapping function taking into account that for some TPRs, many observations (in terms of monitored Moody's ratings) are available while for others there are only few.

We consider three different statistical models: linear, exponential and second order polynomial, to explain the relationship between the monitored Moody's rating (dependent variable) and the TPR (independent variable) by fitting a curve between the percentile levels (the z%-tiles) of each TPR-specific frequency distribution of monitored Moody's ratings and the TPR. To find the optimal parameters for each model, we minimize the sum of weighted least-squares. For each TPR category, we take into account the number of observations available.

We then implement a constraint that the rating factor that the statistical model generates for the TPR representing the lowest credit risk must be equal to or worse than the respective z%-tile Moody's rating.

When choosing a certain percentile (the z%-tile), we typically conduct a sensitivity analysis by deriving alternative mapping functions using a slightly higher and/or lower percentile. We may complement our analysis by carrying out a scenario analysis for a larger number of

different percentile levels where in a first step, we determine the level of credit enhancement necessary for a theoretical senior-most liability tranche with a Aaa target rating and using a portfolio mapped using the given z%-tile. Next, we calculate the rating impact (through Moody's Metric, MM[104]) of adjusting the percentile to a higher level, using the same credit enhancement level. By repeating this exercise up to the 100th percentile and using the same incremental step size when adjusting the percentile, we can calculate the expected MM by weighting the respective percentiles by their probabilities of occurrence. The expected MM must lie within a predetermined tolerance level, which we generally take to be 2 rating subcategories. If the tolerance is exceeded, then either the starting point of the mapping must be more conservative (i.e. a higher percentile), or a larger sample must be gathered to reduce statistical uncertainty.

Default Rate Matching Approach

To establish a mapping between the third party's ratings (TPRs) and our rating factors using the default rate matching approach, we compare our Idealized Default Rates at the same time horizon and the third party's long-run average probabilities of default for each third-party rating category. If the third party's system does not include this information, we compare the performance of the provider's rating system, expressed for example by historical default rates, with the historical performance of Moody's monitoring ratings over a similar time horizon.

The rating factors we derive from this approach need to be supported by the validation results, both in terms of discriminatory power and if applicable, calibration level over a full economic cycle.

Data Quality

While reviewing the third-party rating system in our operational review as we describe above, we also assess the sample and quality of the data provided to establish the mapping. We typically review a number of key factors:

» Rating system: We review the rating system concept, such as the default definition (and how it differs from our default definition[105] and the securitization's default definition), the time horizon (i.e. point-in-time vs. through-the-cycle), the main components (e.g. financial, behavioral and qualitative) and the sources of the inputs.

» Back testing and historical data: We look for data supporting the third party's rating scale, including default rates and rating transitions, ideally covering at least the previous five years or a full economic cycle, including a recession.[106]

Typically, to create a mapping relationship between a sample of the third party's ratings and our rating factors, the sample comprises the entire universe of assets of the type that will be securitized (i.e. the sample should be representative of the securitized portfolio). The data sample may also be tailored to match the characteristics of the portfolio that will be securitized, with assets' attributes such as industry, country, obligor size and credit quality in similar proportions.

Monitoring

When monitoring a transaction where the credit quality of the portfolio is determined using a mapping, we monitor the mapping by looking for the following information:

[104] For more information, see our CDOROM User Guide on www.moodys.com.

[105] For information on Moody's definition of default, see *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

[106] We may also request to evaluate a smaller "control" sample of unrated names which have been analyzed through Moody's CreditEdge and/or RiskCalc models or which have been assigned Moody's credit estimates as a further test.

» Reported overall delinquency and default rates in the portfolio are in line with what we would expect from the average mapped quality of the portfolio and whether defaulted assets exhibit unusual behavior.

» Third-party rating provider to confirm that there has been no significant change in their rating process or approach since the mapping was established. In case we obtain limited or insufficient confirmation, we may apply an additional default probability stress to the mapped rating factors.

We periodically refresh our mapping analysis, given that the relationships between the third party's rating and our rating factors may drift over time. Our refreshing of existing mappings is generally similar to the approach we use to assign initial mappings, incorporating both an updated operational review and quantitative analysis.

Other events such as significant, unexplained credit deterioration in the portfolio as well as material changes in the third-party rating process or approach may prompt a refreshing of our mapping. All mappings which are older than two years are subject to an additional default probability stress when used in our monitoring analysis. When the remaining number of mapped assets has reduced over the transaction life, we may subject the mapped assets to a default probability stress given that the mapping becomes less statistically robust the smaller the number of assets in the transaction portfolio.

Moody's Related Publications

Credit ratings are primarily determined through the application of sector credit rating methodologies. Certain broad methodological considerations (described in one or more cross-sector rating methodologies) may also be relevant to the determination of credit ratings of issuers and instruments. A list of sector and cross-sector credit rating methodologies can be found here.

A list of the specific industries corresponding to the industries listed in Appendix 6 can be found here.

For data summarizing the historical robustness and predictive power of credit ratings, please click here.

For further information, please refer to *Rating Symbols and Definitions*, which includes a discussion of Moody's Idealized Probabilities of Default and Expected Losses, and which is available here.

» contacts continued from page 1

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